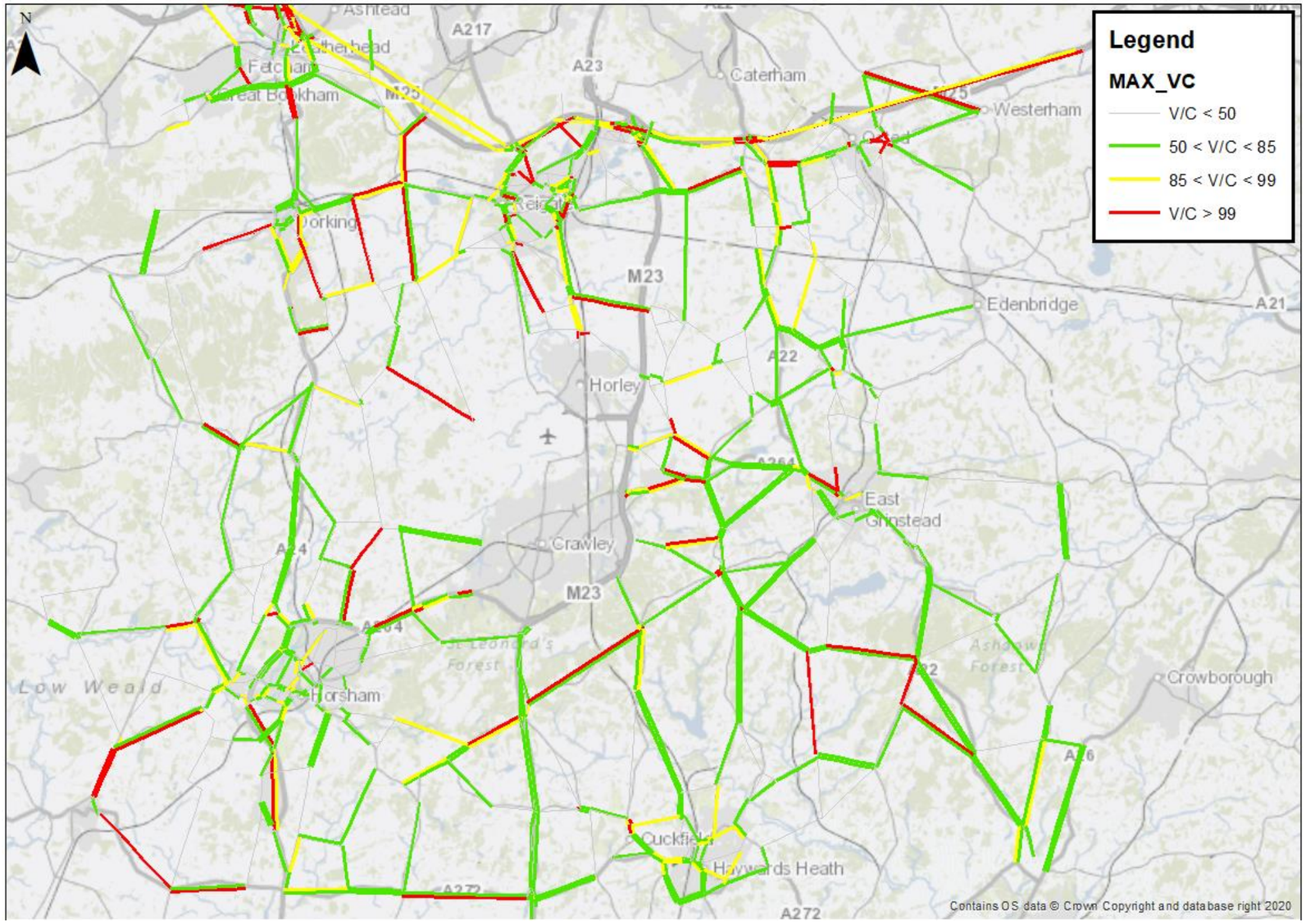
Figure 74: Maximum V/C - 2047, With Project - Performance Area B



10.7 Performance Area C

Operational Performance - Volume / Capacity ratios

10.7.1 Modelled Volume / Capacity ratios were extracted for each of the four modelled time periods. The maximum value across all time periods was selected to identify the highest value modelled and this is presented Figure 78 to Figure 83.

10.7.2 Performance Area C refers to Inter-London north of the M25 to the extents illustrated in Figure 26. Modelling undertaken to date has identified that this area of the network is particularly sensitive and the modelling assumptions (e.g. network definition / scale) will be further reviewed during future workstreams in preparation for the DCO. The primary focus for impacts are considered using the Magnitude of Impact criteria specified.

Magnitude of Impact

10.7.3 An overview of 'Low', 'Medium' and 'High' impacts is presented in Figure 75 to Figure 77. The graphics consider data for all periods.

10.7.4 There are some issues that have been noted within the Croydon area of the model which will be investigated further at the next stage. These issues relate to a mix of zone loading, and some convergence issues in the model where there are instances of route choices changes through the congested network. Croydon is just beyond the area of urban fixed speed modelling which results in some trips through the area being sensitive to small cost changes using the less congested fixed speed coding rather than the full simulation network. This results in instances of flow changes, and hence delay and V/C changes which are not related to the Project.

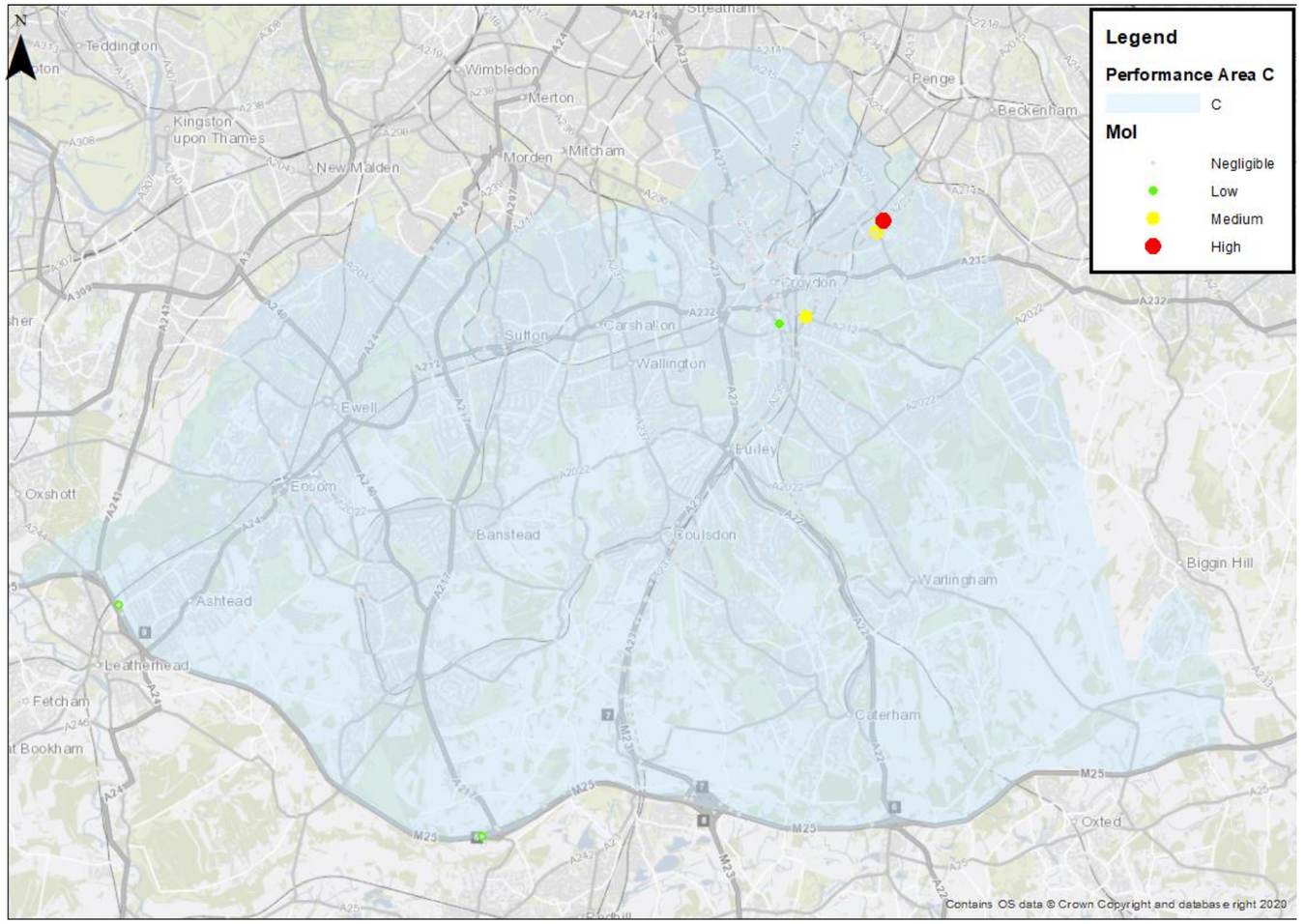
2029

10.7.5 When considering 2029, there is a maximum of one 'Medium' and one 'High' magnitude impact instance across all modelled periods as summarised in Table 10.7.1. These instances are located within Croydon. This 'High' impact occurs at a junction which is already stressed in the Future Baseline scenario and is made worse by a small increase in arrival flow. This is not considered to be a direct impact of the Project. A review of the coding in this area and the zone loading will be undertaken to ascertain where this can be improved.

Table 10.7.1: Magnitude of Impacts: Performance Area C, 2029 Nodes

2029	Performance Area C - Nodes			
MoI	**AM1**	**AM2**	**IP**	**PM**
Negligible	266	101	154	166
Low	1	2	0	1
Medium	1	0	0	1
High	1	0	0	0

Figure 75: Magnitude of Impacts: Performance Area C, 2029 Nodes



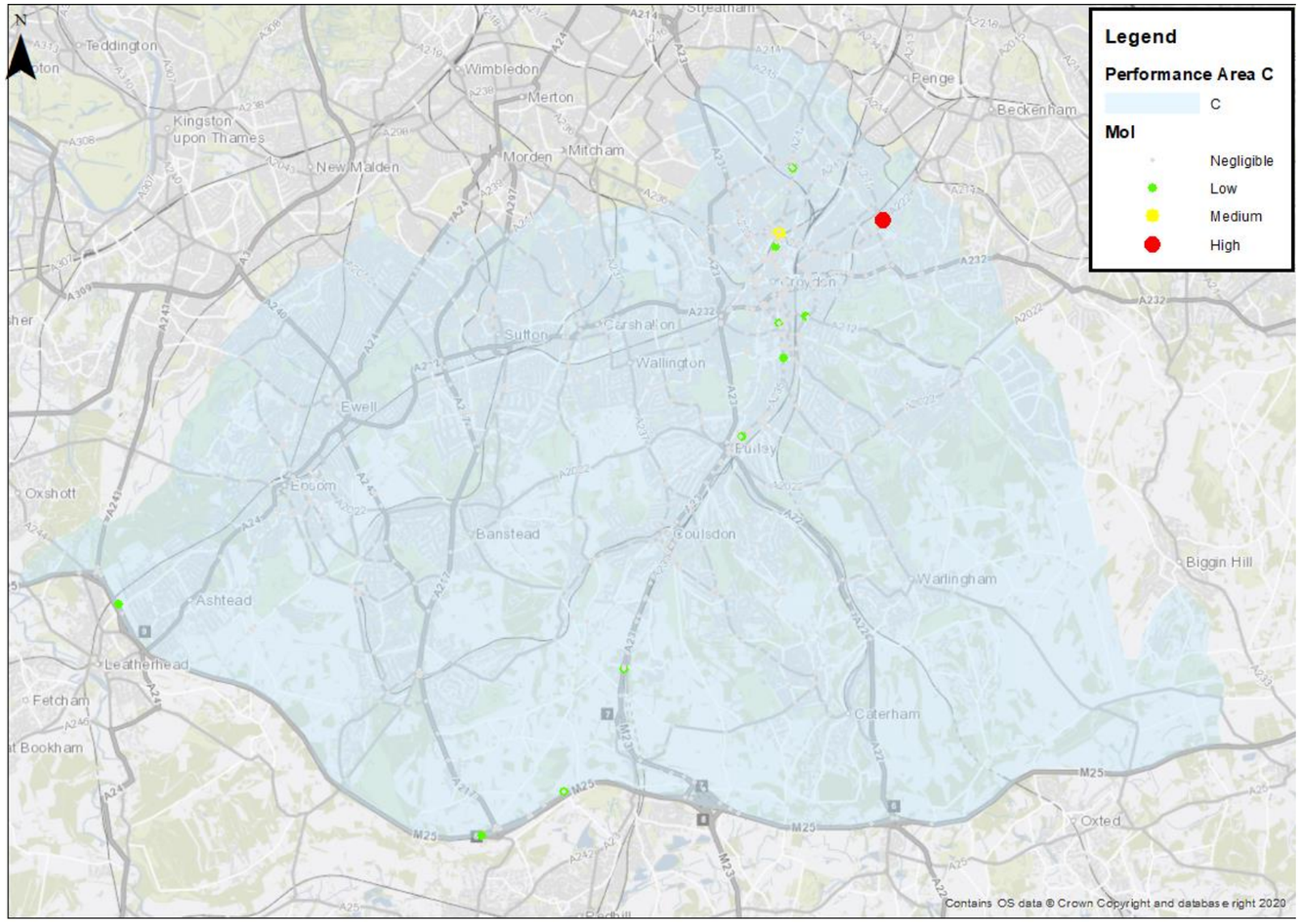
2032

10.7.6 The 2032 assessment year impacts are summarised in Table 10.7.2. The table outlines that there is a maximum of one 'High' impact and one 'Medium' across all modelled periods. Figure 76 outlines all occurrences across all peaks. These instances are located within Croydon. The 'High' impact is in the same location as for 2029, and the 'Medium' is due to re-routing within central Croydon unrelated to the Project.

Table 10.7.2: Magnitude of Impacts: Performance Area C, 2032 Nodes

2032	Performance Area C - Nodes			
MoI	**AM1**	**AM2**	**IP**	**PM**
Negligible	611	429	448	485
Low	4	6	0	5
Medium	0	1	0	0
High	1	0	0	0

Figure 76: Magnitude of Impacts: Performance Area C, 2032 Nodes



2047

10.7.7 The 2047 assessment year impacts are summarised in Table 10.7.3. The table outlines that there is a maximum of one 'High' impact and two 'Medium' instances across all modelled periods. Figure 77 outlines all occurrences across all peaks. These instances are located within Croydon. The 'High' impacts in AM2 and PM are related to traffic switching between zone loading points at a junction which is under significant stress in the Future Baseline scenario and as such is sensitive to very small changes in traffic flows. These will be reviewed in the next stage of modelling.

Table 10.7.3: Magnitude of Impacts: Performance Area C, 2047 Nodes

2047	Performance Area C - Nodes			
MoI	**AM1**	**AM2**	**IP**	**PM**
Negligible	487	492	331	493
Low	2	2	0	1
Medium	2	2	0	0
High	0	1	0	1

Figure 77: Magnitude of Impacts: Performance Area C, 2047 Nodes

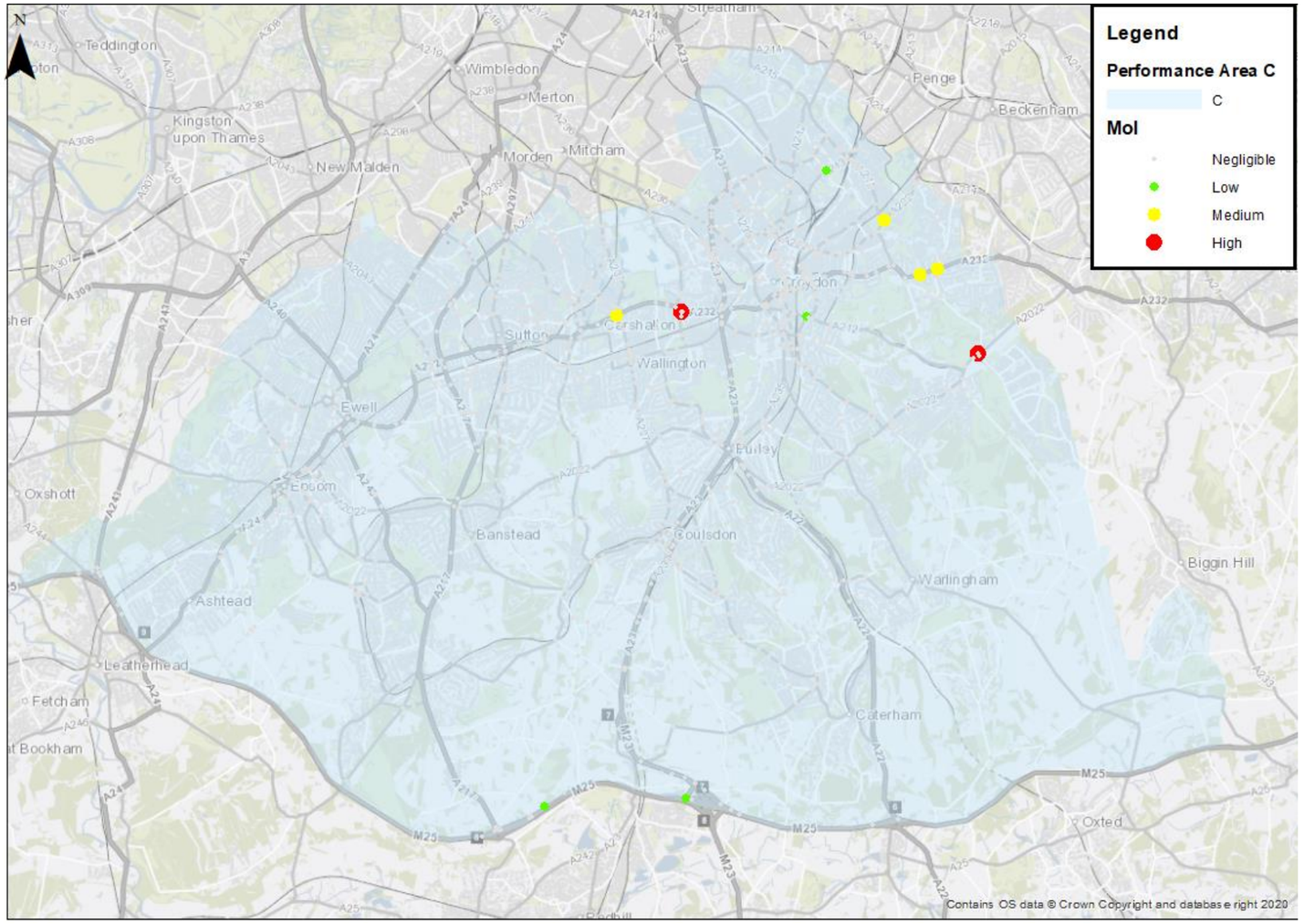


Figure 78: Maximum V/C - 2029, Future Baseline – Performance Area C

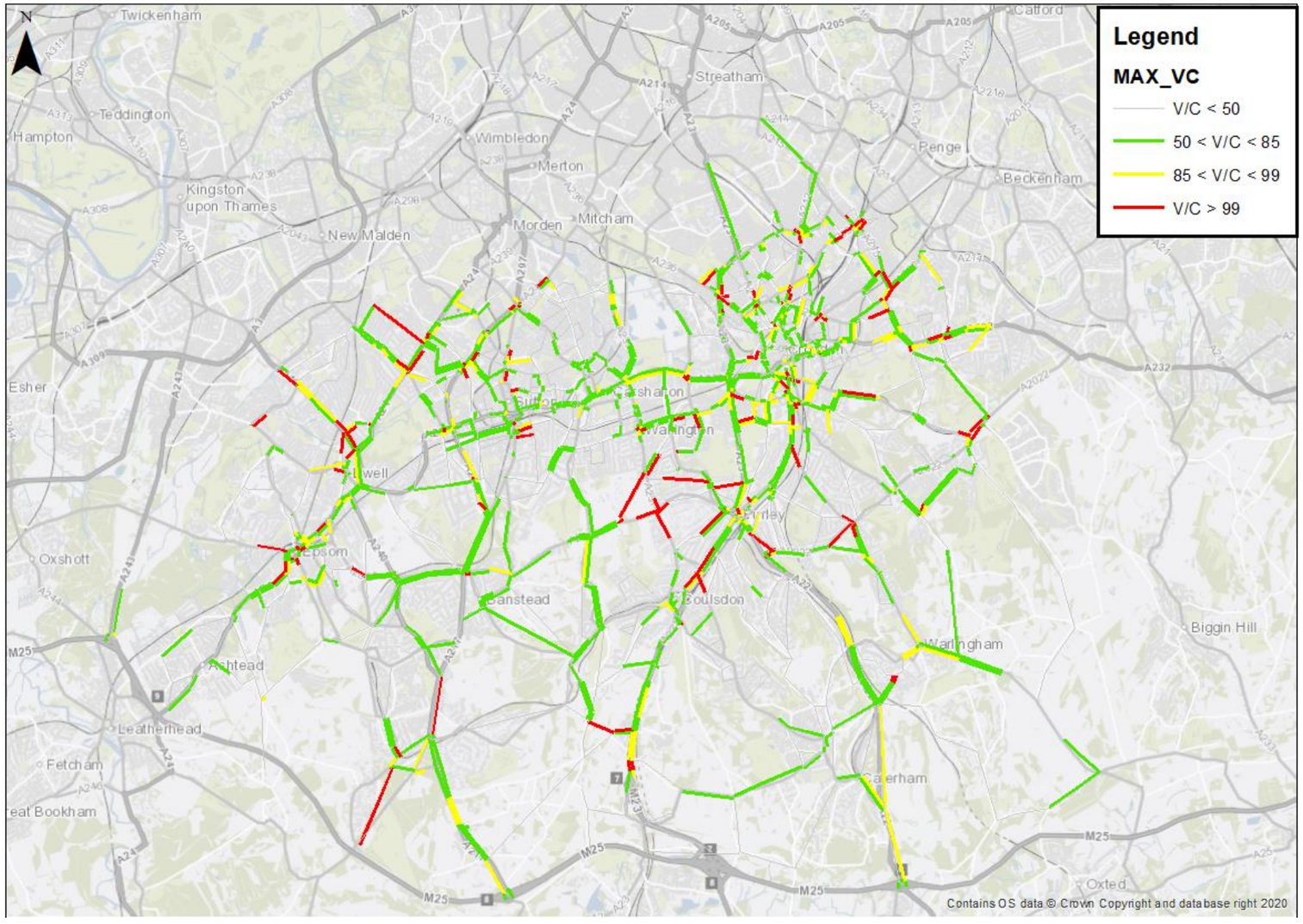


Figure 79: Maximum V/C - 2029, With Project – Performance Area C

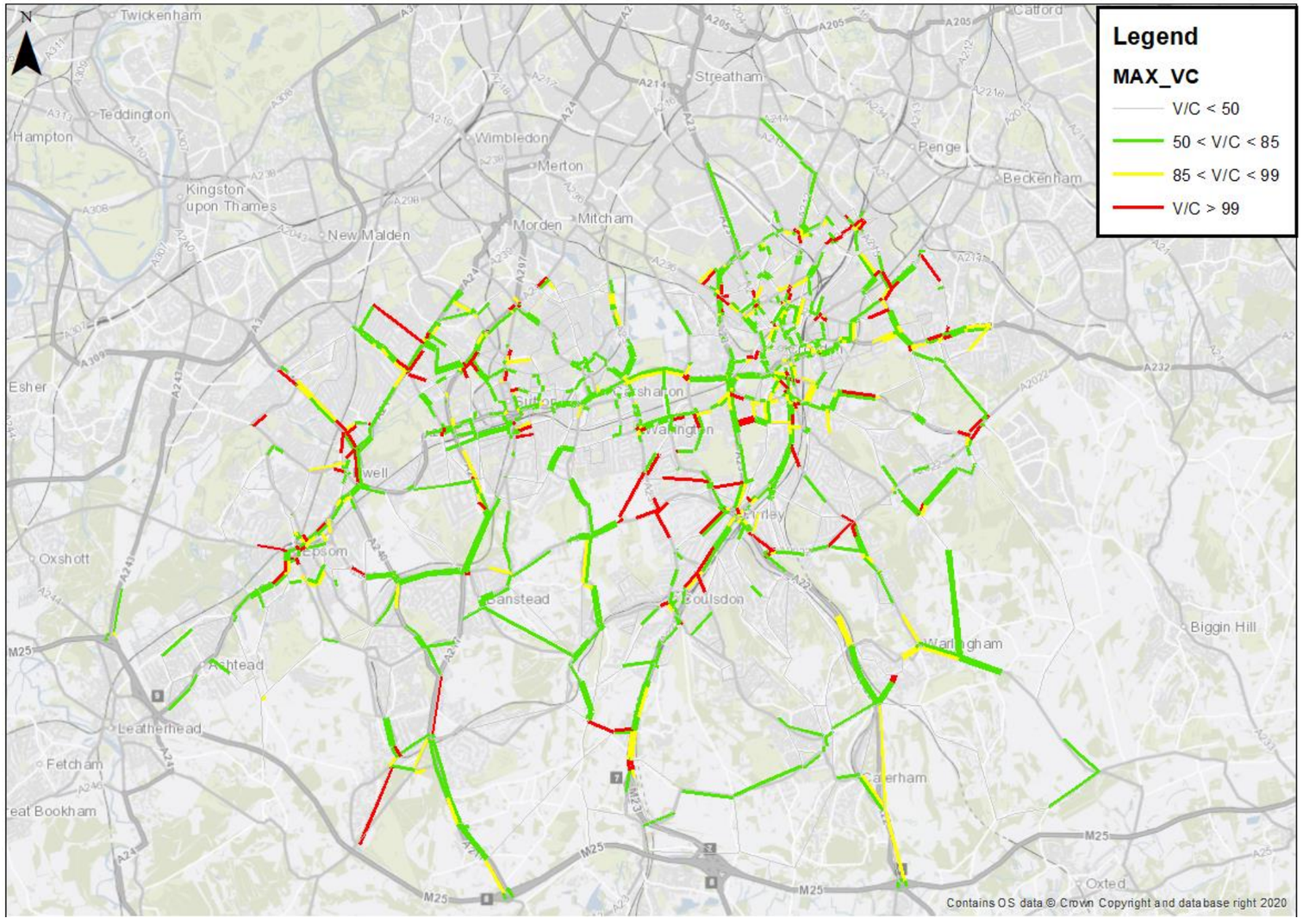


Figure 80: Maximum V/C - 2032, Future Baseline - Performance Area C

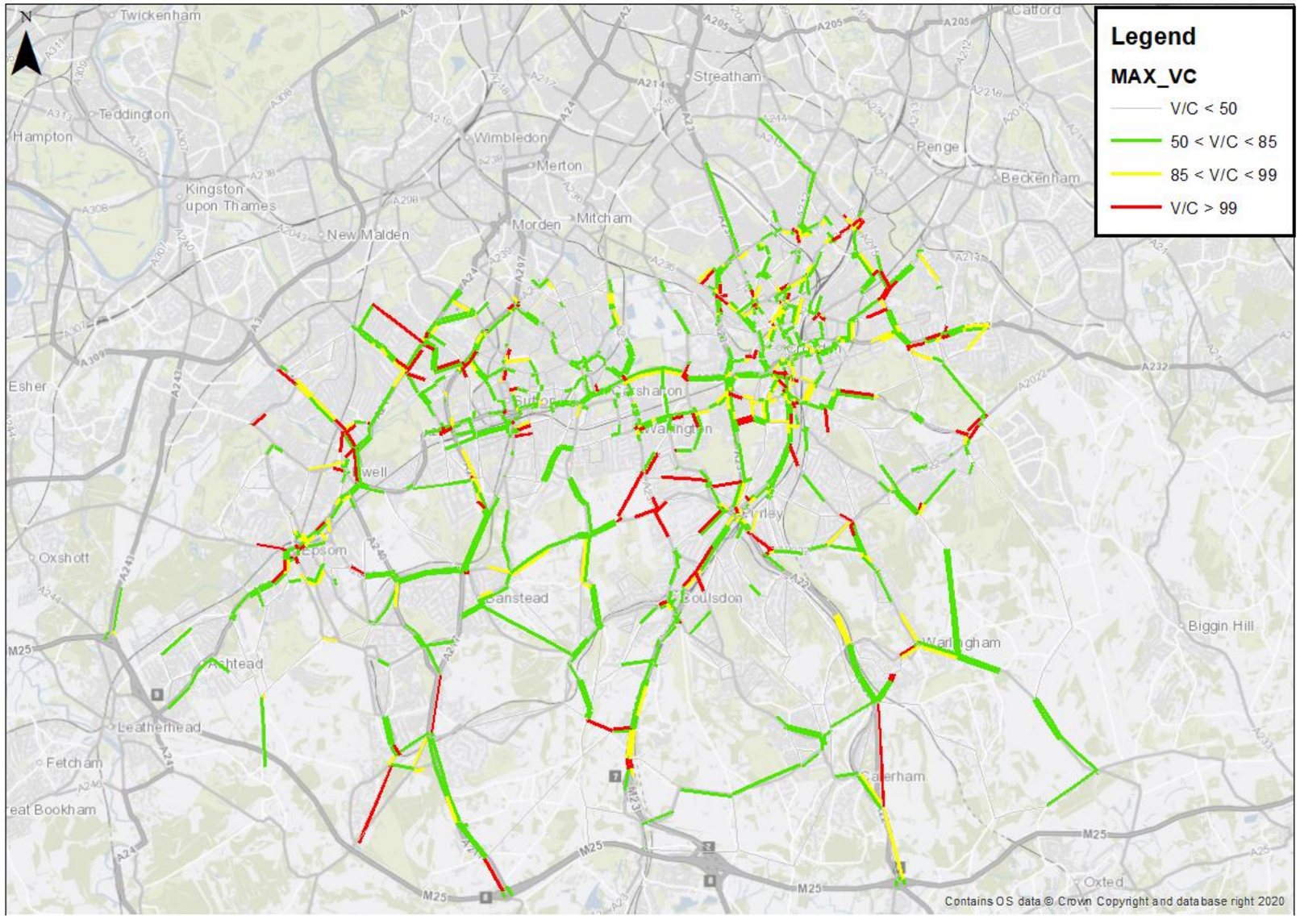


Figure 81: Maximum V/C - 2032, With Project - Performance Area C

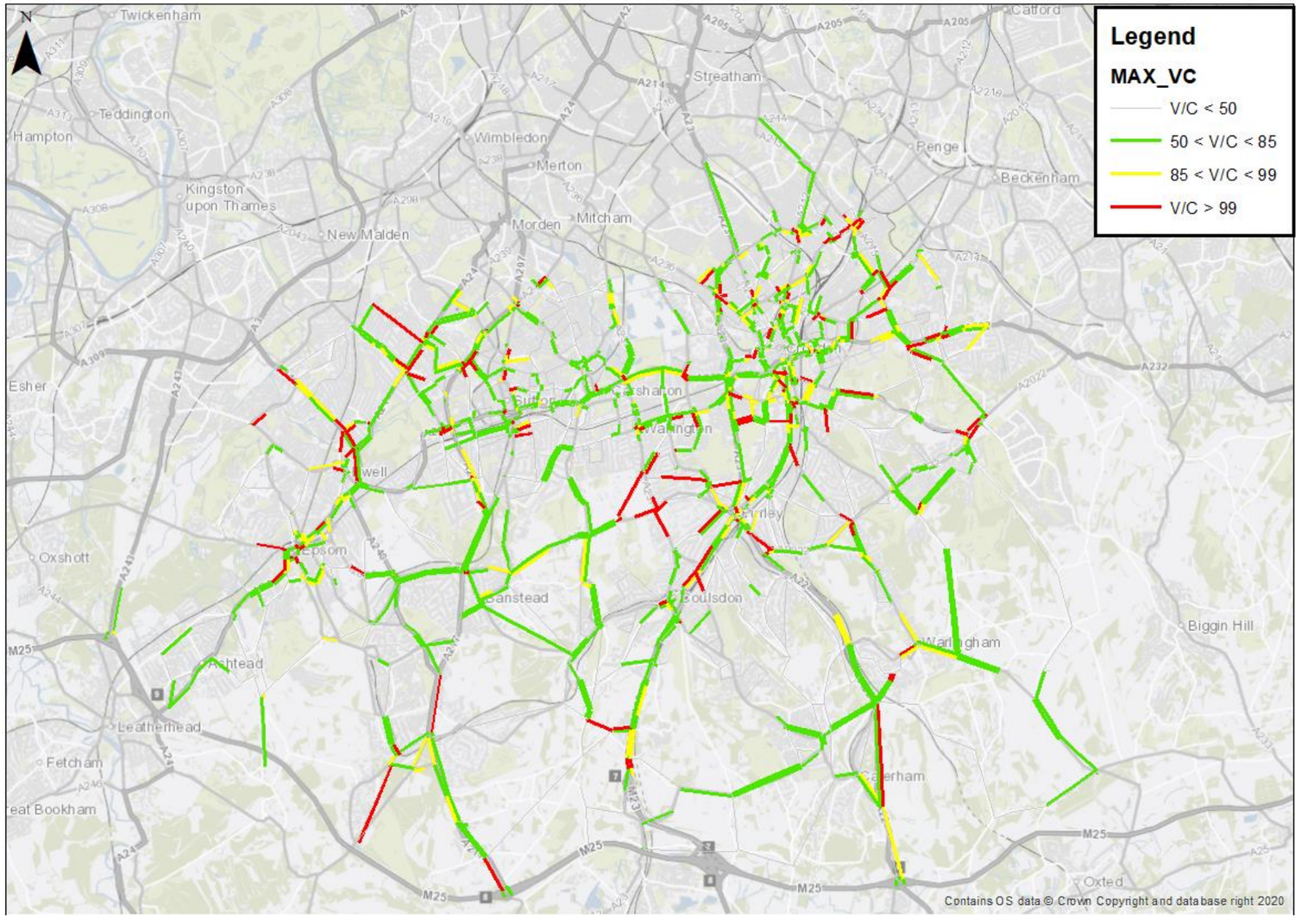


Figure 82: Maximum V/C - 2047, Future Baseline - Performance Area C

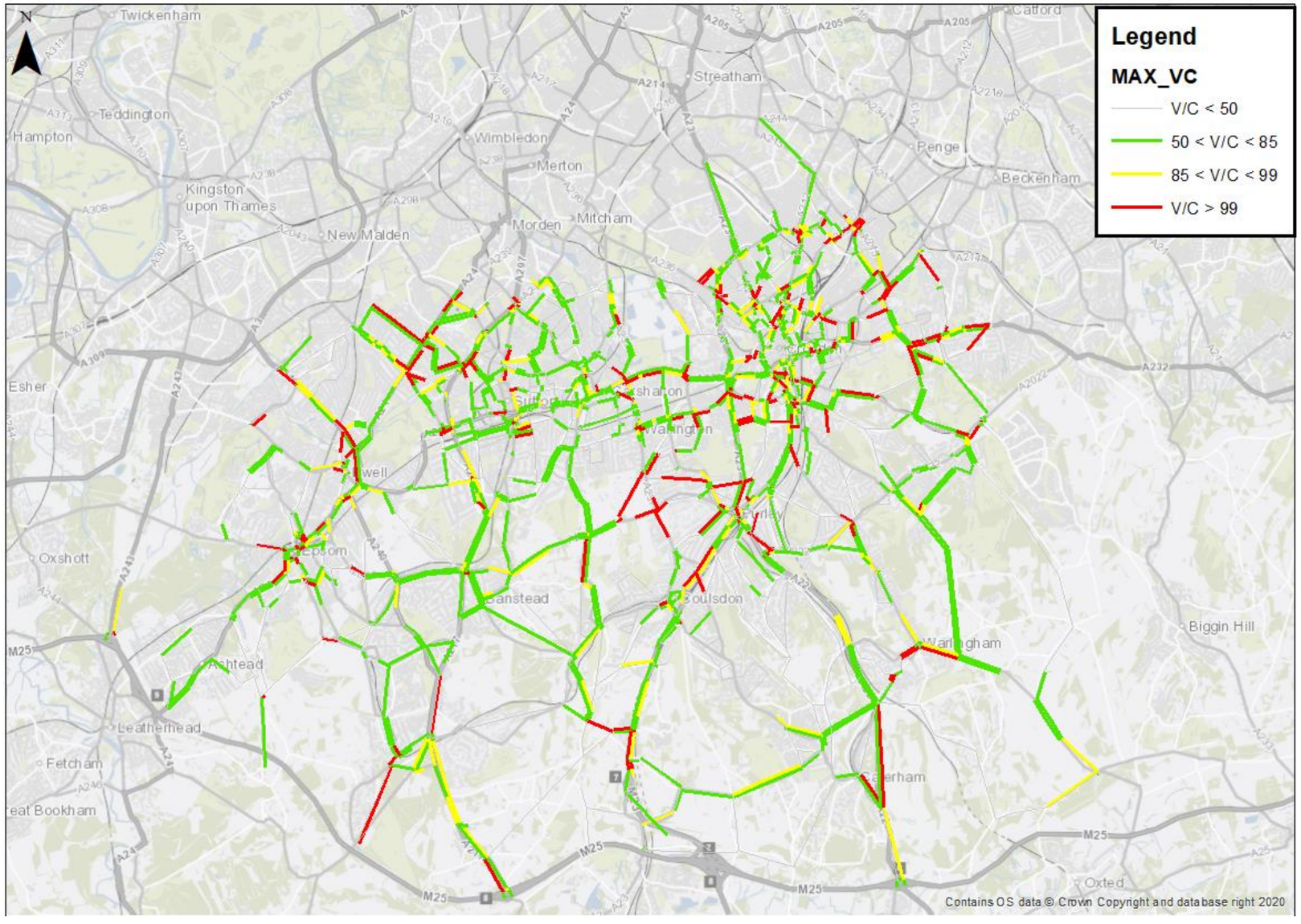
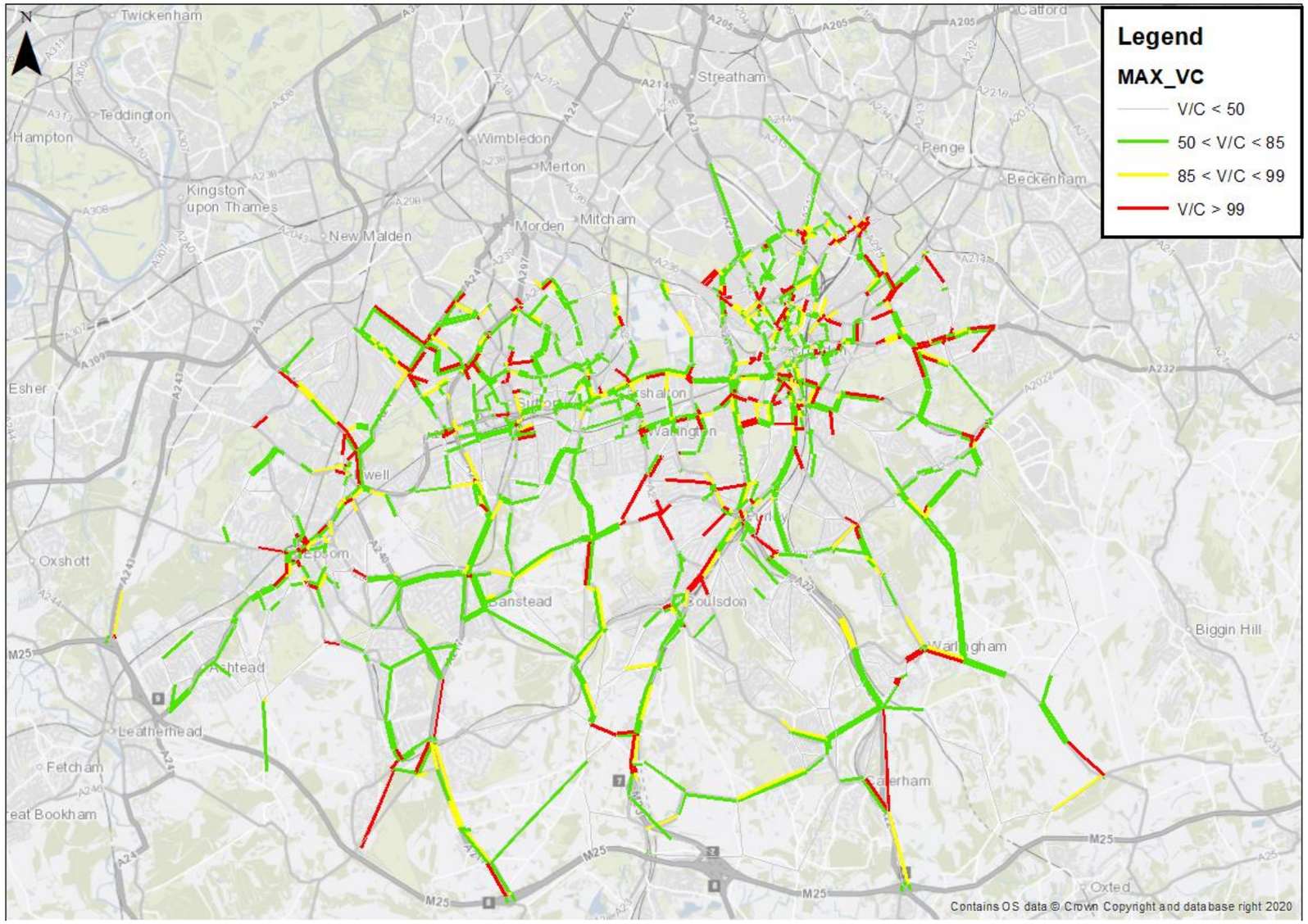


Figure 83: Maximum V/C - 2047, With Project - Performance Area C



10.8 Performance Area D

Journey Times

10.8.1 Journey times routes with respect to Performance Area D includes the following route:

- A272 from Coolham to near Uckfield, eastbound and westbound.

10.8.2 Modelled journey times extracted for these routes demonstrate that no routes are notably impacted between the Future Baseline and With Project Scenario across all assessment years and is summarised in Figure 84 to Figure 86. On balance, there are no notable changes in journey times between the Future Baseline and With Project scenario.

Figure 84: Highway Journey Times – Performance Area D, 2029

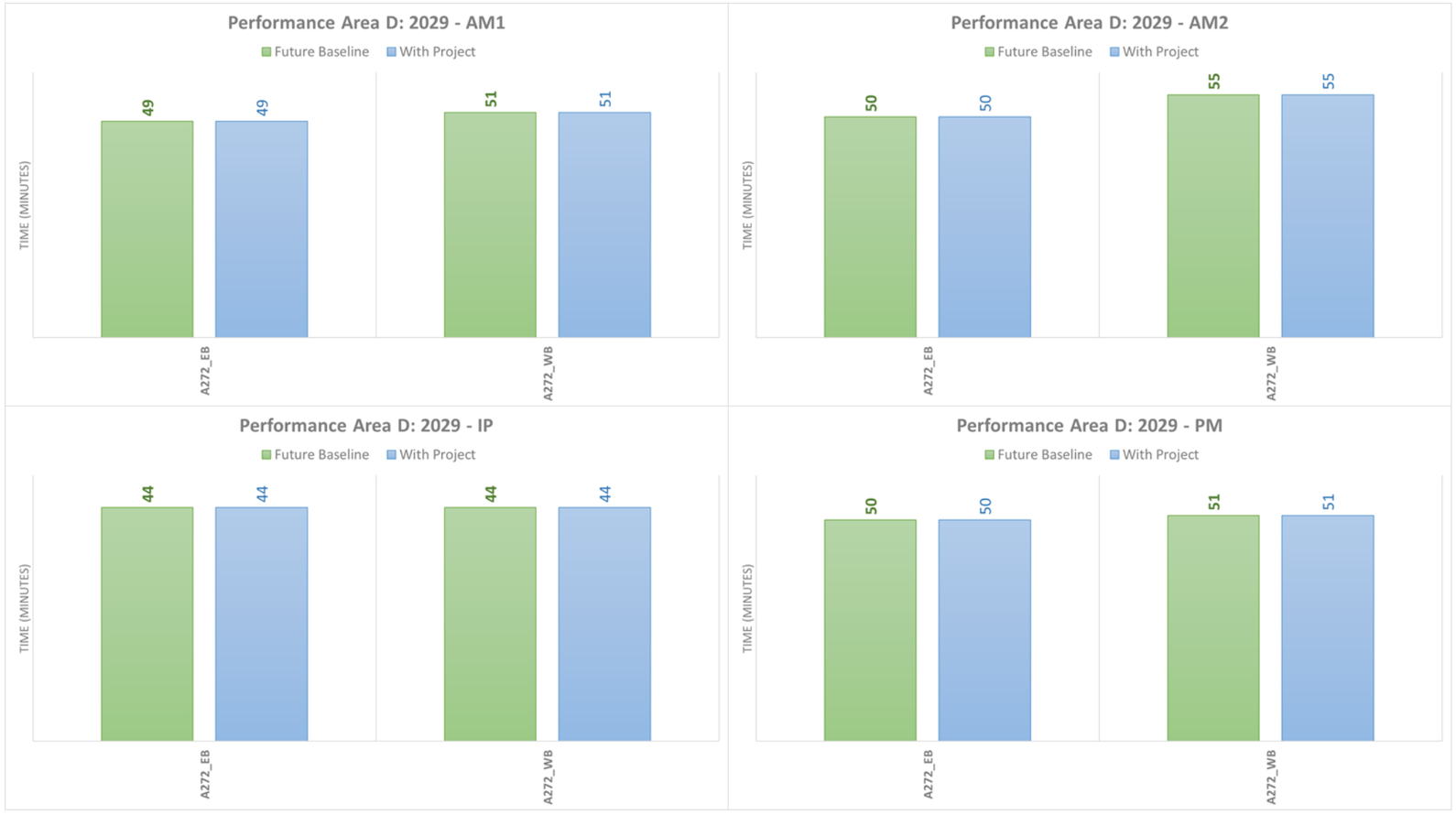
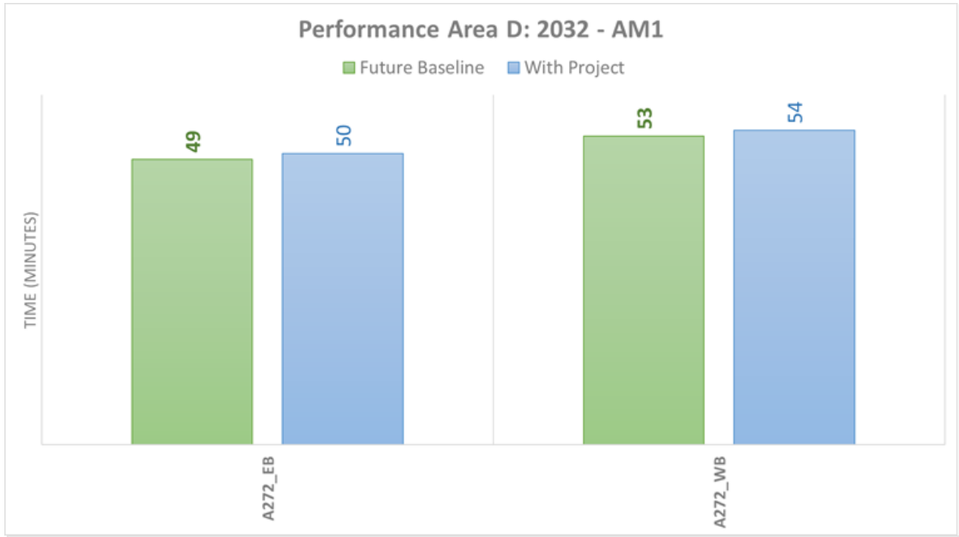
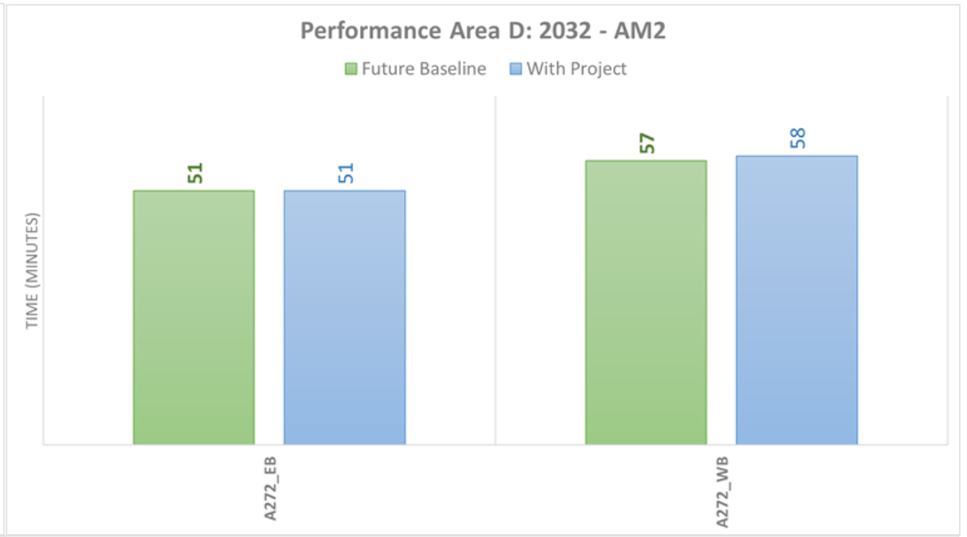
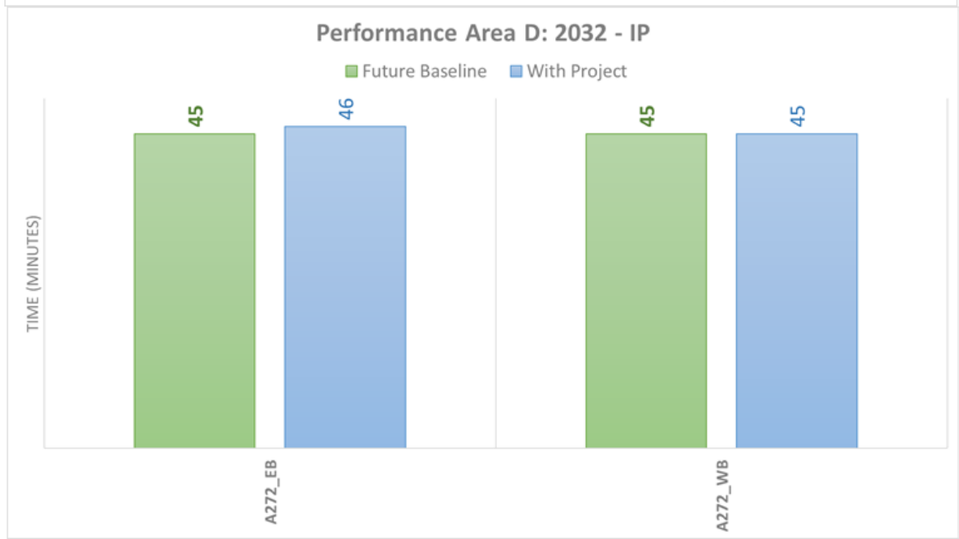


Figure 85: Highway Journey Times - Performance Area D, 2032







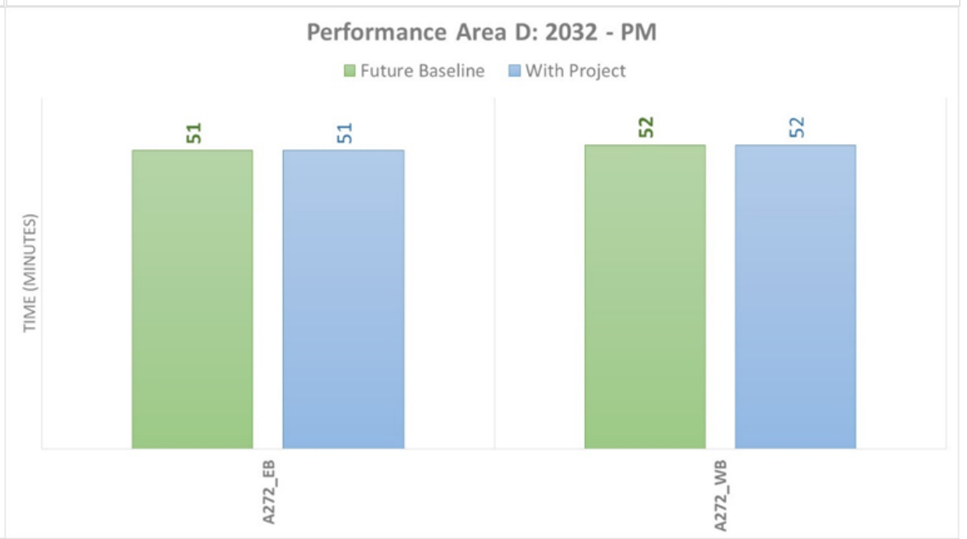
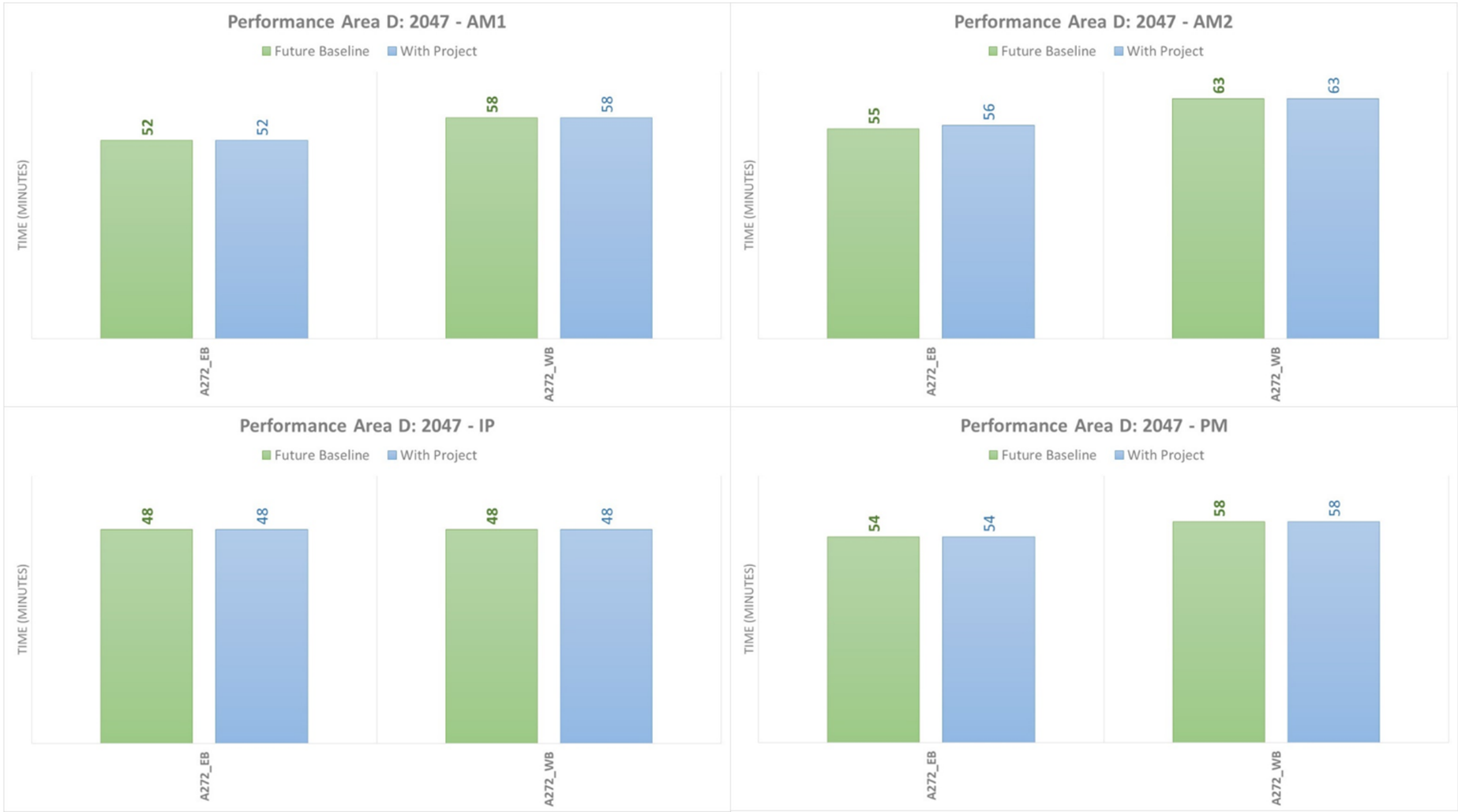


Figure 86: Highway Journey Times – Performance Area D, 2047



Operational Performance - Volume / Capacity ratios

10.8.3 Modelled Volume / Capacity ratios were extracted for each of the four modelled time periods. The maximum value across all time periods was selected to identify the highest value modelled and this is presented in Figure 88 to Figure 93. The evidence suggests that there are no instances of categories changing between the Future Baseline and With Project scenario across all assessment years.

10.8.4 All classifications in terms of Magnitude of Impacts for 2029, 2032 and 2047 show no 'Medium' or 'High' instances between the Future Baseline and With Project scenarios and is evidenced in Table 10.8.1 to Table 10.8.3 and illustrated in Figure 87.

Table 10.8.1: Magnitude of Impacts: Performance Area D, 2029 Nodes

2029	Performance Area D - Nodes			
MoI	**AM1**	**AM2**	**IP**	**PM**
Negligible	33	25	12	17
Low	0	0	0	0
Medium	0	0	0	0
High	0	0	0	0

Table 10.8.2: Magnitude of Impacts: Performance Area D, 2032 Nodes

2032	Performance Area D - Nodes			
MoI	**AM1**	**AM2**	**IP**	**PM**
Negligible	70	84	57	74
Low	0	0	0	0
Medium	0	0	0	0
High	0	0	0	0

Table 10.8.3: Magnitude of Impacts: Performance Area D, 2047 Nodes

2047	Performance Area D - Nodes			
MoI	**AM1**	**AM2**	**IP**	**PM**
Negligible	70	42	68	80
Low	0	0	0	0
Medium	0	0	0	0
High	0	0	0	0

Figure 87: Magnitude of Impacts: Performance Area D, 2029; 2032 & 2047 Nodes

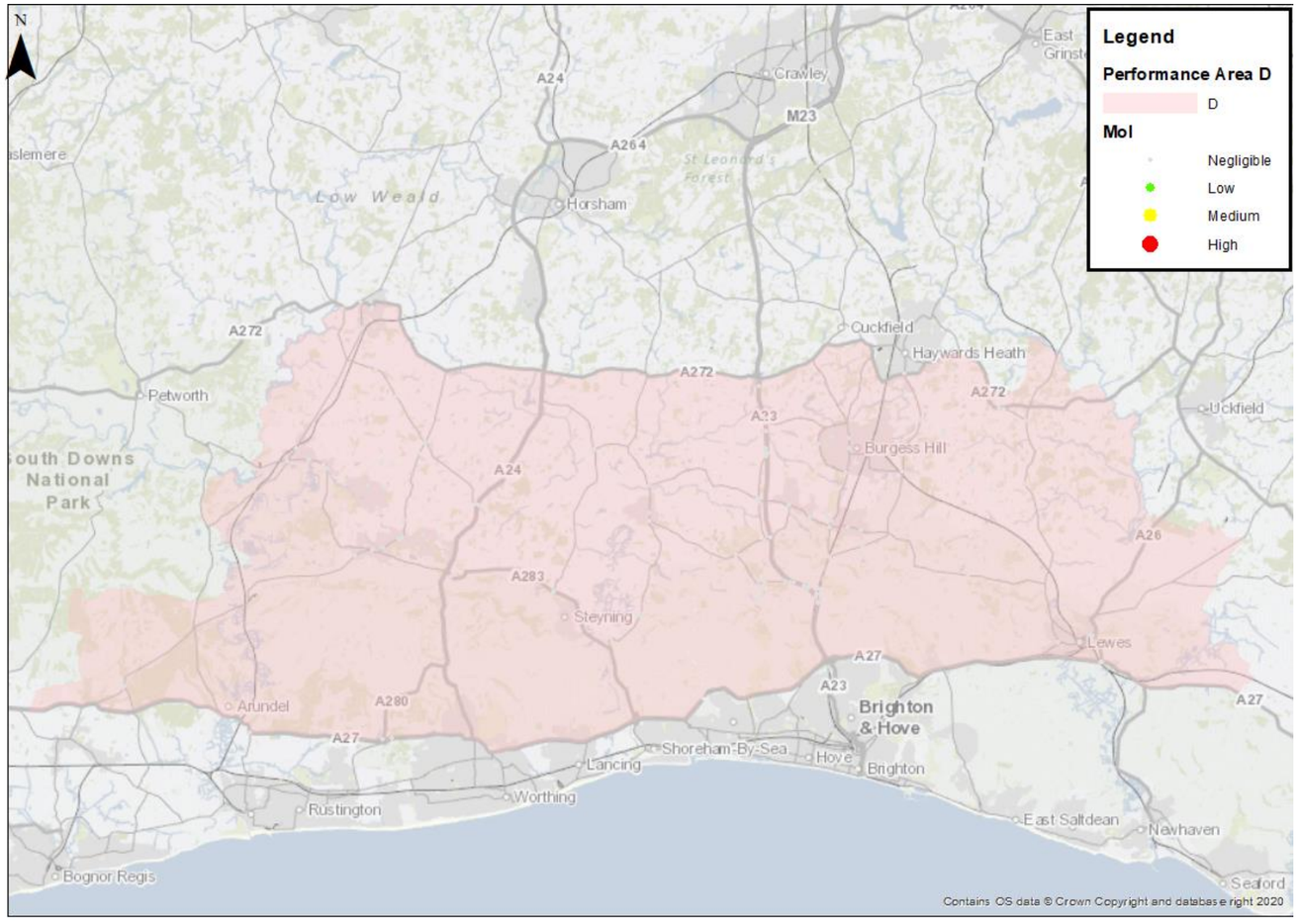


Figure 88: Maximum V/C - 2029, Future Baseline – Performance Area D

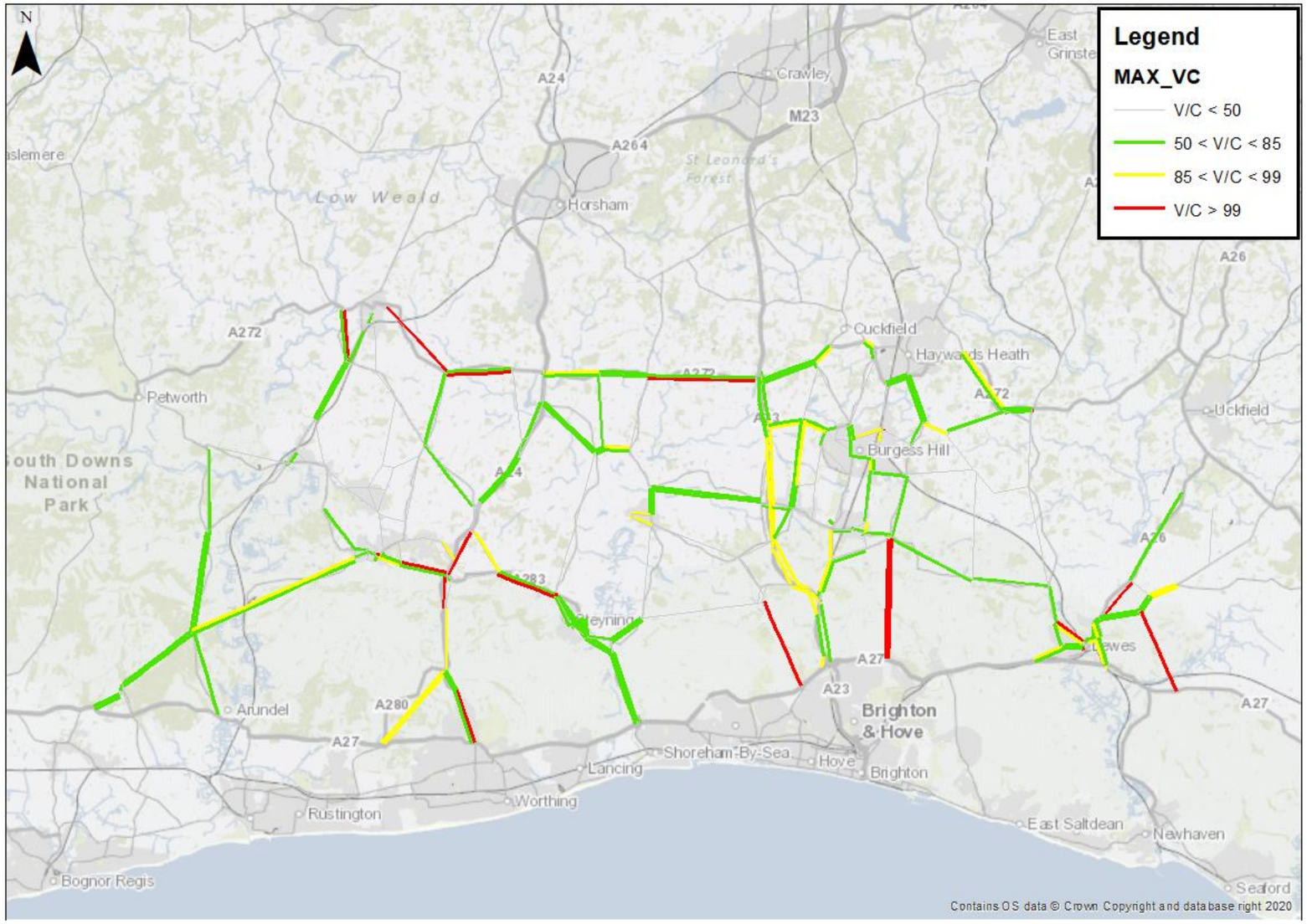


Figure 89: Maximum V/C - 2029, With Project – Performance Area D

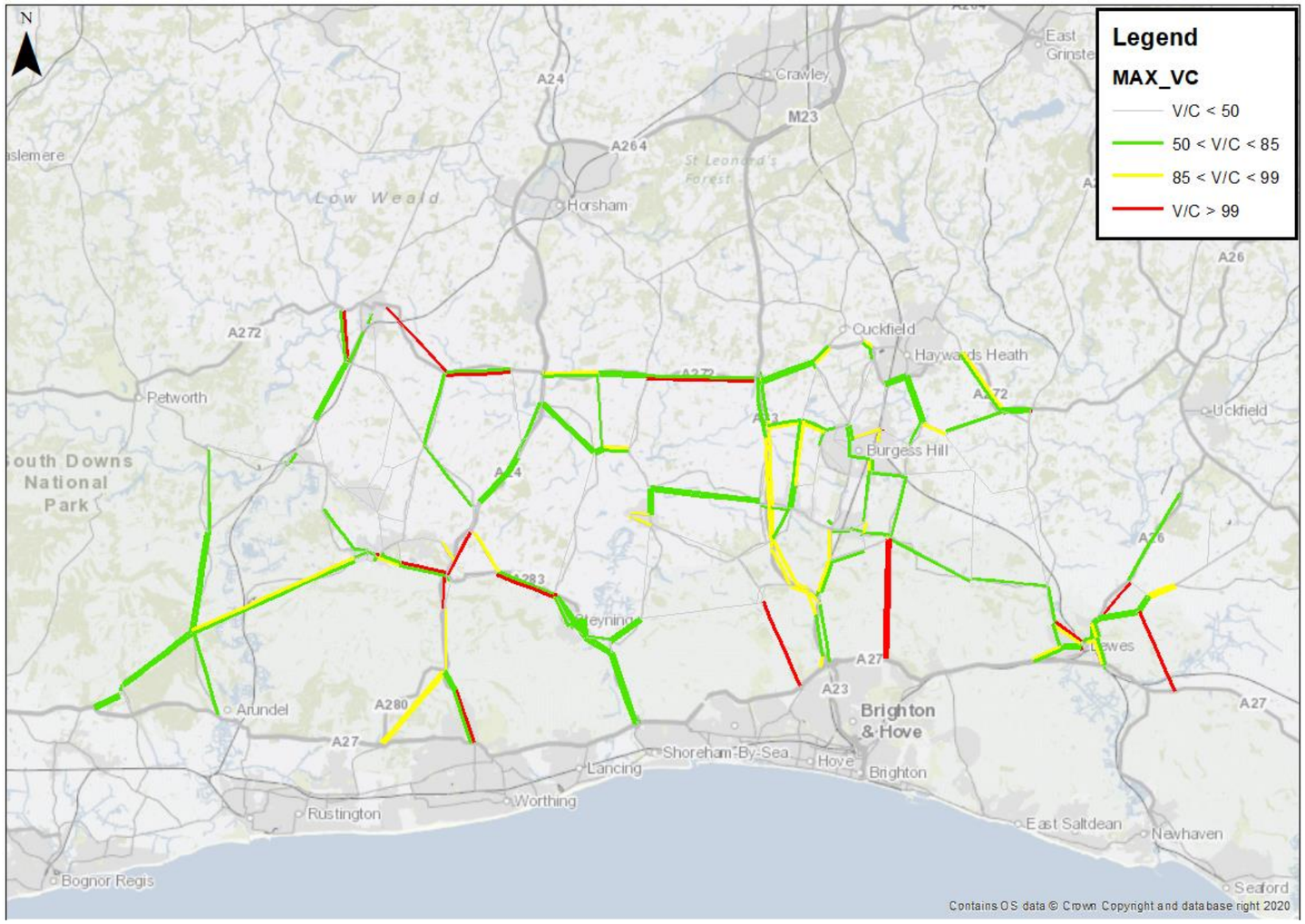


Figure 90: Maximum V/C - 2032, Future Baseline - Performance Area D

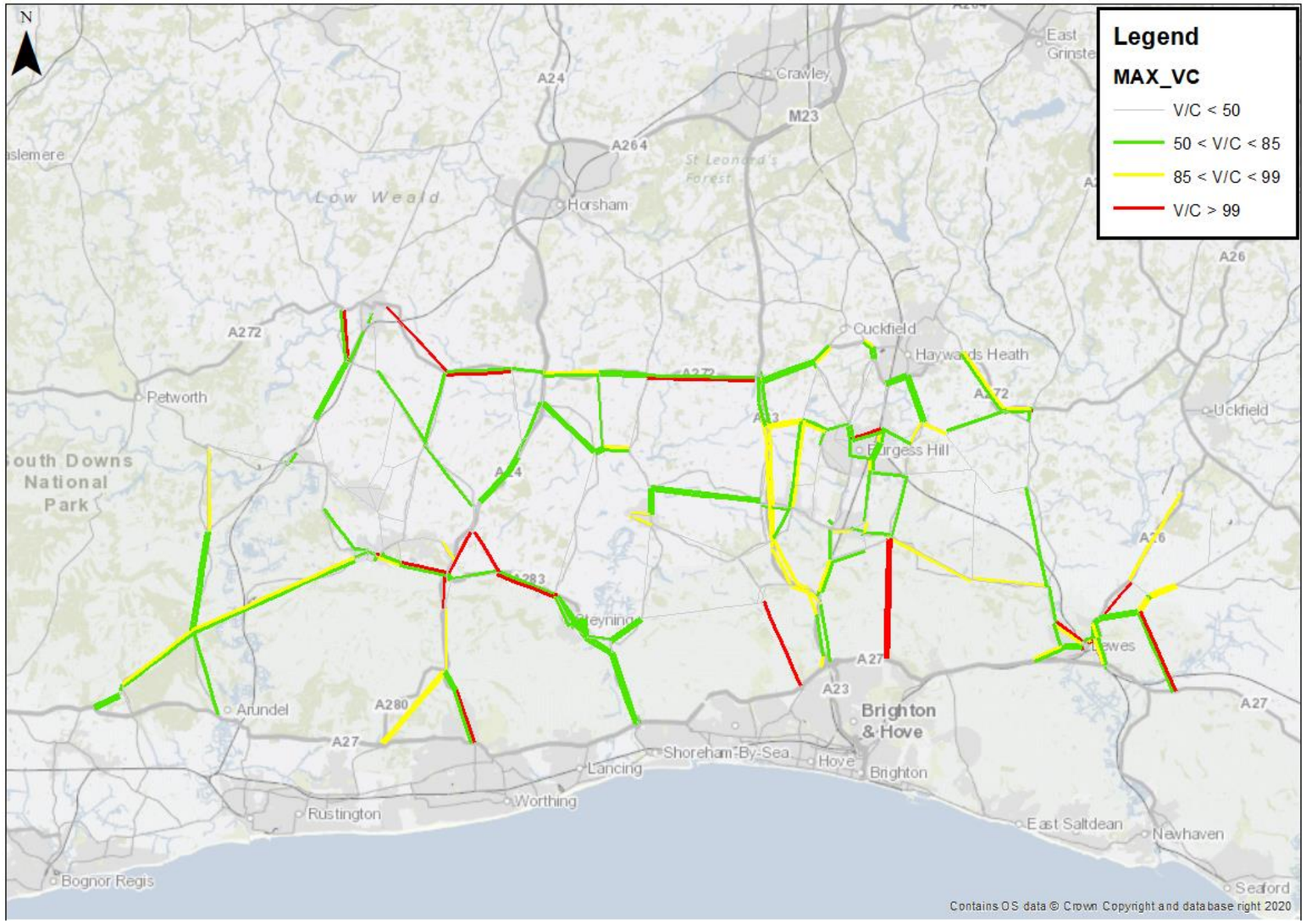


Figure 91: Maximum V/C - 2032, With Project - Performance Area D

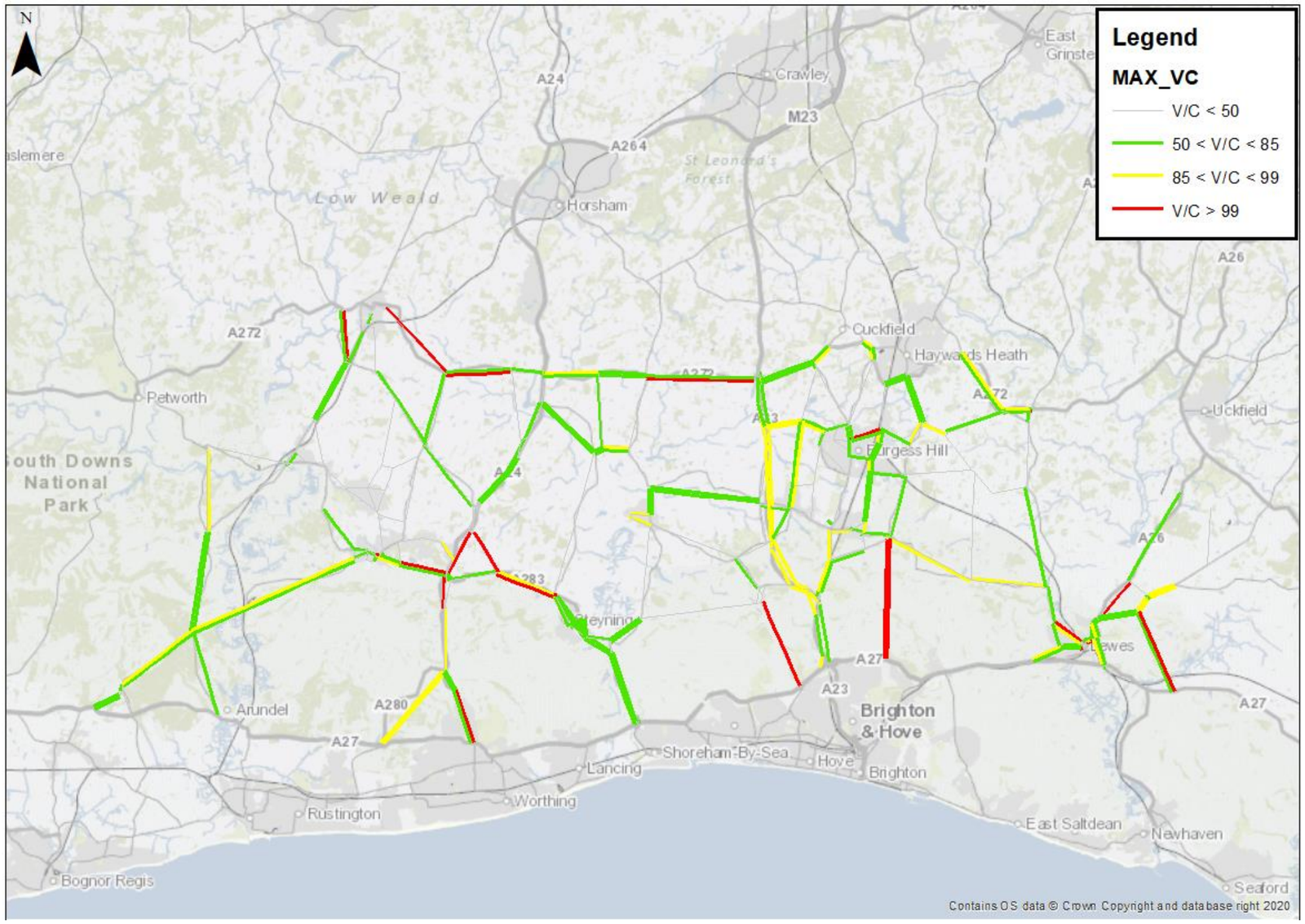


Figure 92: Maximum V/C - 2047, Future Baseline - Performance Area D

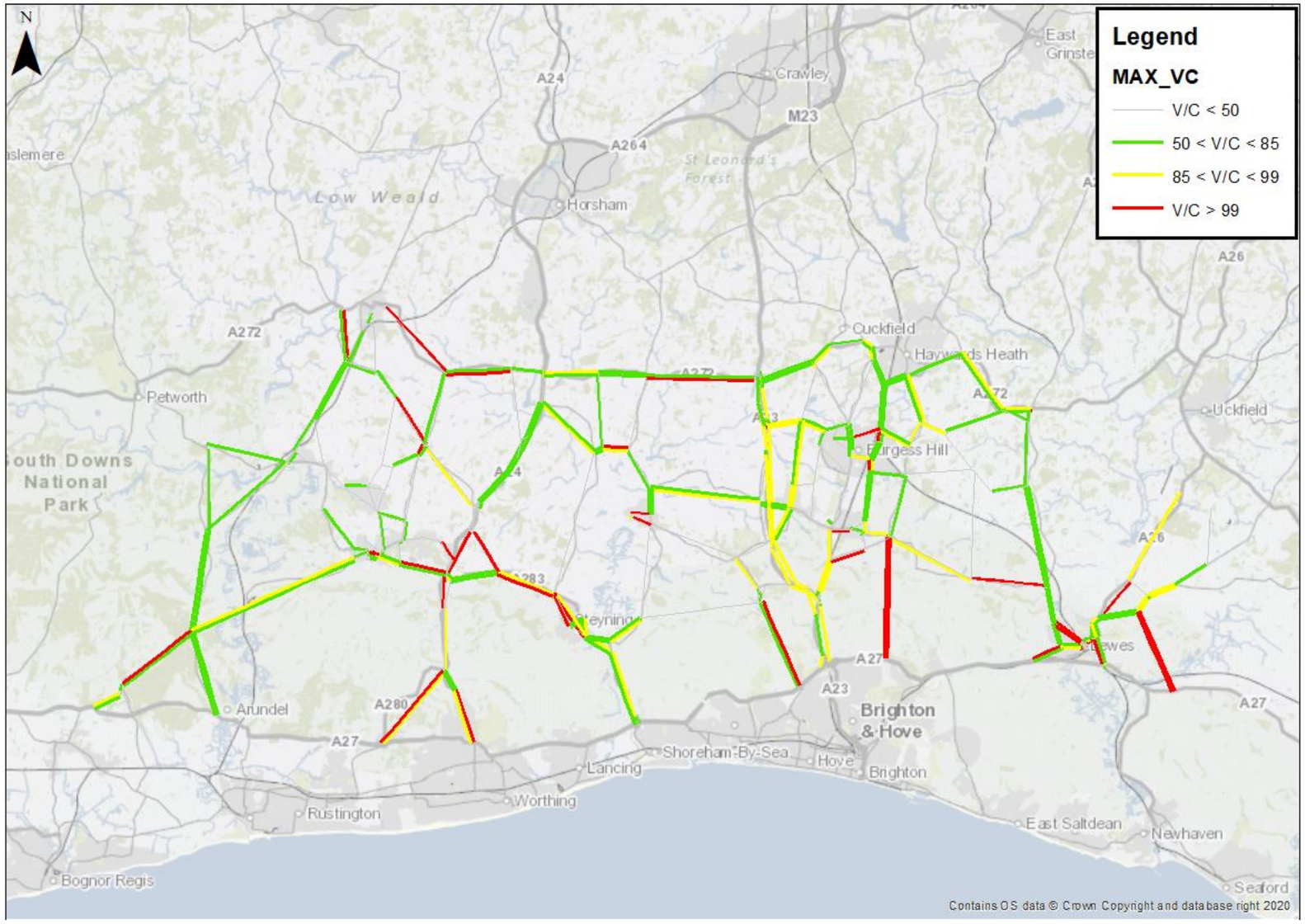
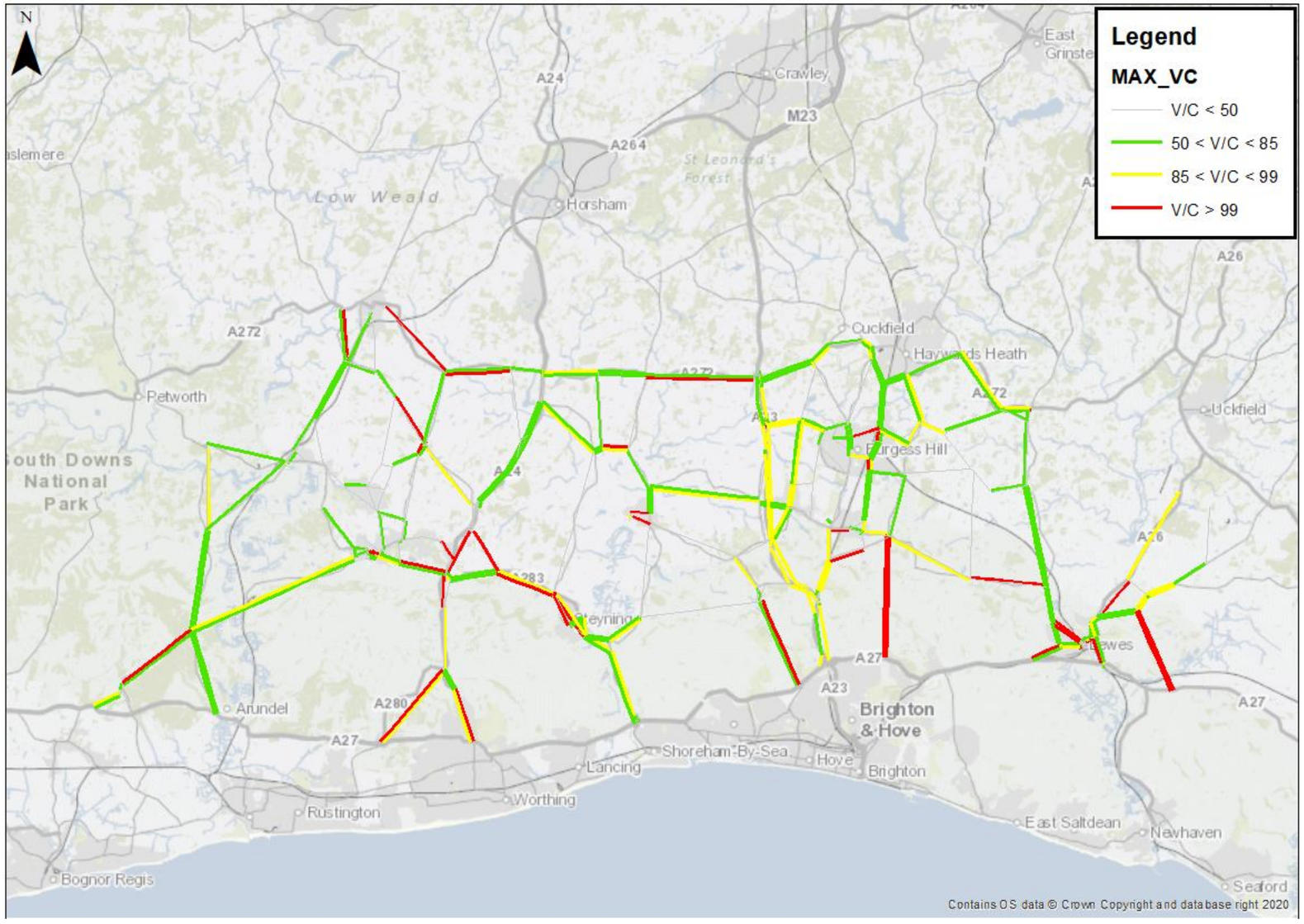


Figure 93: Maximum V/C - 2047, With Project - Performance Area D



11 Public Transport Network Performance

11.1 Introduction

11.1.1 Growth in demand and changes in capacity, impact on passenger experience through changes in crowding. It is important to assess rail crowding because, for timescale and cost reasons, it is not often practical for the rail operator to respond to crowding by expanding capacity. For bus/coach on the other hand, operators can adjust capacity to manage loadings more readily– through adjustment of frequencies and possibly vehicle size. For this reason, we focus on rail crowding in this Section.

11.1.2 The Brighton Main Line (BML), on which Gatwick Airport is located, has heavy peak commuter flows to London in AM peak and from London in PM peak. At these times, demand can exceed the number of seats available and people may have to stand. In future years these conditions may worsen if demand grows faster than capacity. We examine the crowding conditions in Future Baseline and Future Baseline with Project below.

11.2 Rail network performance

11.2.1 In the peak rail assignments, passengers are assigned to services taking account of the regular components of generalised cost (access, wait, in-vehicle time, interchange, egress) and also the crowding levels. Crowding is included in the generalised cost as crowding penalties. This is a feature of the PS model. This distributes the passengers among the available services in a realistic way taking account of capacity as well as journey times. The peak rail assignments are iterative, alternating between (a) loading passengers onto train services and (b) recalculating the crowding penalties; with iteration continuing until route choices are stable and equilibrium is reached.

11.2.2 The BML is a mix of fast and stopping services. Most passengers travelling to/from Gatwick Airport will favour the fast services (Gatwick Express and limited stop Southern and Thameslink services) and these will arrive at / depart from Gatwick Airport with high loads in the peaks. Stopping services (mainly Thameslink) also call at Gatwick but for most passengers these will not be attractive due to the extended journey times and will arrive at / depart from Gatwick Airport with relatively low loadings – these tend to fill up in the section north of Purley. For this reason, train crowding needs to be considered separately for each service group:

- Gatwick Express non-stop to Victoria
- Southern fasts (calling at East Croydon and Clapham Junction) to Victoria
- Thameslink fasts (calling at East Croydon) to London Bridge
- Thameslink stoppers to London Bridge
- North Downs Line, between Gatwick and Reading

Entries and exits at Gatwick

11.2.3 First, we examine the overall change in station entries and exits at Gatwick Airport station. This is shown for AM and PM peaks in Figure 93 and Figure 95. Between 2019 and 2047 station entries/exits are forecast to grow by around 60% in the Future baseline and around 90% in the Future baseline with Project. A simulation model of pedestrian movements through the station is being developed to test the capacity of the station to serve these expanded volumes, which is reported in the PTAR section 12.

Figure 94: Gatwick Airport Station Entries and Exits – AM Peak (07:00-09:00)

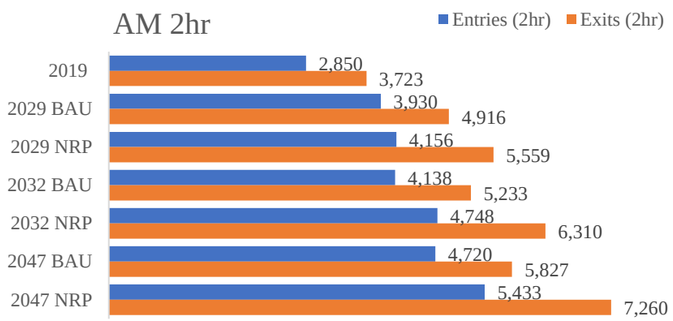
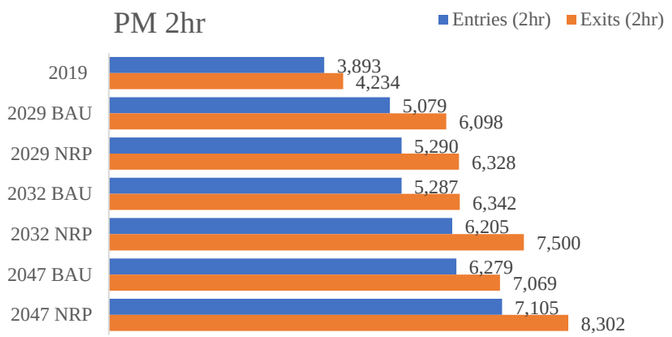


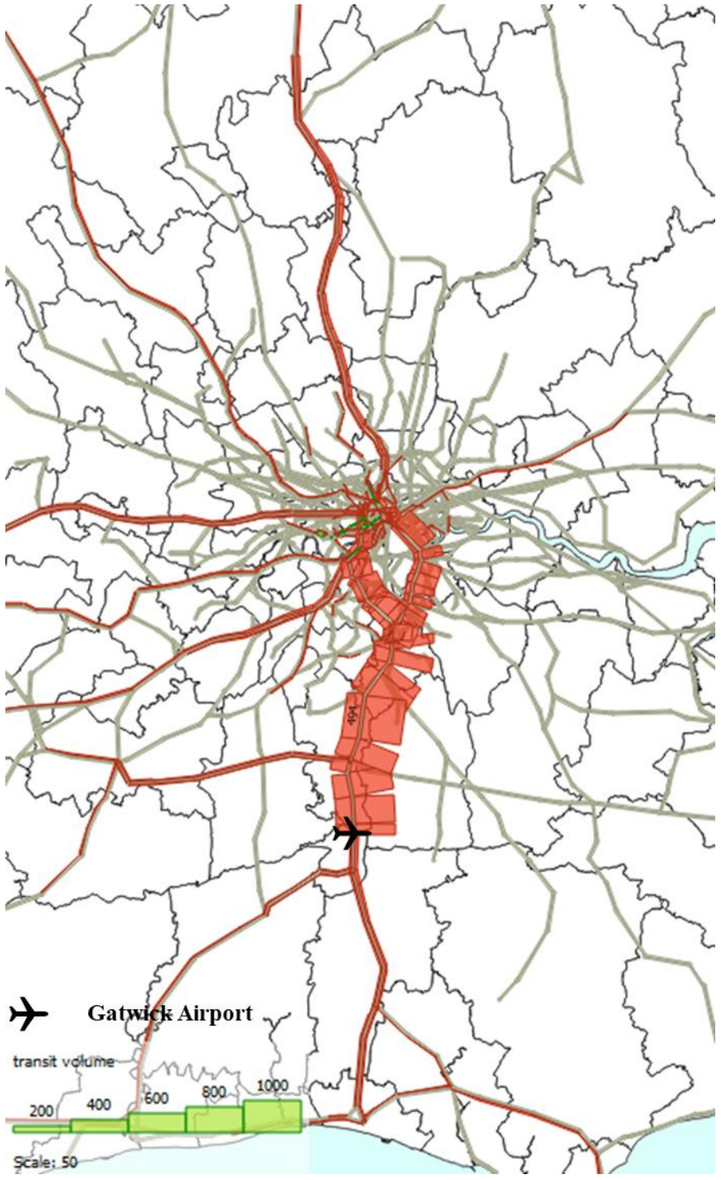
Figure 95: Gatwick Airport Station Demand – PM Peak (16:00-18:00)



Change in volumes on trains

11.2.4 Figure 96 provides an overview of where the additional passengers in the Future Baseline with Project appear on the rail networks. This is a demand difference plot between the Future Baseline with Project and Future Baseline scenario in 2047 AM period. Changes below 10 persons per hour are not shown. The dominance of London for rail demand is quite clear with a roughly 50:50 split between Victoria and London Bridge. In the AM peak, additional Gatwick passengers are predominantly travelling southbound, which is the counter-peak direction at this time of day.

Figure 96: Additional Gatwick passengers in the With Project scenario, 2047 AM (07:00-09:00)



11.2.5 Overall, the Project adds around 18,600 (+4.2%) passengers over 24 hours in 2047 of which:

- 1,350 (+1.2%) are Brighton Main (Brighton)
- 600 (+1.3%) are Arun Valley
- 550 (+3.0%) are North Downs Line (Reading)
- 100 (+2.4%) are Tonbridge Line
- 16,000 (+6.3%) are Brighton Main (London)

Crowding on train services: AM

11.2.6 Table 11.2.1 shows forecast load factors on northbound services in the AM peak for each modelled scenario. It includes all stations that Gatwick services call between Three Bridges and Victoria or London Bridge. These are seated load factors, calculated by dividing 2hr passengers by 2hr seats.

11.2.7 The yellow shading means 80-100% of seats taken; orange means 100-120% of seats taken (some standing) and red means over 120% of seats taken (more dense standing). In 2019, all seats on all service groups other than Gatwick Express are filled by Purley or East Croydon. DfT differentiates between standing for less 20 minutes (generally accepted) and those standing for more than 20 minutes (to be avoided if possible). For example, the DfT PIXC measure (Passengers In eXcess of Capacity) ignores standing under 20 minutes (unless standing capacity is exceeded) but standers above 20 minutes are counted. The 20-minute journey time threshold (from London termini) is in the south Croydon area.

11.2.8 In 2019 there was no significant crowding issues at a 2hr level reported. Although Purley is over 20 minutes from London, some Purley passengers go to East Croydon so it's unlikely that anyone is standing for more than 20 minutes. It is important to note that this is a strategic model that calculates average loads, not loads on individual trains. In reality there will be variation between individual trains and there is likely to be standing for over 20 minutes on some trains. However, the general point is that there are sufficient seats offered over the period, and people from locations south of Purley wanting a seat should be able to get one so long as they avoid the peak of the peak.

11.2.9 In later years, 2029, 2032 and 2047 there are increases in both seating capacity (due to extra services) and in demand.

11.2.10 In 2029 both Future Baseline and Future Baseline with Project scenarios, a similar level of crowding occurs to 2019 because although demand is increased, so is capacity, as the full Thameslink (24 tph) frequencies come into effect as well as extra peak services enabled by the Croydon Area Remodelling Scheme.

11.2.11 In 2032, capacity is unchanged from 2029, but demand growth continues, leading to slightly raised load factors in both scenarios but Purley remains the southern limit for standing.

11.2.12 By 2047, the fast services are approaching seated capacity with Gatwick Express seats being 94% occupied (in the Future Baseline) and 96% (in Future Baseline with Project); Fast Victoria 98% and 100% and Fast London Bridge 99% and 100% (Future Baseline and Future Baseline with Project respectively).

11.2.13 In summary, baseline growth, which is made up mainly of London commuters, determines the underlying seated load factor which approaches 100% on the fast services by the final analysis year, 2047. The Future Baseline with Project scenario adds a further 1-2% to the fast services. Stopping services are forecast to depart from Gatwick largely empty – these serve a different market and fill up to 100% by Purley or East Croydon.

11.2.14 NDL in the tables below refers to North Downs Line. The frequencies on this line increase from 1 tph to 2 tph after 2019 and this provides adequate capacity for all scenarios.

Table 11.2.1: Forecast load factors, AM peak (07:00-09:00) NB

Scenario	Groups	Direction	Seating Capacity	Seated Load Factor (2hr)													
				Three Bridges	Gatwick Airport	Horley	Salfords	Earlswood	Redhill	Merstham	Coulsdon South	Purley	South Croydon	East Croydon (VIC)	Clapham Jcn (VIC)	East Croydon (LBG)	Norwood Jcn (LBG)
2019 AM	NDL	NB	520	0.00	0.17	0.17	0.17	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	GX	NB	4,728	0.65	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.00	0.00
	Fast VIC	NB	6,318	0.52	0.77	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	1.14	1.00	0.00	0.00
	Stoppers VIC	NB	2,672	0.00	0.04	0.03	0.04	0.17	0.41	0.48	0.72	1.10	1.10	1.17	1.05	0.00	0.00
	Fast LBG	NB	9,279	0.58	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.00	0.00	1.32	1.32
	Stoppers LBG	NB	5,312	0.17	0.06	0.07	0.08	0.15	0.33	0.40	0.64	0.84	0.83	0.00	0.00	1.28	1.41
	Total		28,829	0.45	0.54	0.54	0.55	0.57	0.63	0.65	0.72	0.79	0.79	1.02	0.94	1.30	1.35
2029 AM BAU	NDL	NB	1,040	0.00	0.18	0.18	0.18	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	GX	NB	4,728	0.67	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.00	0.00
	Fast VIC	NB	6,318	0.53	0.81	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	1.20	1.05	0.00	0.00
	Stoppers VIC	NB	2,672	0.00	0.04	0.02	0.03	0.14	0.39	0.45	0.69	1.07	1.07	1.19	1.08	0.00	0.00
	Fast LBG	NB	10,964	0.64	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.00	0.00	1.40	1.40
	Stoppers LBG	NB	6,710	0.15	0.06	0.07	0.08	0.16	0.34	0.40	0.64	0.83	0.82	0.00	0.00	1.28	1.45
	Total		32,432	0.46	0.58	0.58	0.58	0.61	0.67	0.69	0.76	0.83	0.83	1.08	0.98	1.35	1.42
2029 AM Project	NDL	NB	1,040	0.00	0.19	0.19	0.19	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	GX	NB	4,728	0.67	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.00	0.00
	Fast VIC	NB	6,318	0.53	0.82	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	1.21	1.05	0.00	0.00
	Stoppers VIC	NB	2,672	0.00	0.04	0.02	0.03	0.14	0.39	0.45	0.69	1.07	1.07	1.19	1.07	0.00	0.00
	Fast LBG	NB	10,964	0.64	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.00	0.00	1.40	1.40
	Stoppers LBG	NB	6,710	0.15	0.06	0.08	0.08	0.16	0.34	0.40	0.64	0.83	0.82	0.00	0.00	1.28	1.45
	Total		32,432	0.46	0.58	0.59	0.59	0.61	0.67	0.69	0.76	0.83	0.83	1.08	0.98	1.36	1.42
2032 AM BAU	NDL	NB	1,040	0.00	0.20	0.20	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	GX	NB	4,728	0.69	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.00	0.00
	Fast VIC	NB	6,318	0.56	0.85	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	1.22	1.06	0.00	0.00
	Stoppers VIC	NB	2,672	0.00	0.04	0.02	0.03	0.14	0.39	0.46	0.71	1.10	1.10	1.21	1.09	0.00	0.00
	Fast LBG	NB	10,964	0.67	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.00	0.00	1.43	1.43
	Stoppers LBG	NB	6,710	0.16	0.07	0.08	0.09	0.17	0.36	0.42	0.66	0.86	0.85	0.00	0.00	1.31	1.48
	Total		32,432	0.48	0.60	0.61	0.61	0.64	0.70	0.72	0.79	0.87	0.86	1.10	1.00	1.38	1.45
2032 AM Project	NDL	NB	1,040	0.00	0.21	0.21	0.21	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	GX	NB	4,728	0.69	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.00	0.00
	Fast VIC	NB	6,318	0.56	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	1.24	1.06	0.00	0.00
	Stoppers VIC	NB	2,672	0.00	0.04	0.02	0.03	0.14	0.40	0.46	0.71	1.10	1.10	1.21	1.09	0.00	0.00

Scenario	Groups	Direction	Seating Capacity	Seated Load Factor (2hr)													
				Three Bridges	Gatwick Airport	Horley	Salfords	Earlswood	Redhill	Merstham	Coulsdon South	Purley	South Croydon	East Croydon (VIC)	Clapham Jcn (VIC)	East Croydon (LBG)	Norwood Jcn (LBG)
	Fast LBG	NB	10,964	0.68	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.00	0.00	1.44	1.44
	Stoppers LBG	NB	6,710	0.15	0.07	0.08	0.09	0.17	0.36	0.42	0.66	0.86	0.85	0.00	0.00	1.31	1.48
	Total		32,432	0.49	0.62	0.62	0.62	0.65	0.71	0.73	0.80	0.88	0.88	1.11	1.01	1.39	1.45
2047 AM BAU	NDL	NB	1,040	0.00	0.24	0.24	0.24	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	GX	NB	4,728	0.79	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.00	0.00
	Fast VIC	NB	7,849	0.69	0.97	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	1.22	1.07	0.00	0.00
	Stoppers VIC	NB	3,319	0.00	0.04	0.02	0.03	0.18	0.47	0.54	0.80	1.16	1.16	1.21	1.11	0.00	0.00
	Fast LBG	NB	11,661	0.83	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.00	0.00	1.51	1.51
	Stoppers LBG	NB	6,710	0.21	0.09	0.11	0.12	0.20	0.41	0.48	0.73	0.91	0.90	0.00	0.00	1.40	1.57
	Total		35,308	0.59	0.71	0.71	0.72	0.75	0.82	0.84	0.91	0.98	0.98	1.14	1.04	1.47	1.53
2047 AM Project	NDL	NB	1,040	0.00	0.26	0.26	0.26	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	GX	NB	4,728	0.79	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.00	0.00
	Fast VIC	NB	7,849	0.69	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.24	1.07	0.00	0.00
	Stoppers VIC	NB	3,319	0.00	0.04	0.03	0.03	0.18	0.47	0.55	0.80	1.16	1.16	1.22	1.11	0.00	0.00
	Fast LBG	NB	11,661	0.83	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.52	1.52
	Stoppers LBG	NB	6,710	0.21	0.10	0.12	0.13	0.21	0.41	0.49	0.73	0.91	0.90	0.00	0.00	1.40	1.57
	Total		35,308	0.59	0.72	0.73	0.73	0.76	0.83	0.85	0.92	0.99	0.99	1.15	1.05	1.48	1.54

11.2.15 In the counter-peak direction (AM southbound) there are no crowding issues: the load factors in all scenarios and service groups are 60% or below at all locations.

Crowding on train services: PM

11.2.16 Table 11.2.2 shows forecast load factors on southbound services in the PM peak for each modelled scenario.

11.2.17 The peak volumes are lower in PM than in AM. This is because London's PM peak is more spread (of longer duration) than the AM peak. The patterns mirror the AM peak insofar as the standing passengers (loadings above 100%) in the PM peak are in the section London to East Croydon.

11.2.18 The forecast 2hr load factors in the section south of East Croydon do not exceed 95% in any scenario. In 2047 Future Baseline with Project the fast services have 85-95% of seats occupied on arrival at Gatwick.

11.2.19 In the counter-peak direction (PM northbound) there are no crowding issues: the load factors in all scenarios and service groups are below 80% at all locations.

Table 11.2.2: Forecast load factors, PM peak SB (16:00-18:00)

Scenario	Groups	Direction	Seating Capacity	Seated Load Factor (2hr)													
				London Victoria	Clapham Jcn (VIC)	London Bridge	Norwood Jcn (LBG)	East Croydon	South Croydon	Purley	Coulsdon South	Merstham	Redhill	Earlswood	Salfords	Horley	Gatwick Airport
2019 AM	NDL	SB	520	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.33	0.33	0.33	0.00
	GX	SB	5,400	0.57	0.57	0.00	0.00	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.31
	Fast VIC	SB	6,077	0.80	1.01	0.00	0.00	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.39
	Stoppers VIC	SB	1,074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.11	0.10	0.12	0.00
	Fast LBG	SB	8,098	0.00	0.00	0.88	0.93	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.55
	Stoppers LBG	SB	4,601	0.00	0.00	1.15	1.08	0.84	0.84	0.60	0.43	0.38	0.20	0.15	0.14	0.14	0.14
	Total		25,770	0.63	0.74	0.98	0.98	0.61	0.61	0.57	0.54	0.53	0.50	0.49	0.49	0.49	0.36
2029 PM BAU	NDL	SB	1,040	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.41	0.41	0.41	0.00
	GX	SB	5,400	0.67	0.67	0.00	0.00	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.33
	Fast VIC	SB	6,077	0.83	1.07	0.00	0.00	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.42
	Stoppers VIC	SB	1,074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.10	0.09	0.12	0.00
	Fast LBG	SB	10,072	0.00	0.00	0.99	1.02	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.54
	Stoppers LBG	SB	5,968	0.00	0.00	1.16	1.09	0.79	0.79	0.57	0.40	0.36	0.18	0.13	0.13	0.13	0.17
	Total		29,631	0.69	0.80	1.05	1.05	0.68	0.68	0.63	0.59	0.59	0.55	0.54	0.54	0.54	0.38
2029 PM Project	NDL	SB	1,040	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.42	0.42	0.42	0.00
	GX	SB	5,400	0.67	0.67	0.00	0.00	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.33
	Fast VIC	SB	6,077	0.83	1.07	0.00	0.00	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.42
	Stoppers VIC	SB	1,074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.10	0.09	0.12	0.00
	Fast LBG	SB	10,072	0.00	0.00	0.99	1.03	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.54
	Stoppers LBG	SB	5,968	0.00	0.00	1.16	1.09	0.79	0.79	0.57	0.40	0.36	0.19	0.13	0.13	0.13	0.17
	Total		29,631	0.69	0.81	1.06	1.05	0.68	0.68	0.64	0.60	0.59	0.56	0.55	0.55	0.55	0.38
2032 PM BAU	NDL	SB	1,040	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.45	0.45	0.45	0.00
	GX	SB	5,400	0.71	0.71	0.00	0.00	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.35
	Fast VIC	SB	6,077	0.83	1.08	0.00	0.00	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.44
	Stoppers VIC	SB	1,074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.10	0.10	0.12	0.00
	Fast LBG	SB	10,072	0.00	0.00	1.01	1.04	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.56
	Stoppers LBG	SB	5,968	0.00	0.00	1.17	1.11	0.82	0.82	0.59	0.42	0.38	0.20	0.14	0.14	0.14	0.18
	Total		29,631	0.71	0.83	1.07	1.07	0.71	0.71	0.66	0.62	0.61	0.58	0.57	0.57	0.57	0.40
2032 PM Project	NDL	SB	1,040	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.48	0.48	0.48	0.00
	GX	SB	5,400	0.74	0.74	0.00	0.00	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.36
	Fast VIC	SB	6,077	0.85	1.10	0.00	0.00	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.44
	Stoppers VIC	SB	1,074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.11	0.10	0.13	0.00
	Fast LBG	SB	10,072	0.00	0.00	1.02	1.06	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.57

Scenario	Groups	Direction	Seating Capacity	Seated Load Factor (2hr)													
				London Victoria	Clapham Jcn (VIC)	London Bridge	Norwood Jcn (LBG)	East Croydon	South Croydon	Purley	Coulsdon South	Merstham	Redhill	Earlswood	Salfords	Horley	Gatwick Airport
	Stoppers LBG	SB	5,968	0.00	0.00	1.19	1.12	0.82	0.82	0.60	0.42	0.38	0.20	0.15	0.14	0.14	0.18
	Total		29,631	0.73	0.85	1.08	1.08	0.74	0.74	0.69	0.66	0.65	0.61	0.60	0.60	0.60	0.40
2047 PM BAU	NDL	SB	1,040	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.66	0.66	0.66	0.00
	GX	SB	5,400	0.84	0.84	0.00	0.00	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.48
	Fast VIC	SB	7,646	0.81	1.04	0.00	0.00	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.62
	Stoppers VIC	SB	1,074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.15	0.14	0.17	0.00
	Fast LBG	SB	10,448	0.00	0.00	1.01	1.08	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.72
	Stoppers LBG	SB	5,968	0.00	0.00	1.24	1.16	0.87	0.87	0.68	0.50	0.45	0.26	0.21	0.20	0.20	0.22
	Total		31,576	0.76	0.88	1.09	1.11	0.83	0.83	0.79	0.75	0.74	0.71	0.70	0.70	0.70	0.53
2047 PM Project	NDL	SB	1,040	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.70	0.70	0.70	0.00
	GX	SB	5,400	0.86	0.86	0.00	0.00	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.48
	Fast VIC	SB	7,646	0.82	1.06	0.00	0.00	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.61
	Stoppers VIC	SB	1,074	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.16	0.15	0.18	0.00
	Fast LBG	SB	10,448	0.00	0.00	1.02	1.10	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.72
	Stoppers LBG	SB	5,968	0.00	0.00	1.25	1.18	0.88	0.88	0.68	0.50	0.45	0.27	0.22	0.21	0.21	0.23
	Total		31,576	0.78	0.90	1.11	1.13	0.86	0.86	0.82	0.78	0.77	0.75	0.73	0.73	0.73	0.53

Impact at Victoria and London Bridge

11.2.20 Figure 97 shows the demand routing in London (volume changes less than 50 person per hour not shown) of the additional passenger demand (calculated as the difference between the Future Baseline with Project and Future Baseline scenarios).

Figure 97: Additional with Project Gatwick passengers, 2047 AM (07:00-09:00) (London detail)

11.2.21 The only links beyond Victoria and London Bridge that exceed an additional 50 persons per hour are on the Victoria Line as far north as Oxford Circus and on the Thameslink core as far north as St Pancras.

11.2.22 Table 11.2.3 shows the forecast volumes on London Underground at Victoria and London Bridge. In the rightmost three columns, the changes from between the two scenarios are given. The changes are small in comparison to the overall volumes forecast on these links, with a maximum forecast change being 141 for the two hours from Green Park on the Victoria Line. Changes of this magnitude will be unnoticeable.

Table 11.2.3: Change in volumes on London Underground, 2047 AM (07:00-09:00)

	Dir	Link	2019	2029 BAU	2029 Project	2032 BAU	2032 Project	2047 BAU	2047 Project	2029 Project - 2029 BAU	2032 Project - 2032 BAU	2047 Project - 2047 BAU
London Victoria	Victoria Line NB	Pimlico - Victoria	38,456	40,699	40,700	41,300	41,291	44,288	44,292	1	-9	4
		Victoria - Green Park	52,652	55,328	55,348	56,477	56,524	63,111	63,212	20	47	101
	Victoria Line SB	Green Park - Victoria	38,436	40,221	40,289	41,030	41,151	43,217	43,358	68	121	141
		Victoria - Pimlico	20,478	21,051	21,053	21,378	21,380	22,874	22,875	2	2	1
	District Line EB	Sloane Square - Victoria	40,697	45,755	45,777	46,311	46,350	48,483	48,555	22	39	72
		Victoria - St James's Park	43,241	49,034	49,022	49,531	49,476	52,068	51,996	-12	-55	-72
	District Line WB	St James's Park - Victoria	22,597	25,039	25,046	25,344	25,338	25,400	25,427	7	-6	27
		Victoria - Sloane Square	29,178	31,260	31,260	31,562	31,585	31,922	31,965	0	23	43
London Bridge	Jubilee Line EB	Southwark - London Bridge	27,333	30,120	30,123	30,976	30,997	34,743	34,774	3	21	31
		London Bridge - Bermondsey	26,128	27,316	27,302	28,167	28,166	33,451	33,455	-14	-1	4
	Jubilee Line WB	Bermondsey - London Bridge	32,893	39,031	39,046	40,128	40,174	41,990	42,040	15	46	50
		London Bridge - Southwark	37,246	42,790	42,783	43,705	43,722	45,822	45,840	-7	17	18
	Northern Line NB	Borough - London Bridge	22,573	24,250	24,251	24,585	24,590	25,931	25,944	1	5	13
		London Bridge - Bank	27,872	29,948	29,944	30,414	30,405	32,841	32,864	-4	-9	23
	Northern Line SB	Bank - London Bridge	12,068	13,603	13,617	13,970	13,993	14,619	14,652	14	23	33
		London Bridge - Borough	10,328	12,132	12,131	12,374	12,373	13,133	13,137	-1	-1	4

11.3 Bus and coach access to Gatwick

11.3.1 The purpose of this section is to provide a summary of changes in airport related demand on bus and coach services. As noted above, for bus and coach services the assumption is that operators can adjust capacity to manage loadings more readily than rail services, through adjustment of frequencies as Gatwick demand grows. Coach and bus loadings are therefore not assessed against a fixed capacity plan.

Future Year Network Assumptions

11.3.2 For the purpose of the calculating time and costs for the choice models, it was assumed that coach frequencies will rise proportionally with Gatwick demand.

- 2029 BAU: +33% (e.g. if there are 6 buses/day on a particular route in the base this is assumed to rise to around 8 in 2029 BAU)
- 2029 Project: +42%
- 2032 BAU: +37%
- 2032 Project: +67%
- 2047 BAU: +56%
- 2047 Project: +86%

11.3.3 It was also assumed that for the Future Baseline with Project scenario, a new coach service every two hours will be introduced serving Chatham – Maidstone – Sevenoaks – Gatwick Airport as recommended by a previous study for Gatwick and a new hourly bus service serving Uckfield to Gatwick via East Grinstead which fills an existing gap in the bus network.

[11] Future Baseline
[12] Future Baseline with Project

Future bus/coach demand

11.3.4 Table 11.3.1 shows the forecast bus/coach demand by local authority for each scenario. The local bus served areas mostly serve the airport employees, while the coach serves the air passengers principally. Given that air passengers grow at a significantly faster rate than airport employees it is not a surprise to see this reflected in the table. The growth rates 2019 to 2047 Project are around 40% for local bus and around 140% for coach. This would ensure healthy loadings in and out of Gatwick and possibly require more coaches than input to the model. This will be reviewed in more detail at a later stage.

11.3.5 The combined impact of the Future Baseline with Project scenario and the proposed Chatham coach, raises Kent coach patronage by around 330 per day, which suggests the proposition could be viable and deserves further study (if there are 12 services in each direction this implies around 14 persons per coach).

Table 11.3.1: Bus/coach demand, 24 hr

		Airport-related bus/coach trips (24 hr)						
		2019	**2029 BAU**	**2029 Project**	**2032 BAU**	**2032 Project**	**2047 BAU**	**2047 Project**
Local Bus	Crawley	1969	2329	2423	2372	2599	2536	2750
	Mole Valley	7	10	11	10	12	11	12
	Reigate and Banstead	174	215	226	221	247	236	263
	Tandridge	12	16	18	17	21	20	24
	Mid Sussex	46	58	62	60	69	64	74
	Horsham	72	86	91	88	99	93	104
Coach	Brighton and Hove	210	378	425	404	551	490	651
	Rest of West Sussex	37	63	70	67	91	77	104
	Rest of Surrey	16	25	27	26	33	28	35
	East Sussex	54	88	98	94	120	104	132
	Kent	73	124	376	131	442	139	470
	London	1089	1719	1894	1807	2331	1941	2527
	Hampshire	220	383	431	411	557	453	612
	Ox, Bucks, Berks	468	681	744	708	889	763	973
	REST OF UK	1013	1507	1658	1599	2006	1714	2168
	TOTAL	**5459**	**7681**	**8554**	**8014**	**10069**	**8668**	**10900**

12 Construction Scenarios

12.1.1 As outlined in section 2.4 two construction scenarios have been modelled to assess the impact of construction at two different phases of the development being delivered. These scenarios reflect:

- the airfield and airport works; and
- the effect of the highway construction.

12.2 Airfield construction

12.2.1 A peak airfield construction scenario has been tested with construction trips added on to 2029 baseline traffic levels.

12.2.2 Construction vehicle data has been generated on a monthly basis by GAL's construction team in relation to core and non-core construction activities to deliver the Northern Runway Project.

12.2.3 The busiest month for construction vehicle activity is December 2026 with 38,450 construction vehicles for the busiest shift across that month, comprising 16,360 construction workforce or Person Owned Vehicles (POVs) and 22,090 other construction vehicles as a mix of HGVs, LGVs and Liveried Vans and a two shift day.

12.2.4 However, December is a lower month for traffic on the highway network around the Airport and therefore the assessment has also considered other months during the peak months of construction activity in 2026 and 2027. Typically, the summer months, with high Airport activity and background traffic, are the busiest on the network.

12.2.5 Accordingly, the modelling and assessment considers the highest summer month which occurs in August 2027 with 21,834 vehicles for the busiest shift across that month, comprising 7,326 POVs and 14,508 other construction vehicles and two, 10 hour shifts and an 8-hour night shift.

12.2.6 This monthly data has been used to generate daily and peak period traffic volumes by:

- Considering shift patterns.
- Dividing monthly vehicle numbers by 22 working days per month.
- Assuming 1.5 construction workers per vehicle, which is considered to be conservative. GAL's construction team have data which suggests that a reasonable proportion of the recent workforce on airside projects at the Airport came to site in minivans with up to 6 people per van. As such, 1.5 construction workers per vehicle is considered a conservative case.
- Assuming 10% construction workforce public transport mode share. Again, this is a low percentage given the excellent connectivity provided by Gatwick Airport railway station, as well as local bus and long-distance coach services.

12.2.7 The three shifts in August 2027 mean that, for the busiest daytime peak, the monthly total POVs is 7,326 vehicles, equivalent to 3,663 POVs in one direction. When divided by 22 working days and factored by 90% to reflect 10% of construction workers on public transport, this gives 150 construction worker vehicles travelling into the MA1 site in the AM peak period (07:00-08:00) and out of the site after the PM peak period (18:00-19:00) in August 2027.

12.2.8 The 150 construction worker vehicles travel into the MA1 site in the AM peak period (07:00-08:00) and out of the site after the PM peak period (18:00-19:00) in August 2027.

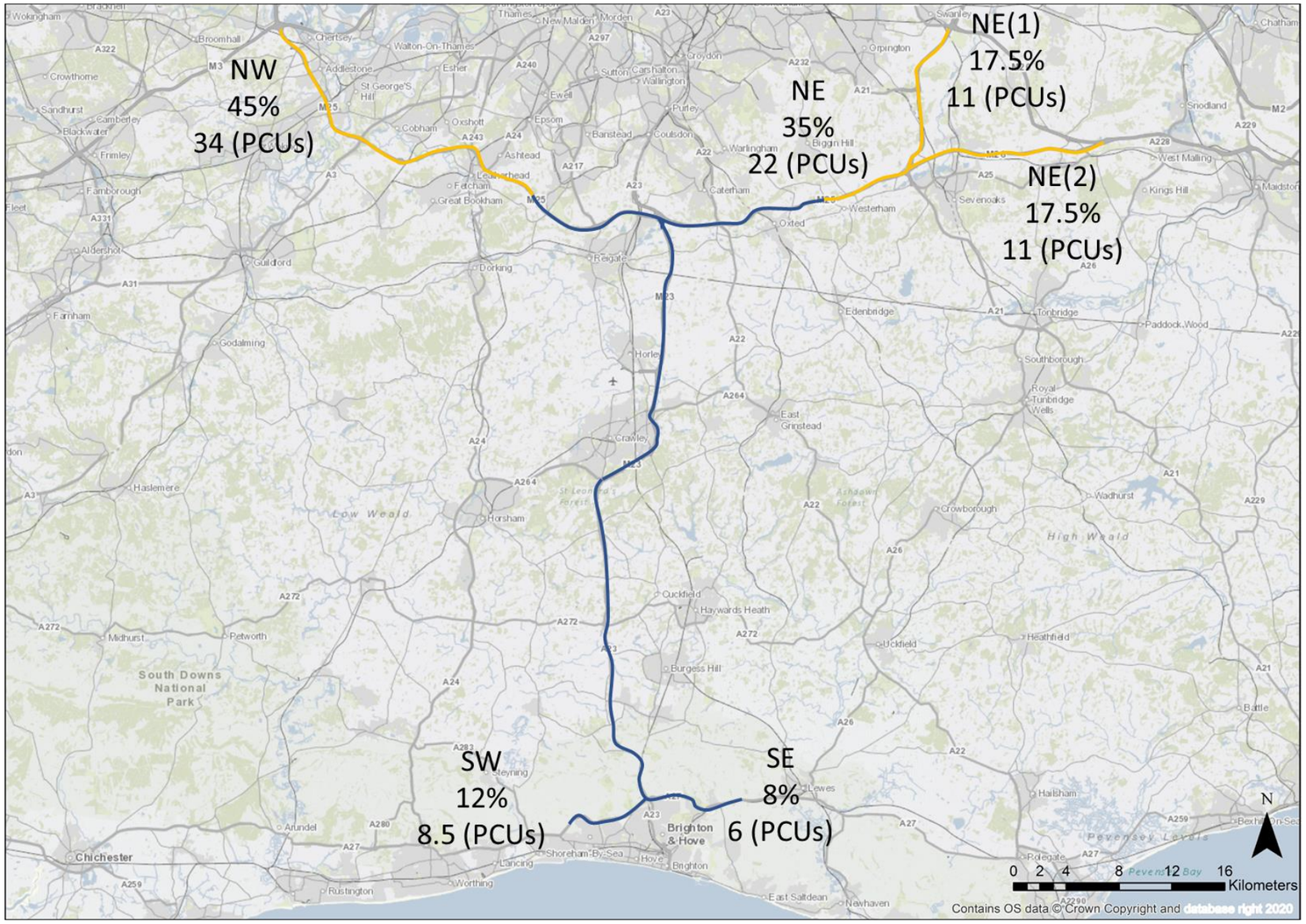
12.2.9 In order to provide a reasonable distribution of potential locations from which construction workers will travel to/from, the modelling assumes that construction workers are drawn from Croydon, the Gatwick Diamond area and Brighton and Hove. The trips are distributed between zones in nine Local Authority areas, including Croydon, Brighton and Hove, Crawley, Epsom and Ewell, Horsham, Mid Sussex, Mole Valley, Reigate and Banstead and Tandridge. The distribution of construction workers by Local Authority reflects the proportion of construction workers living in those areas from 2019 Office of National Statistics data. Given that it will be very difficult to mandate and then monitor routes for construction workers, it is assumed that these vehicles will arrive at MA1 via the most appropriate highway route from or to each zone.

12.2.10 For HGVs and LGVs, the shift patterns in August 2027 mean that, for the busiest daytime shift, the monthly total construction vehicles are 14,508 vehicles, equivalent to 7,254 in one direction. When divided by 22 working days and spread over a 10-hour shift, the estimated vehicle trip generation is 33 vehicles (HGVs and LGVs) in and out every hour along the M23 Spur. At this stage, material-carrying construction vehicles, i.e. LGVs and HGVs, have not been excluded from peak hours on the highway network to test the impact of extra construction traffic in the peak.

12.2.11 The proposal is for all construction vehicles to travel to and from the airport from via M23 Junction 9, and no restrictions are proposed for construction worker vehicles. Construction traffic would be monitored to ensure compliance with proposed routes, unless disruption causes these to be unavailable and signed diversionary routes provided.

12.2.12 The estimated vehicle trip generation is 33 vehicles (HGVs and LGVs) in and out an hour along the M23 Spur, and 150 construction worker vehicles in the AM peak hour. As described above the construction workers have been distributed out over the local authorities while the construction vehicles have been defined in the HAM as fixed routes and the distribution of these vehicles is shown in Figure 98.

Figure 98: Distribution of construction vehicles in PCUs – AM Peak Hour (07:00-08:00) and PM Peak Hour (18:00-19:00)



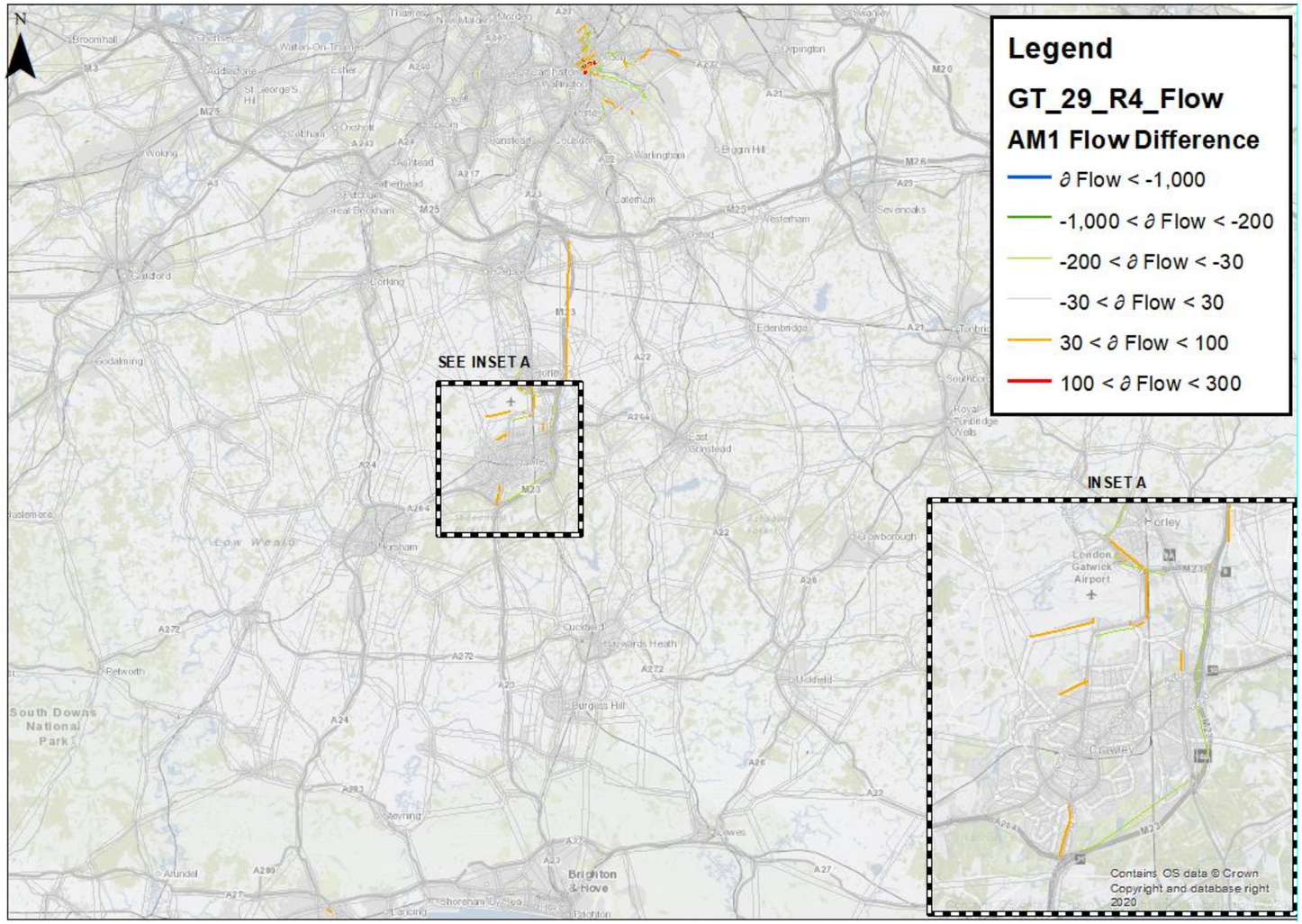
12.2.13 The modelling has tested the summer peak level of construction activity in August 2027 on 2029 baseline airport and background traffic levels to provide a robust assessment of potential construction impacts. The difference in traffic flows between 2027 and 2029 will be small (up to 5% higher) and accordingly within the daily variation in any given year.

Highway Network Performance

12.2.14 The modelling shows that there are negligible changes in traffic flows when including the airfield construction traffic, which is expected given the limited volume of airfield construction traffic generated by the Project.

12.2.15 The differences are shown in Figure 99 for the AM peak hour, with a 30 to 100 vehicle two-way flow change shown predominantly on the M23, M23 Spur and A23. There are also minor vehicle increases on Charlwood Road south of the Airport and a number of smaller roads in North Crawley.

Figure 99: Flow difference Airfield Construction minus. AM Peak Hour (07:00-08:00)



12.2.16 The magnitude of impact assessment described in 10.1 has been undertaken for the airfield construction scenario comparing against the 2029 future baseline, shown in Figure 100. This shows that the airfield construction vehicles have minimal effect on the operation of the highway network, with only one junction flagging as low near the airport, the junction between the A23, Gatwick Road and Perimeter Road East.

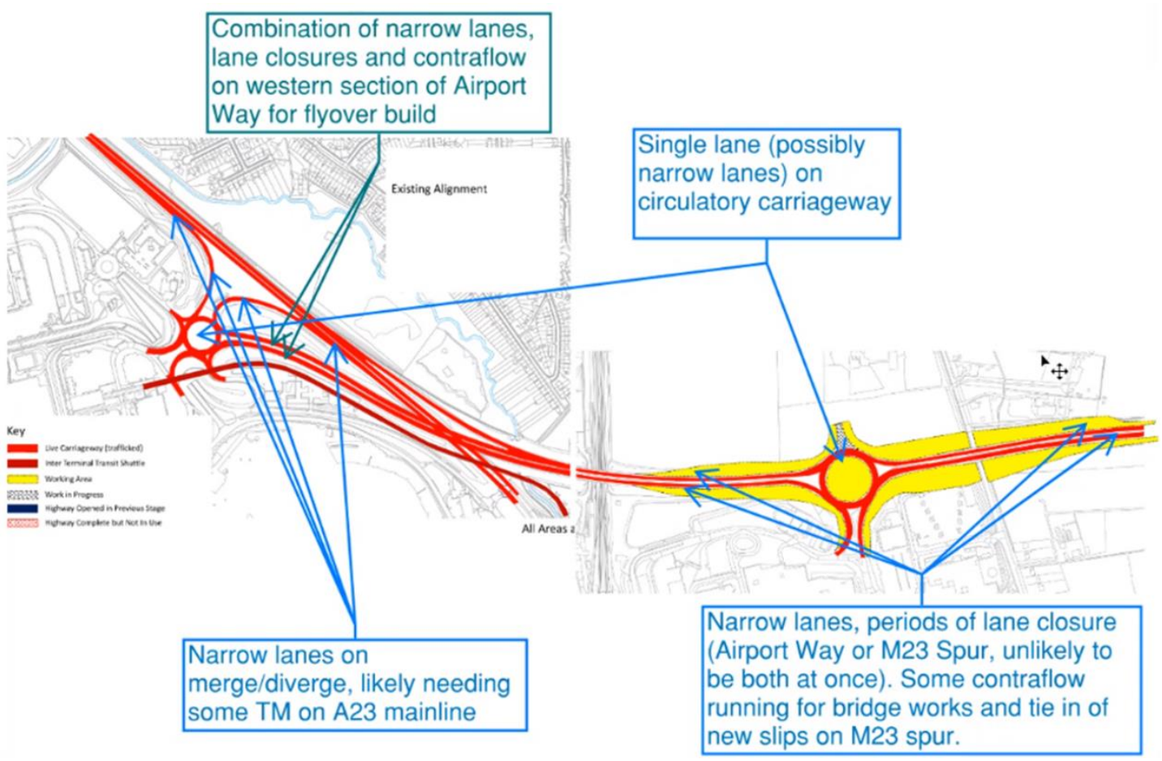
12.2.17 As described in section 10.7 the effects shown in Croydon are not as a result of the airport construction traffic but associated model noise in Croydon due to the area being highly congested and this will be investigated further in the next Phase for DCO submission.

Figure 100: Magnitude of Impact Assessment for Airfield Construction Scenario

12.3 Highway Construction

12.3.1 The most complex highway construction phase as currently envisaged would involve a combination of construction works at both the South and North Terminal roundabouts, as shown in Figure 101. The construction methods are typical for the works envisaged but the sequencing of these to avoid unnecessary disruption creates complexity.

Figure 101: Potential Highway Construction Phase



12.3.2 The works could last for a period of up to four months and would include:

- South Terminal roundabout
  - Narrow lane running or periods of temporary lane closure on the M23 Spur and/or Airport Way, with some contraflow running for bridge works and tying in the new slips back to the M23 Spur.
- Both roundabouts
  - Single of narrow lanes on the circulatory of both roundabouts.
- North Terminal roundabout
  - Narrow lanes on merges and diverges, likely requiring some traffic management on the A23.
- A combination of narrow lanes and/or lane closures and contraflow running on the western section of Airport Way to allow the flyover to be built.

12.3.3 It is envisaged that these works would take place November through to February. Therefore, the modelling has tested the most conservative highway construction activity phase, against winter Airport traffic. This assumes 2029 with Project demand, i.e. assuming the Northern Runway is open, to provide a robust assessment of potential construction impacts with additional demand generated by increased runway capacity.

12.3.4 Airport passenger demand on a peak Friday in winter (Nov-Feb) is circa. 72% of a peak summer day, reflecting that this is a quieter period at the Airport and therefore when it would make the most sense to sequence the more complex phases of highway construction.

12.3.5 The AADT flow difference presented in Figure 102 demonstrate the effects of the highway construction on the transport network. This shows that the construction constraint on the highway network at both south terminal and north terminal roundabouts leads to slightly lower numbers of trips using the key routes in/out of the airport via the M25 and M23 corridors across the day.

12.3.6 The links shown in red indicate a reduction in traffic with the effect on the M23 Spur being that background traffic not needing to access the Airport is shown by the modelling to seek alternative routes. This also effects traffic levels on the M23 itself, though Junction 9 sees an increase in traffic flows. This increase is related to right-turning into the Airport being rerouted during this construction phase and therefore traffic from the west for South Terminal u-turns at Junction 9.

12.3.7 Additionally, there are increases in AADT through Crawley, between 0 and 1,000 vehicles AADT on Lowfield Heath Road, Bonnetts Lane and the B2036 Balcombe Road. These are

vehicles that would normally use the Spur temporarily using alternate routes to avoid the constraints on the Spur and terminal roundabouts. The magnitude of impact assessment assesses the junction performance of the highway construction scenario against the 2029 Future Baseline with Project scenario, shown in Figure 103.

12.3.8 Discounting the impacts shown in Croydon due to the model noise issues discussed previously in this report. The modelling shows some localised and temporary impacts on highway network performance at South terminal Roundabout and on the A23 with the highway construction scenario.

12.3.9 This impact is not unexpected as the highway network is constrained in this area with narrow lane running and lane closures affecting capacity of the network.

12.3.10 Additionally, the roundabout between Copthorne Way, Copthorne Road and Copthorne Common Road to the East of M23 Junction 10 shows a low impact on junction performance due to the increases in traffic using the A2220 of between 0 and 1,000 AADT using two arms of this roundabout.

Figure 102: AADT Flow Difference of Highway Construction minus 2029 With Project

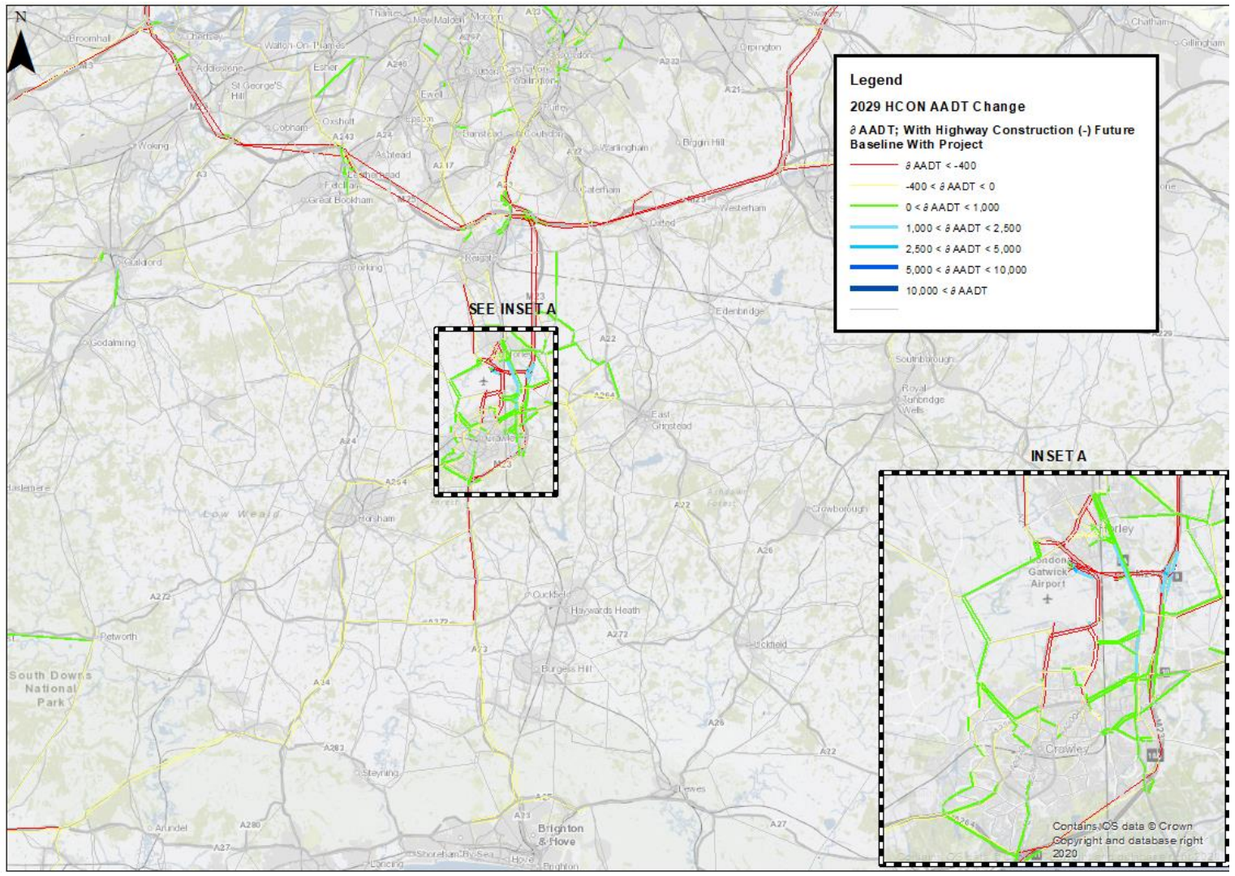
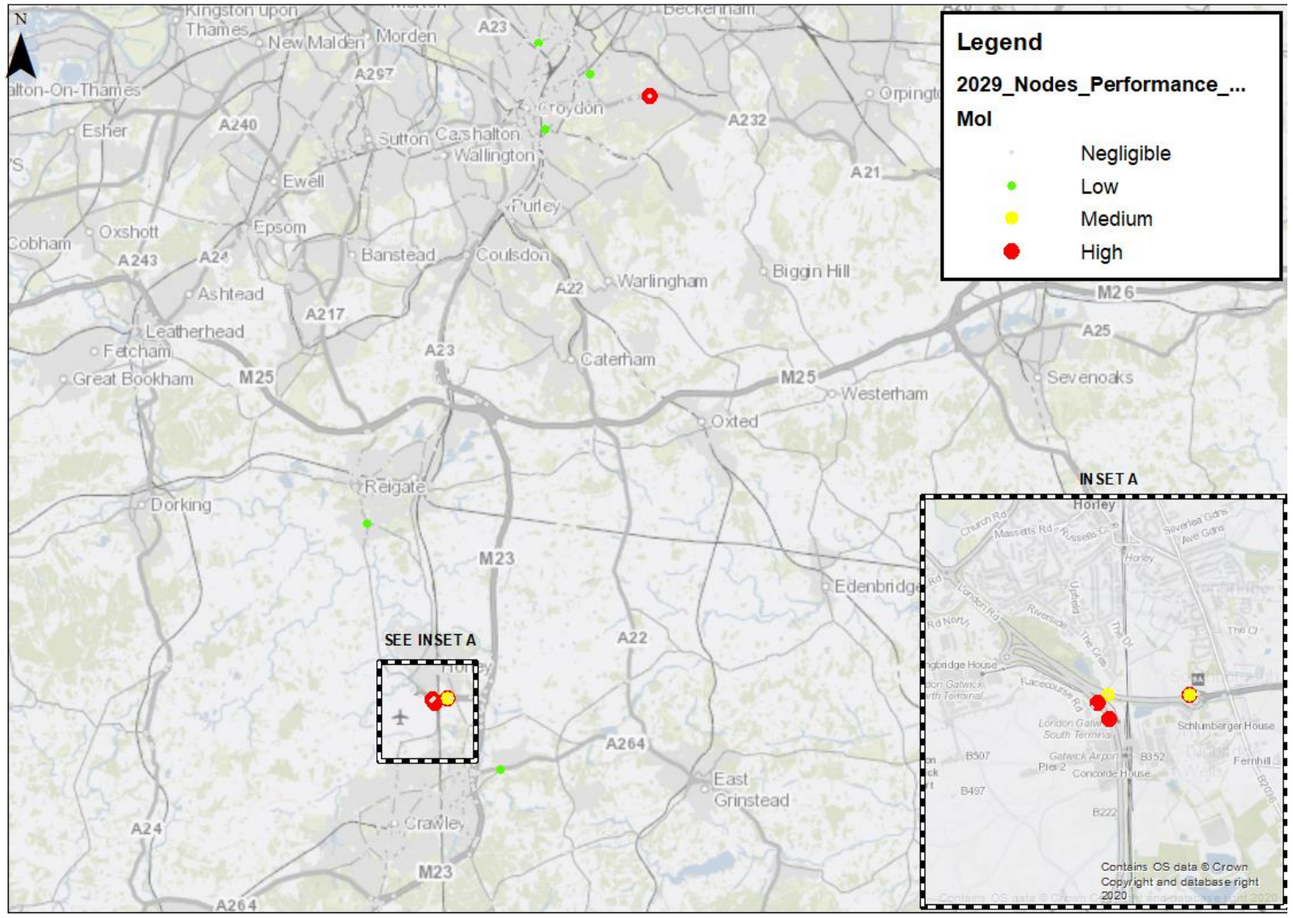


Figure 103: Magnitude of Impact Assessment of Highway Construction Scenario



13 Environmental Outputs

13.1.1 In order to generate the relevant outputs from the transport models to support environmental analysis, a series of factors were developed to support this. The key outputs required for environmental analysis included:

- Annual average daily traffic at a 24 hour and 18-hour level
- Annual average weekday traffic at a 24 hour and 18-hour level.

13.1.2 The aim of these factors were to help convert the time period level outputs from the highway model, expressed as a June weekday traffic flow, to the appropriate annual average traffic flow.

13.1.3 The first step of this was to combine time periods to create an 11-hour traffic volume. This was undertaken as:

- AM1+AM2+(6xIP)+(2xPM)

13.1.4 This was done for each section of road modelled. These were subsequently factored by a series of factors derived for airport and non-airport demand as set out in Table 12.3.1 and Table 12.3.2. These were derived from available traffic count data within the AoDM as well as airport seasonality data. The same factors for the airport passenger and employee demand were applied.

Table 12.3.1: Annual Average Daily Traffic Factors

AADT	Non-Airport	Airport
Average (24Hr)	1.72369	2.33603
Average (18Hr)	1.65527	1.93136

Table 12.3.2: Annual Average Weekday Traffic Factors

AAWT	Non-Airport	Airport
Average (24Hr)	1.35370	1.74919
Average (18Hr)	1.29998	1.44618

14 Conclusion

14.1 Introduction

14.1.1 This report, the PEIR Strategic Modelling Report, provides the detail around the suite of transport models that have been developed to both help develop a sustainable surface access strategy for the future of the airport and help assess the impacts of the proposed development on the surface transport network. The report provides a summary of the rationale for the development of the transport models with full technical details of the model development being provided at the DCO stage.

14.1.2 The strategic model includes measures within the Airport Surface Access Strategy, and wider network changes that may affect demand and mode share, most notably increases in forecourt and parking charges. These lead to an increase in passenger public transport mode share from around 45% prior to the Covid-19 pandemic up to 54% and 56% between 2029 and 2047. Whilst not at the 60% draft target set by GAL for 2030, this increase in public transport mode share for air passengers is significant and notable given the growth in passenger numbers with the Project.

14.1.3 In terms of employees, the strategic model shows that a sustainable transport mode share of 47% is achievable and this would indicate that further measures are required, in particular these could include incentives around EV uptake as well as restrictions on staff parking.

14.1.4 Even with increases in sustainable mode share, the modelling also then assumes proposed highway mitigation is in place in the 'with Project' scenarios in 2032 and 2047. Highway works are proposed as part of Project, to both the South Terminal and North Terminal roundabouts, to improve capacity and mitigate against significant effects, with additional improvement works also proposed at the Longbridge Roundabout.

14.1.5 The following impacts and mitigation have been identified through transport modelling and analysis to date.

14.2 Rail and Bus

14.2.1 In terms of rail, the Project will increase the number of rail passengers but based on the line loading, seated loading factor and standing capacity assessments, no significant crowding on rail services is expected as a result of the Northern Runway.

14.2.2 Given the adaptability of bus and coach provision, it is not considered necessary to model crowding on bus and coach services explicitly within the modelling framework. However, the assessment includes service frequency and quality as a measure of public transport amenity. The bus and coach assessment indicates that additional peak period services or network changes including consideration of new or revised routes, provides for increased patronage by both employees on local bus services and air passengers on coaches. Increased service frequencies provide improved amenity for non-airport users also, benefitting both local communities and businesses by improving connectivity.

14.3 Highway

14.3.1 The M23 Smart Motorways scheme widens the motorway to effectively 4 lanes in each direction at peak times between Junctions 8 and 10, providing significant additional capacity. Furthermore, committed schemes improve reliability along the corridor.

14.3.2 From a highway perspective, the ASAS measures proposed, and the highway mitigation measures included as part of the Project result in journey times which are not notably affected between the Future Baseline and with Project scenarios, with changes across all years limited to no greater than a 1-minute increase for end-to-end journey times.

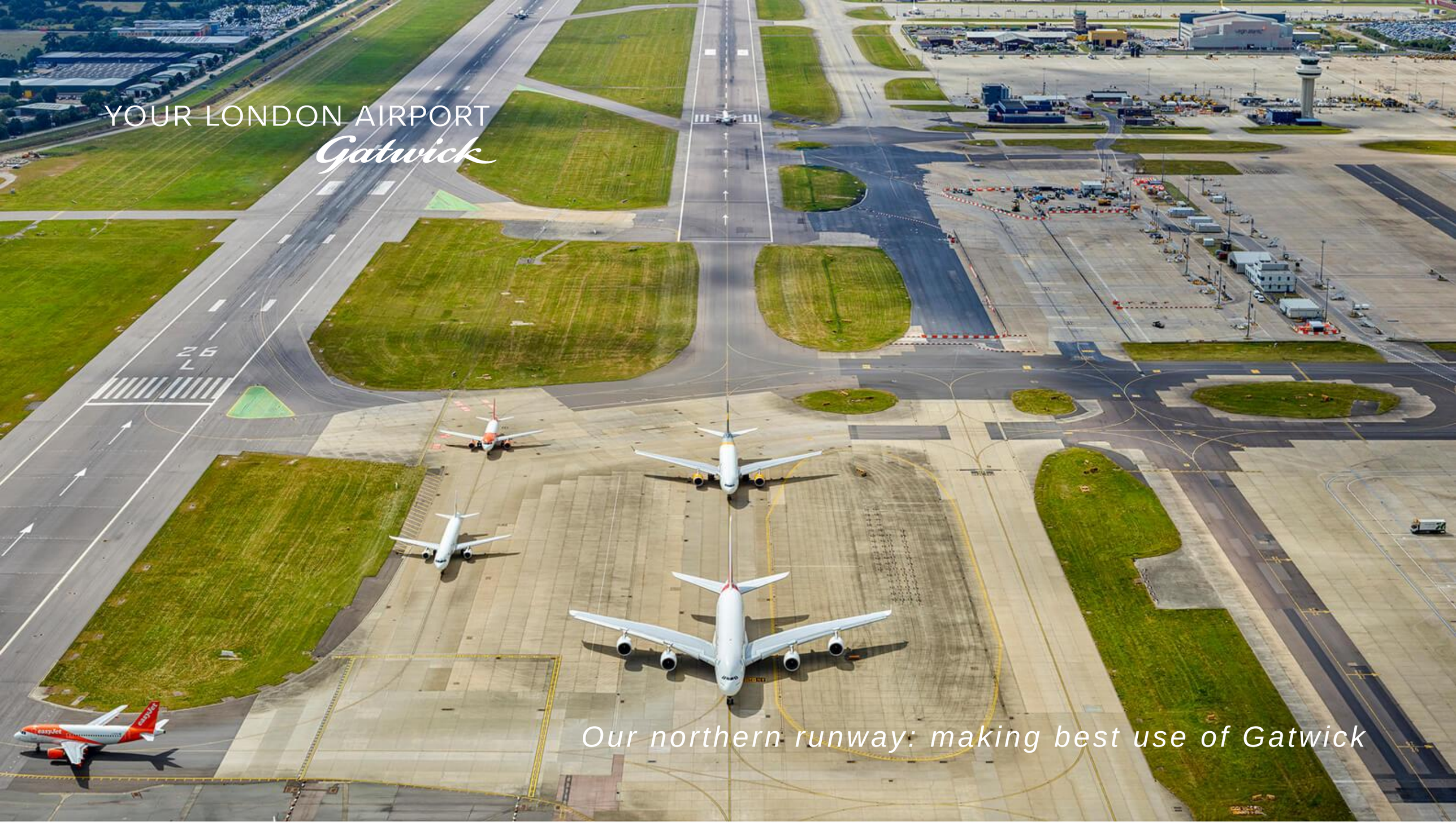
14.3.3 Modelling shows that the Future Baseline to 2029 can be accommodated on the M23 Spur with local widening and signalisation works that will be delivered prior to 2029.

14.3.4 Given the congestion shown by the model for 2032 Future Baseline, Gatwick has made the decision that more significant improvements will be required on the highway network to support additional growth with the Project, otherwise there will be potential for delays on the network. This comprises grade-separation at the South Terminal and North Terminal roundabouts to improve capacity as well as enlarging Longbridge Roundabout.

14.3.5 With Project and background traffic growth to 2047, modelling shows some localised areas where congestion would still be expected with highway improvements. However, congestion levels are manageable and indicate that the improvements are appropriate and proportionate. All of these local impact areas are examined in further detail in local VISSIM microsimulation modelling, which is reported in the PTAR.

14.3.6 The airfield construction scenario adds a small number of construction vehicles and construction worker vehicles during peak hours. These changes, reflected in the highway model, give rise to no material impacts.

14.3.7 Highway construction has been modelled to represent the four-month period when construction work will be carried out around north and south terminal roundabouts. The modelling shows that the constraint on the highway network at both North and South Terminal roundabouts leads to slightly lower numbers of trips using the key routes in/out of the airport and some increases in AADT through Crawley. However, the main affects being seen are immediately adjacent to the airport and temporary in nature.



Preliminary Environmental Information Report
Appendix 12.9.1: PTAR Annex C: Scheme Development Report - Highway Mitigation

September 2021

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1 Introduction

1.1 Gatwick Airport Northern Runway Project -Project Overview

1.1.1 Arup has been appointed by Gatwick Airport Limited (GAL) to act as consultant in the development of the concept design of highway mitigations associated with the Gatwick Northern Runway Project. The proposed increase in capacity of the Airport is expected to lead to an increase in traffic volumes in the vicinity of the airport. The purpose of the design proposals is to improve the existing highway layout to mitigate the effects associated with the anticipated increase in traffic volumes.

1.1.2 Gatwick Airport is currently served by a single runway. The Airport also has a further runway, which is located north of the main runway and is only available for use when the main runway is closed.

1.1.3 The Gatwick Airport Northern Runway Project (referred to within this report as 'the Project') proposes to make alterations to the northern runway, including repositioning its centreline to the north by 12 metres which, along with the lifting of the planning condition restricting its use, would enable dual runway operations in accordance with international standards.

1.1.4 The Project includes the development of a range of infrastructure and facilities which, together with the alterations to the northern runway, would enable the airport passenger and aircraft operations to increase. These works include the proposed highway mitigations that are the subject of this report. The scope of the works under consideration includes modifications to the North Terminal junction, South Terminal junction (including the M23 spur motorway), Longbridge junction and the connecting link roads.

1.1.5 It is anticipated that by 2047 these improvements could increase airport capacity up to 80.2 million passengers per annum (mppa), compared to a maximum potential capacity based on existing facilities of 67.2 mppa within the same timescale. This represents an increase of approximately 13 mppa.

1.1.6 The Preliminary Transport Assessment Report (PTAR) for the Project sets out the transport network, its operation and performance and potential transport impacts of the Project. It includes an assessment of impacts, and provides a high-level overview of how those impacts will be mitigated to promote sustainable development. This report provides more detail on the proposed highway mitigations for the Project and also includes a description of the alternative design options for the highway mitigation that were considered but are not being taken forward to the next design stage.

1.2 Existing Highway Network

1.2.1 An overview of the existing transport network in the vicinity of Gatwick Airport is provided in Figure 1. Gatwick Airport is located in West Sussex adjacent to the county border with Surrey. The Airport can be directly accessed from the national strategic road network via the M23 motorway, which runs north-south adjacent to the Airport. Junction 9 of the M23 is the main access point with an onward link of motorway standard dual carriageway providing connectivity to the airport's South Terminal roundabout (Junction 9a). This link is known as the M23 spur. The M23 connects to the M25 around London and the A23 towards Brighton and the South Coast.

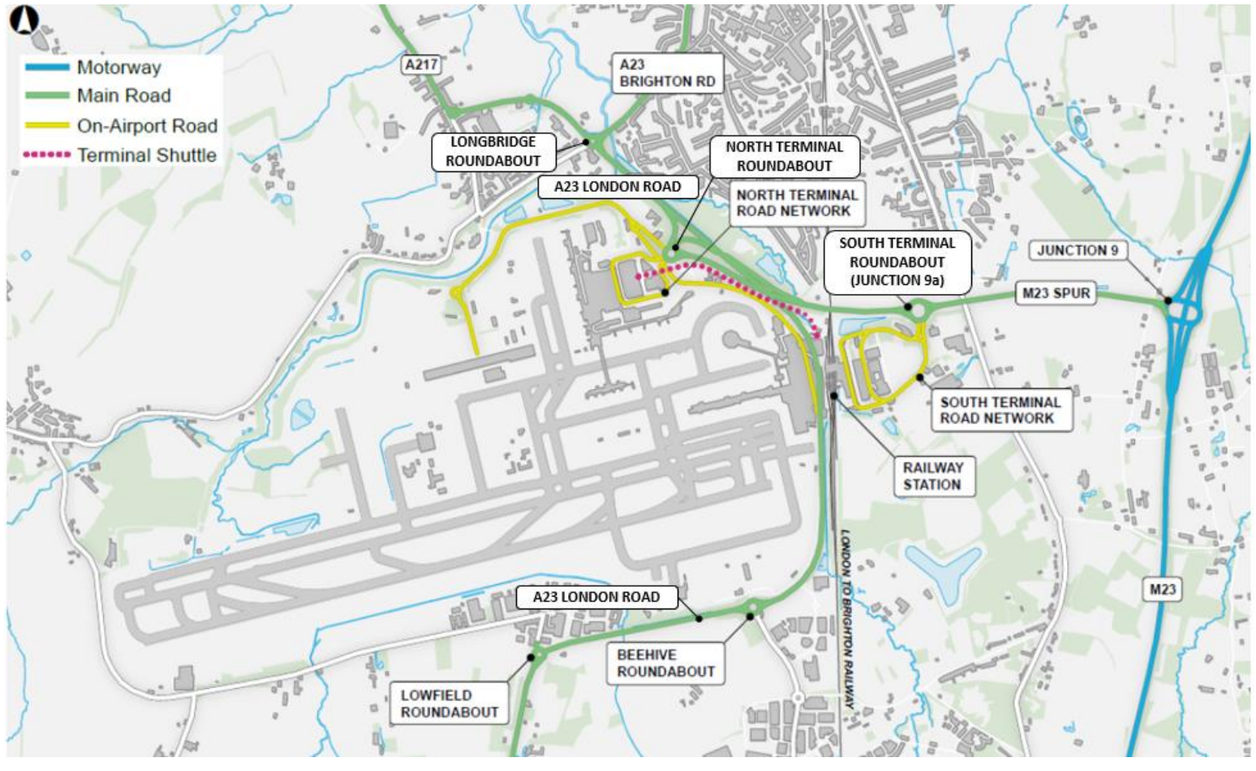

Figure 1: Gatwick Airport – Transport Overview

1.2.2 At-grade roundabouts at the North Terminal and South Terminal provide access to the Airport's road network. The A23 London Road provides connectivity to and from the local road network north and south of the Airport. Longbridge junction to the north of the Airport provides access to local routes and to the neighbouring town of Horley.

1.3 Required Highway Mitigation

1.3.1 Whilst Gatwick is committed to securing a higher surface access mode share by sustainable modes, highway access will remain critical for future access for passengers, staff, and freight, including those arriving by local bus and express coach. The Gatwick strategic highways traffic model developed in SATURN is the primary highway assessment tool used for the Preliminary Environmental Information Report. (PEIR). It was used to inform demand on links and through junctions as well as variation in speeds to be fed into more detailed junction modelling using VISSIM as well as into air quality and noise models.

1.3.2 An assessment of the modelled traffic flows produced for the design year of 2047 indicated that the existing highway network in the vicinity of the Airport did not have suitable capacity to support the forecasted traffic volumes. Therefore, in order to accommodate the proposed increase in passenger numbers and taking into account other known and planned developments in the area, highway works are proposed as part of the Project, to both the South Terminal and North Terminal roundabouts, and at Longbridge roundabout. These highway modifications works are embedded mitigations as part of the Project. Their purpose is to provide additional capacity to mitigate the significant effects associated with the anticipated increase in traffic volumes.

1.3.3 Summaries of the proposed highway modifications for each of the three junctions are provided in Section 5 of this document. The final designs will be subject to further road traffic assessment and detailed engagement with highway authorities, including Highways England.

1.4 Purpose of the Report

1.4.1 This document sets out the highway development strategy for the Project. It contains the following key information.

- An overview of the full surface access strategy for the Project and a summary of key development constraints.
- A high-level summary of the traffic modelling work undertaken to date.
- A summary of the proposed highway modifications and associated design features such as structures and drainage design proposals.
- A description of the alternative design options that were considered but are not being taken forward to the next design stage.

2 Surface Access Strategy

2.1 Existing Highway Network

2.1.1 The existing South Terminal junction comprises a three arm at-grade roundabout with a three lane circulatory carriageway (reducing to one wide lane between the M23 spur roundabout exit and entry) as depicted in Figure 2. Airport Way and the M23 Spur, located to the west and east of the roundabout respectively, are dual carriageways with a posted speed limit of 50 mph. Access to Gatwick Airport South Terminal is provided by the southern arm of the junction with a posted speed limit of 30 mph.

Figure 2: South Terminal Roundabout Existing Layout

2.1.2 The M23 Spur has recently been upgraded under the scope of the M23 Junctions 8-10 Smart Motorway Project, completed in 2020. As part of these works the westbound hard shoulder was converted into a permanent running lane, resulting in the provision of three traffic lanes westbound between M23 Junction 9 and the South Terminal. Upgrades also included the introduction of a 'Place of Relative Safety' for westbound traffic located to the east of the South Terminal Roundabout. In the eastbound direction the existing two running lanes and hard shoulder provision were retained.

2.1.3 Key existing structures in the vicinity of the South Terminal Junction and M23 spur include:

- M23 Spur Balcombe Road overbridge - Overbridge located approximately 190 metres to the east of South Terminal Roundabout, carrying the M23 Spur over Balcombe Road
- Airport Way London to Brighton railway overbridge – Overbridge located approximately 400 metres to the west of South Terminal Roundabout, carrying Airport Way over the London to Brighton railway.

2.2 North Terminal Junction

2.2.1 The existing North Terminal junction is located to the north east of Gatwick's North Terminal. As illustrated in Figure 3, the junction consists of a five arm at-grade roundabout with a two lane circulatory carriageway. The Longbridge Way and Gatwick Way arms provide access to car parks, hotels and other airport infrastructure. The south western arm provides the primary access to and from the airport terminal via Northway and North Terminal Approach. The eastern approach to the junction is provided by Airport Way, a dual carriageway with two lanes in each direction connecting the North Terminal to the M23 Spur via the South Terminal roundabout.

2.2.2 Connectivity to neighbouring towns of Crawley and Horley is facilitated by the A23 London Road, a dual carriageway with two lanes in each direction travelling north-south underneath the existing Inter Terminal Transit System (ITTS) and Airport Way. The A23 London Road connects the North Terminal to Longbridge roundabout to the north, The North Terminal junction is connected to the A23 London Road northbound via at-grade diverge and merge slip roads. However, the existing highway layout does not permit vehicle movements between the North Terminal and the A23 London Road southbound. Traffic seeking to travel southbound on A23 London Road from North Terminal must currently travel via Longbridge roundabout. Southbound traffic on A23 London Road seeking to access North Terminal must currently travel via South Terminal roundabout and Airport Way. The speed limit for Airport Way, the A23 London Road and North Terminal Roundabout is 50mph, whilst the speed limit for the airport access roads is 30mph.

Figure 3: North Terminal Roundabout Existing Layout

2.2.3 The key existing structures in the vicinity of North Terminal roundabout can be summarised as follows.

- A skewed concrete bridge carries Airport Way over the A23 London Road.
- An underpass is located beneath the Northway and North Terminal Approach Road allowing Northgate Road and Tunnel Road/Fuel Farm Road to pass beneath.
- A viaduct carries the ITTS over North Terminal Approach and Gatwick Way before running parallel to Airport Way towards the South Terminal Shuttle Station.

2.3 Longbridge Roundabout

2.3.1 Longbridge roundabout is an existing at-grade partially signal-controlled roundabout located north of Gatwick Airport in Horley. It is a four arm roundabout with a two lane circulatory carriageway which widens to three lanes adjacent to the Povey Cross Road arm. Figure 4 illustrates the existing junction layout. Connectivity to the North and South Terminals of Gatwick Airport is provided via the A23 London Road dual carriageway which approaches the Longbridge junction from the south. Local access to the surrounding town of Horley is provided by the A23 Brighton Road, A217 and Povey Cross Road. Each arm of the roundabout includes a provision of signal-controlled toucan crossings and shared-use paths for use by pedestrians and cyclists.

2.3.2 The A23 London Road has a speed limit of 50mph. The A217 speed limit is 40mph, whilst the speed limit for the A23 Brighton Road and Povey Cross Road is 30mph.

2.3.3 There is an existing segregated left turn lane provision for southbound traffic between the A23 Brighton Road and A23 London Road. This is supported by an existing stilt structure which spans an area of flood plain associated with the River Mole to the east of the junction. Additional structures in the vicinity of the junction include the River Mole overbridges located on the A23 Brighton Road and A23 London Road.

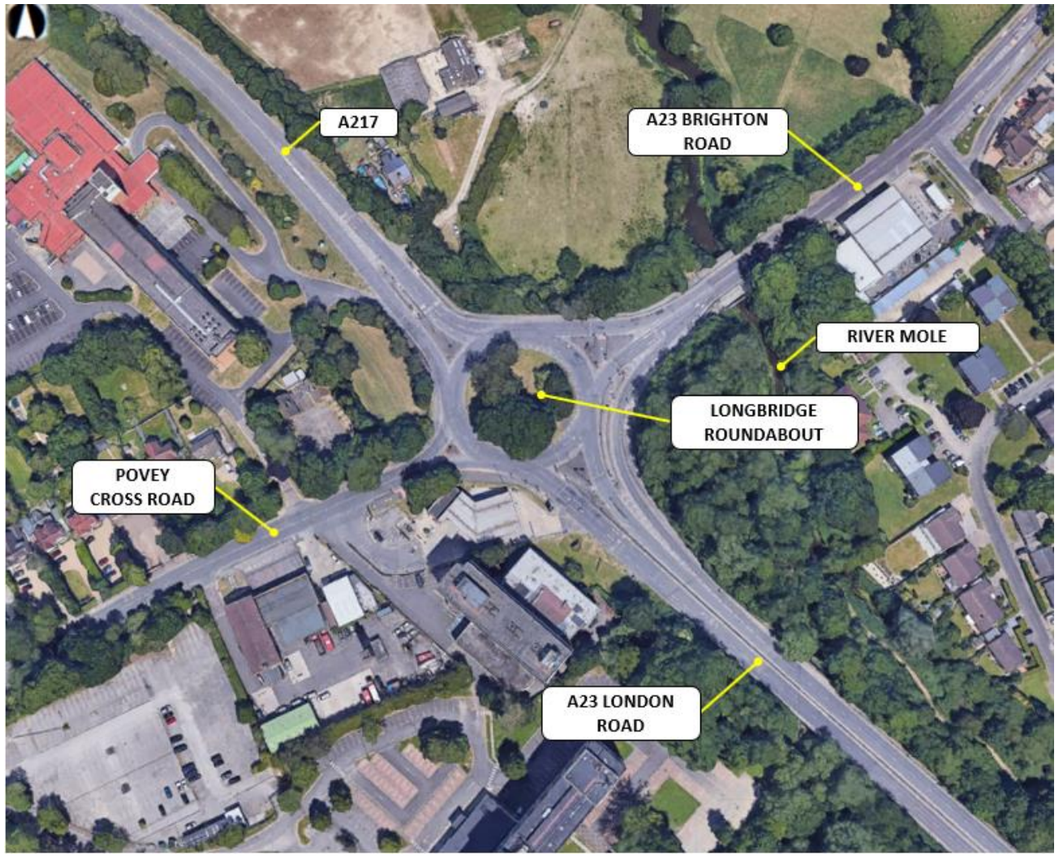

Figure 4: Longbridge Roundabout Existing Layout

2.4 Highway Development Strategy

2.4.1 The key aims of the proposed highway mitigation are as follows.

- Provide increased highway capacity to mitigate the forecasted airport traffic growth.
- Provide better travel conditions on through routes at the North and South Terminal junctions for non-airport users and, where possible, to separate airport traffic from non-airport traffic to add capacity and resilience as well as to improve safety.
- Minimise disruption to road users during construction.
- Minimise the impact to key areas of ecological, landscape or recreational value in the vicinity of the works.

2.5 Forecourt and Car Parking Strategy

2.5.1 At the North Terminal forecourt, the existing drop off facility on Northway is not expected to be able to accommodate the forecast level of passenger growth for drop-off and pick-up. Accordingly, there is an opportunity to reconfigure the North Terminal forecourt to provide more capacity for drop off and also to increase priority for buses. This strategy envisages moving drop-off from Northway into the short-stay Multi-Storey Car Parks (MSCPs) which is where pick-up is currently handled . Additionally, GAL has recently introduced forecourt charges at both terminal drop off zones in an initiative to reduce the proportion of "Kiss and Fly" trips.

2.5.2 The South Terminal forecourt generally has more capacity than the North Terminal and it is not expected that significant changes are required.

2.5.3 New car parking will be required on site in order to meet additional parking demand generated by the proposed increase in passengers with Project, and to replace existing parking spaces that may be lost owing to development associated with the Project. The overall net increase in car parking spaces by 2047 with the Project is approximately 18,500 spaces.

2.5.4 Further details on the proposed future forecourt strategy and car parking strategy can be found in Appendix 12.9.1 of the PEIR.

2.6 Public Transport Strategy

2.6.1 Gatwick is the only London Airport to have 24 hour rail, bus and express coach access. The seven platform train station adjacent to South Terminal (owned by Network Rail) provides access to a wide range of rail services. These include the Gatwick Express service to London Victoria as well the Southern and Thameslink networks. North and South Terminals offer bus and coach access and are connected via an inter-terminal shuttle system.

2.6.2 Draft actions and targets for the Airport Surface Access Strategy are included for consultation in Appendix 12.9.1 of the PEIR. The final strategy in the application for development consent will be prepared in conjunction with Gatwick's Airport Transport Forum and in accordance with the Aviation Policy Framework guidance.

2.6.3 Gatwick intends to put forward a robust strategy which enhances Gatwick as a regional transport hub through improvements to rail, bus, and sustainable transport with challenging but achievable mode share targets established towards a lower carbon future.

The travel plan will focus on specific interventions related to staff travel in particular. The travel plan will seek to promote sustainable and healthier modes of transport for staff and reduce travel to work by single occupancy car.

2.7 Walking and Cycling Strategy

2.7.1 Gatwick is exploring options to improve walking and cycling and have submitted proposals to improve linkages alongside the Capital Investment Plan improvements proposed for highways (see Appendix 12.9.1 of the PEIR for further details).

2.7.2 The final Airport Surface Access Strategy accompanying the application for development consent will further develop Gatwick's strategic plan for walking and cycling. Strategies that will be explored will include increased and improved amenities, upgraded routes on and, where appropriate, off airport, improved wayfinding and a programme of maintenance for existing routes. The strategy will also take into account inclusive design considerations.

3 Development Constraints

3.1 Scheme Boundary

3.1.1 To better understand the impact of the proposed development a number of boundaries are relevant to the application. The identified boundaries include the following:

- Local Authority and Local Highway Authority boundaries;
- Surrey County Council (SCC);
- West Sussex County Council (WSCC);
- Extent of GAL ownership;
- Existing airport operation;
- Highways England boundary;
- Areas of ecological or landscape value;
- Riverside Garden Park;
- Private land holdings and buildings; and
- Proposed developments.

3.1.2 Impacts to land within the extents of the above boundaries caused by the proposed highway developments are to be considered during the development of the highways design. In addition, consultation with the relevant stakeholders and third parties will be conducted.

3.2 Local Authorities Highway Network

3.2.1 The GAL site is located on the border of two Local Highway Authority boundaries, SCC and WSCC. A list of the key highways impacted by the scheme within the bounds of each local authority is provided below.

West Sussex County Council:

- A23 London Road

Surrey County Council:

- A217
- A23 Brighton Road
- Povey Cross Road
- Longbridge roundabout circulatory carriageway

3.2.2 Design proposals impacting the local authority highway networks are subject to the approval of the relevant local highway authority.

3.3 Highway England's Network

3.3.1 A list of the key highways impacted by the Project within the bounds of Highways England's network is provided below.

Highways England Network:

- M23 Spur
- M23 Junction 9
- South Terminal roundabout circulatory carriageway
- Airport Way
- A23 London Road northbound diverge and merge at North Terminal roundabout
- A23 London Road southbound diverge onto Airport Way
- North Terminal roundabout circulatory carriageway

3.3.2 Design proposals impacting the Highways England network are subject to the approval of Highways England.

3.4 GAL highway network

3.4.1 In addition to the local highway and Highways England network, GAL's highway network would be impacted by the proposed highway mitigation. The impacted roads include those listed below.

- GAL Highway Network:
- Gatwick Way
- Northway
- North Terminal Approach

- Northgate Road
- Longbridge Way
- Perimeter Road North
- Ring Road North
- Ring Road South

3.5 Structures

3.5.1 It is proposed to minimise the scope of any works where possible to the following existing structures in the vicinity of the scheme.

- Inter-Terminal Shuttle viaduct
- The underpass carrying Tunnel Road/Fuel Farm Road beneath Northway and North Terminal Road
- A23 London Road overbridge on Airport Way
- River Mole overbridge on the A23 London Road
- Network Rail London to Brighton Railway overbridge on Airport Way
- Peaks Brook Lane Overbridge on the M23 Spur
- M23 overbridges at Junction 9

3.5.2 Additional structures impacted by the Project are outlined in Section 6 of this report. The final scope of the impact to existing structures in the vicinity of the Project is subject to change as part of ongoing design development.

3.6 Environment, Landscape and Water

3.6.1 Key areas of ecological, landscape or recreational value in the vicinity of the Project include:

- Riverside Garden Park
- Church Meadows Park

3.6.2 Key existing watercourses in the vicinity of the Project include:

- River Mole
- Gatwick Stream
- Tributaries of Burstow Stream

3.6.3 Further details on the environmental considerations including landscaping and mitigation planting proposals; ecology and habitats; water; air quality and archaeology can be found the PEIR.

4 Traffic Modelling

4.1 Overview of Traffic Modelling

4.1.1 The Gatwick strategic highways traffic model developed in SATURN is the primary highway assessment tool used for the PEIR. It was used to inform demand on links and through junctions as well as variation in speeds to be fed into more detailed junction modelling using VISSIM as well as into air quality and noise models.

4.1.2 Full details on the traffic modelling work undertaken to date are provided in the PTAR, Appendix 12.9.1 of the PEIR. A summary of the key conclusions of this assessment work is provided below.

- Modelling shows that the future baseline to 2029 can be accommodated on the M23 Spur with local widening and signalisation works that will be delivered prior to 2029.
- Given the congestion shown by the model for 2032 future baseline, Gatwick has made the decision that more significant mitigation will be required on the highway network to support additional growth with the Project, otherwise there will be potential for delays on the network.
- With Project and background traffic growth to 2047, modelling shows some localised areas where congestion would still be expected, even with mitigation. However, congestion levels are manageable and at expected levels for 15 years after opening, indicating that the mitigation is appropriate and proportionate - ie it is sufficient to provide for expected growth but does not over-provide network capacity.

4.1.3 Through to DCO submission, the highway design will be adjusted in line with VISSIM modelling to address changes in capacity requirements.

5 Proposed Highway Mitigation

5.1 Design Process Overview

5.1.1 Table 1 provides a summary of the key potential design options examined for each of the proposed junction upgrades as part of the development of the proposed concept design. A preferred design option to be taken forward for further design development was selected for each junction. The selection of a preferred design has taken into account considerations such as environmental impact, safety, buildability, cost and viability from an engineering perspective.

5.1.2 The preferred design options will be subject to further development in consultation with Highways England and the local highway authorities.

Table 1: Highway Mitigation Option Summaries

Option Number	Option Name	Option Summary	Preferred Option
South Terminal			
Option 1a	Grade separated junction - M23 Spur/Airport Way Flyover (40mph)	At-grade roundabout to be retained and flyover through route to be introduced for the M23 Spur/Airport Way via a viaduct. M23 Spur/Airport Way mainline to be designed to be suitable for a 40mph speed limit.	
Option 1b	Grade separated junction - M23 Spur/Airport Way Flyover (50mph)	At-grade roundabout to be retained and flyover through route to be introduced for the M23 Spur/Airport Way via a viaduct. M23 Spur/Airport Way mainline to be designed to be suitable for a 50mph speed limit.	**Yes**
Option 1c	Grade separated junction (including northern access arm) - M23 Spur/Airport Way Flyover (50mph)	At-grade roundabout to be retained with a new northern arm to accommodate future potential developments to the North. Flyover through route to be introduced for the M23 Spur/Airport Way via a viaduct. M23 Spur/Airport Way mainline to be designed to be suitable for a 50mph speed limit.	
Option 2	Grade separated junction – Elevated Roundabout	Roundabout circulatory carriageway to be elevated and new at-grade through route for the M23 Spur/Airport Way to be provided.	
Option 3	Grade separated junction – Off-line	At-grade roundabout located off-line to the north of the existing South Terminal junction. The M23 Spur/Airport Way to be realigned off-line to develop a flyover through route at the proposed roundabout location. This option was discounted at an early stage for reasons including increased disruption to road users during construction and increased environmental impact due to the increased footprint of works	
North Terminal			
Option 1a	Grade separated junction – Constrained (40mph)	Provision of an at-grade elongated gyratory junction with a through route for the A23 London Road via a flyover. Junction layout constrained by the Riverside Garden Park to the North and existing Gatwick estate to the South. Mainline A23 London Road speed limit of 40mph.	
Option 1b	Grade separated junction – Constrained (50mph)	Provision of an at-grade elongated gyratory junction with a through route for the A23 London Road via a flyover. Junction layout constrained by the Riverside Garden Park to the North and existing Gatwick estate to the South. Mainline A23 London Road speed limit of 50mph.	

Option Number	Option Name	Option Summary	Preferred Option
Option 2b	Grade Separated junction – Unconstrained (50mph)	Provision of an at-grade elongated gyratory junction with a through route for the A23 London Road via a flyover. Junction layout constrained by the existing Gatwick estate to the South but unconstrained by the Riverside Garden Park to the North. Mainline A23 London Road speed limit of 50mph	
Option 3b	Grade separated junction – Unconstrained (50mph)	Provision of an at-grade elongated gyratory junction with a through route for the A23 London Road via a flyover. Junction layout constrained by the Riverside Garden Park to the North but unconstrained by the existing Gatwick estate to the South. Mainline A23 London Road speed limit of 50mph.	
Option A2 (4b)	At-grade free flow and signal-controlled junction with Airport Way westbound flyover	Existing roundabout junction to be replaced with an at-grade signal controlled junction providing free flow links between the A23 London Road, Airport Way and the North Terminal . A through route for the Airport Way Westbound connection onto the A23 London Road Northbound to be provided via a flyover.	**Yes**
Option 5	At-grade offline signal-controlled junction	Modifications to the existing North Terminal roundabout with the provision of a new offline roundabout in Staff Car Park Y. Improvements to Longbridge Way and Longbridge Way roundabout to facilitate changes in traffic flow.	
Longbridge Junction			
Option 1	Signal-controlled Junction	Existing roundabout junction to be replaced with a signal-controlled junction	
Option 2	Signal-controlled Roundabout	Local improvements to the existing Longbridge roundabout whilst retaining the existing junction footprint	
Option 3	Enlarged Signal-controlled Roundabout	Improvements to the existing roundabout to increase the junction size to facilitate increased junction capacity	**Yes**

5.1.3 The preferred options to undergo further design development are described in more detail below. Further details on the alternative design options that weren't taken forward can be found in Appendix A of this report.

5.2 South Terminal Junction (including M23 Spur)

Grade Separated Junction - M23 Spur/Airport Way Flyover (50mph) Option 1b

5.2.1 This solution proposes that an at-grade roundabout is retained and a through route for the M23 Spur/Airport Way is developed via a flyover. New slip roads would be provided to link the roundabout to the elevated mainline. The existing southern roundabout arm layout would be retained. An overview of the design is illustrated in Figure 5.

5.2.2 The M23 Spur Motorway and flyover would be designed to be suitable for a 50mph speed limit. It is proposed that the speed limit would transition to 40mph on Airport Way. The location of the speed threshold will be finalised at a later design stage.

Figure 5: M23 Spur/Airport Way Flyover (50mph) Option 1b Concept Layout

5.2.3 To develop the flyover the M23 Spur/Airport Way alignment would be raised above the existing surface level via a viaduct. Construction of the viaduct would require earthworks and retaining structures to support the approaches to the flyover. The earthworks associated with constructing the viaduct and slip roads would require increased land-take beyond the existing highway boundary and would impact existing buildings to the south of the mainline.

5.2.4 To minimise the impact of raising the M23 Spur/Airport Way mainline, it is proposed that the alignment would tie in with the existing carriageway to the east of the Network Rail London to Brighton Railway overbridge on Airport Way. This would avoid or minimise requirements to strengthen or widen the existing structure. However, the tie into the existing carriageway east of the junction would likely be beyond the existing B2036 Balcombe Road overbridge. As a result, it is assumed that three new bridge structures would be required to support the realigned M23 Spur and the new slip roads.

5.2.5 The hard shoulder of the eastbound carriageway of the M23 Spur, between the South Terminal roundabout and M23 Junction 9, is proposed to be converted to a permanent running lane to provide three lanes of traffic. This is consistent with the changes recently made to the M23 Spur westbound carriageway as part of the M23 Junction 8-10 Smart Motorway Project, completed in 2020.

5.2.6 In summary, this design option proposes to mitigate the forecasted increase in traffic volume through introducing a through route on the M23 Spur/Airport Way. This provides the opportunity for non-airport traffic to bypass the South Terminal junction allowing the capacity of the existing roundabout to be maximised.

5.2.7 The key benefits of this option include the following.

- The provision of a flyover would create a free flow movement between the M23 Spur Motorway and Airport Way, removing non-airport traffic from the junction to maximise the capacity of the existing junction and accommodate the forecasted increase in traffic volume.
- The provision of the M23 Spur flyover would reduce the number of conflict points for through traffic compared to an at-grade junction, leading to a number of safety benefits for road users.
- Retaining an at-grade roundabout would minimise construction works and the associated disruption to the existing network during construction in comparison to proposals to elevate the circulatory carriageway. This is a result of being able to retain the southern arm of the junction, reducing the impact to the infrastructure associated with the South Terminal.
- The reduced footprint compared to an elevated roundabout design would lead to reduced environmental impacts compared to other options examined.
- The geometry design provides flexibility in positioning the proposed Airport Way 40mph speed limit transition.
- The proposed design does not preclude future amendments to the roundabout to accommodate potential developments in the vicinity of the junction.

5.2.8 The key disbenefit of this option is:

- The existing M23 Spur overbridge at B2036 Balcombe Road would need to be replaced.

5.2.9 The benefits of this proposal were considered to outweigh the disbenefits and the outcomes resulting from the proposed grade separated junction layout were tested using VISSIM modelling and considered to be preferable in comparison to the other options considered. As a result, Option 1b has been put forward as the preferred highway mitigation solution for South Terminal junction.

5.3 North Terminal Junction

Option A2 – At-Grade Part Free Flow and Signal-Controlled Junction with Airport Way/A23 London Road Flyover

5.3.1 This proposal would replace the existing roundabout with an at-grade signal-controlled junction, providing a number of free flow links between the A23 London Road, Airport Way and the Gatwick Way and North Terminal Approach connector roads to the North Terminal facilities. An at-grade solution resolves access problems and mitigates the forecasted increase traffic volumes at the junction whilst minimising the extent of construction works, environmental impact and disruption to the existing network through the reduced junction footprint. In addition, a through route is proposed via a flyover connecting Airport Way westbound to the A23 London Road northbound. The concept layout for the at-grade free flow junction is provided in Figure 6.

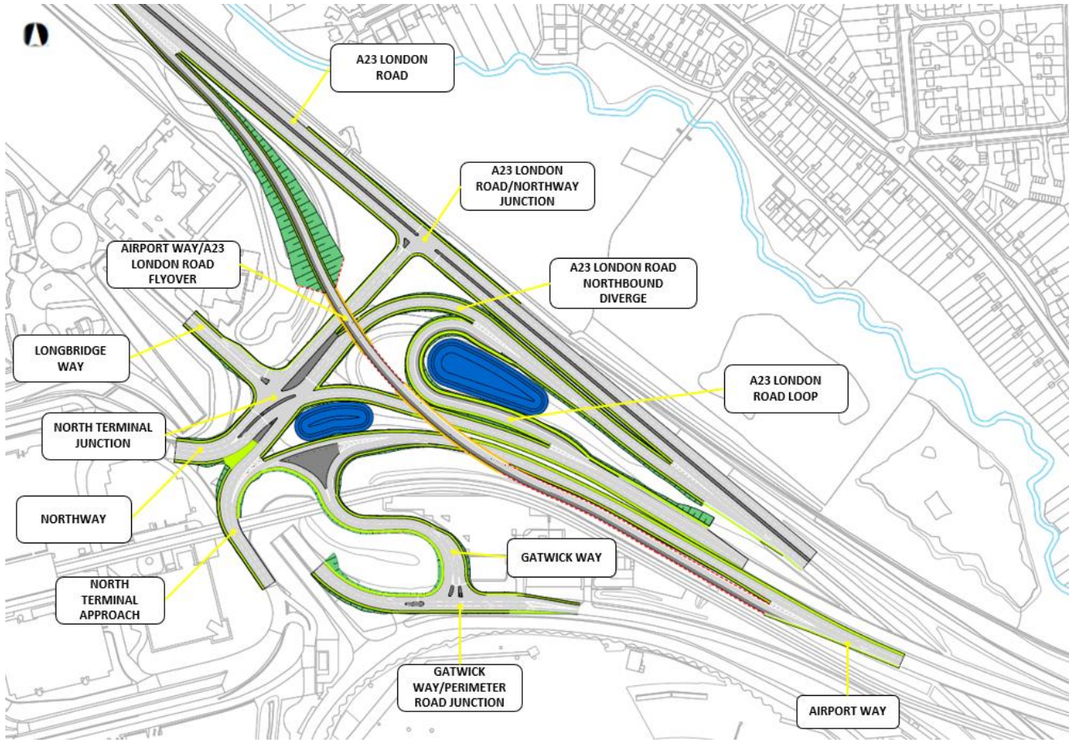

Figure 6: North Terminal At-grade Free Flow and Signal-Controlled Junction

5.3.2 The principle features of the concept design are detailed below.

5.3.3 The proposed free flow links A23 London Road Northbound Diverge, A23 London Road Loop and Airport Way Westbound to allow the following movements.

- Airport Way Westbound to North Terminal Approach
- Airport Way Westbound to Gatwick Way
- Airport Way Westbound to A23 London Road Northbound
- A23 London Road Northbound to Airport Way Eastbound

5.3.4 Three signal-controlled junctions, A23 London Road/Northway Junction, North Terminal Junction (Junction of Northway, A23 London Road Northbound Diverge to North Terminal Approach, Airport Way Eastbound and Longbridge Way) and Gatwick Way/Perimeter Road North Junction will allow the following movements.

- A23 London Road Northbound to North Terminal Approach
- A23 London Road Northbound to Longbridge Way
- Northway to A23 London Road Northbound/Southbound
- Northway to Airport Way Eastbound
- Longbridge Way to A23 London Road Northbound/Southbound
- Gatwick Way to Northgate/Perimeter Road North

5.3.5 Principally this proposal aims to minimise construction works and the impact to the existing network. Therefore, the proposed vertical alignments are as close to the existing ground levels as possible to reduce the extent of earthworks required in construction.

5.3.6 An at-grade signal-controlled junction would connect the existing highway network of the North Terminal with the A23 London Road and Airport Way. All connector roads within the junction would retain posted speeds of 30mph as per existing. Access to the North Terminal would be principally be provided via the North Terminal Approach. The exit from the North Terminal estate would be via an upgraded four lane Northway. Two lanes would accommodate right turn movements through the signalised junction towards Airport Way Eastbound, a central lane would provide access northwards to the A23 London Road Northbound/Southbound and a dedicated left turn lane would be provided for traffic heading onto Longbridge Way. As per the existing junction, Gatwick Way would only be accessible via Airport Way Westbound.

5.3.7 A through route is proposed via a flyover to accommodate non-airport traffic travelling on Airport Way Westbound to the A23 London Road Northbound, reducing traffic volumes heading through the signal-controlled junction. The flyover would be developed from a combination of retaining walls, viaduct and earthworks. To minimise the impact and disruption to the existing North Terminal operation, the horizontal alignment of the flyover would be developed to ensure the existing ITTS structure can be retained.

5.3.8 To the southeast of North Terminal Junction, the existing A23 London Road signal-controlled junction with Perimeter Road North would be upgraded to provide increased capacity and allow for additional traffic movements within the junction.

5.3.9 The key benefits of this option include the following.

- The proposed Airport Way Westbound flyover and the proposed free flow links between the local highway network and the North Terminal will enable undisrupted traffic movements on key routes through the junction and provide an increase in junction capacity.
- The provision of the Airport Way westbound flyover would enable non-airport traffic to bypass the junction and would reduce the number of conflict points for through traffic compared to an at-grade junction, leading to a number of safety benefits for road users.
- The at-grade option is proposed to remain largely within the existing highway footprint, minimising the impact to the Riverside Garden Park and other existing infrastructure in the vicinity of the junction in comparison to other options examined. This would reduce the environmental impact of the Project compared to other options examined.
- The proposed at-grade solution minimises the required construction works due to the reduced earthwork requirements which will result in reduced disruption to road users during the construction phase.

5.3.10 The key dis-benefits of this option include the following.

- The tight site spatial constraints may require relaxations and/or departures from standard as part of the highways geometry design. These will be examined in more detail as part of ongoing design development with appropriate mitigations put in place where required.
- The proposed layout restricts direct access to Longbridge Way from Airport Way. Alternative access routes would be via Gatwick Way/Northgate Road.

5.3.11 The benefits of this proposal were considered to outweigh the disbenefits and the outcomes resulting from the proposed free flow links and minimised earthworks footprint were considered to be preferable in comparison to the other options considered. In addition VISSIM modelling showed journey time improvements with this option as compared to other grade-separated proposals at North terminal. As a result, Option A2 has been put forward as the preferred highway mitigation solution for North Terminal junction.

5.4 Longbridge Junction

Option 3 Enlarged Signal Controlled Roundabout

5.4.1 This option would address future capacity issues associated with the existing partially signalised roundabout at Longbridge junction. The roundabout footprint would be increased and the circulatory carriageway would be widened. The concept proposal for the enlarged signal controlled roundabout is presented in Figure 7.

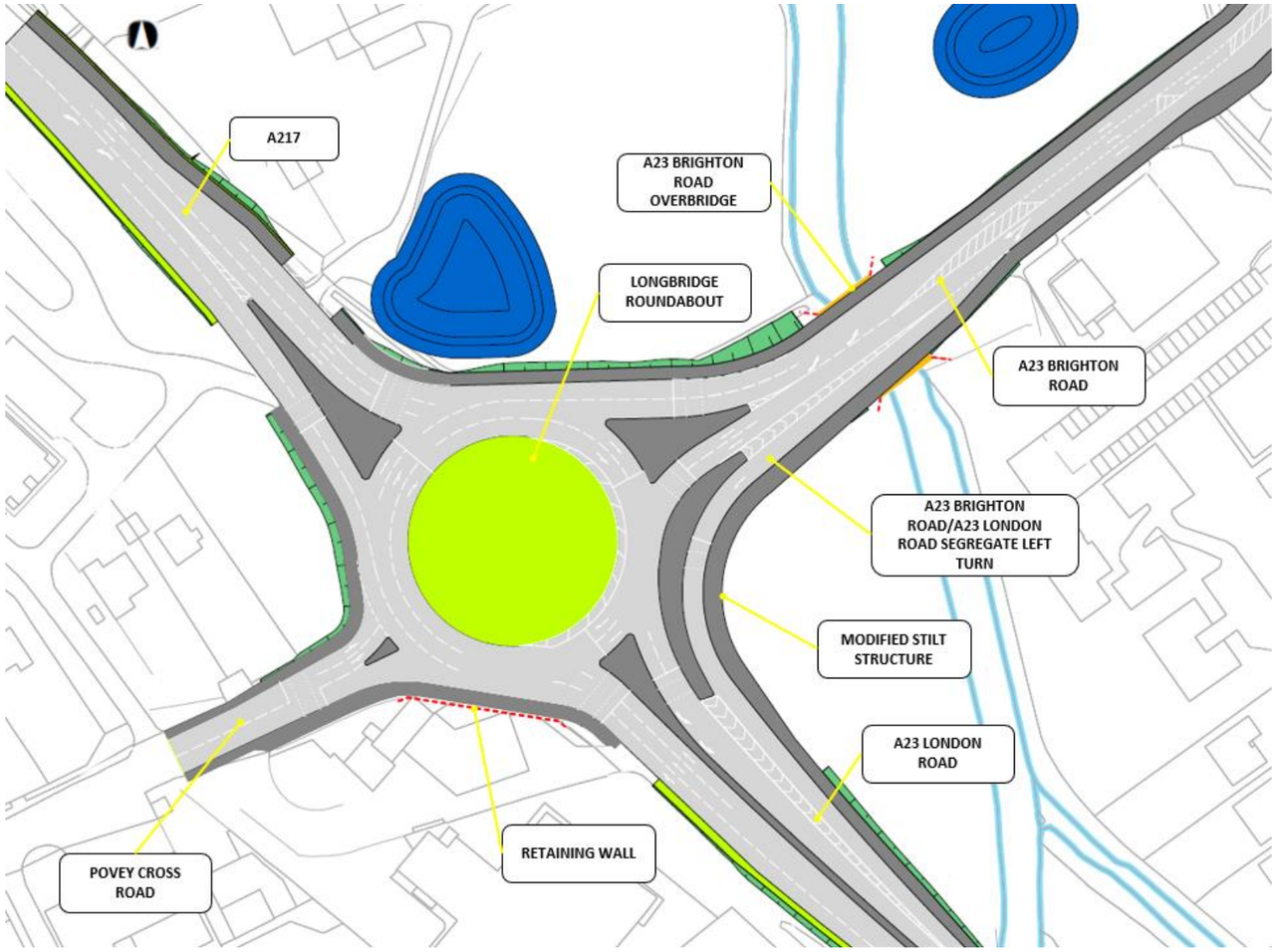

Figure 7: Enlarged Signal Controlled Longbridge Roundabout Concept Layout

5.4.2 Widening the circulatory carriageway would better accommodate turning movements of Heavy Goods Vehicles (HGV's). The design will also increase stacking capacity at the junction to support the greater forecasted traffic volumes.

5.4.3 Modifications proposed to the roundabout and circulatory carriageway layouts would impact the approach arms of the junction. Minor amendments to the horizontal geometry of the A23 London Road and Povey Cross Road would be required to align with the widened roundabout junction. The dedicated left turn lane on the A217 for traffic turning left onto the A23 Brighton Road would be extended.

5.4.4 Highway geometry changes on the A23 Brighton Road including an increased length of the segregated left turn lane (SLTL) diverge would result in carriageway widening over the existing River Mole bridge. These changes would require the existing structure to be modified or replaced. The increased junction footprint and modifications to the SLTL between the A23 Brighton Road and the A23 London Road would require the supporting stilt structure to be widened or replaced. New retaining walls may also be required to minimise the impact of the increased junction footprint on surrounding land parcels.

5.4.5 It is proposed to replace existing walking and cycling infrastructure impacted by the proposed junction layout changes on a like-for-like basis. The proposed design will ensure that existing walking and cycling connectivity between each arm of the roundabout will be retained with replacement toucan crossings and shared-use paths to be provided on each arm of the roundabout.

5.4.6 The key benefits of this option include the following.

- Retaining a roundabout junction layout is considered more favourable than proposals to replace the existing junction with a signal-controlled intersection. This will provide capacity benefits for road users and will lead to reduced disruption during construction.
- The increased circulatory carriageway width will provide safety and capacity benefits, in particular by making the junction more suitable for HGV turning movements.
- The provision of additional queuing capacity in combination with the proposed geometry changes will provide additional junction capacity to facilitate the anticipated traffic volume increases.

5.4.7 The key dis-benefits of this option include the following.

- The existing A23 Brighton Road overbridge crossing the River Mole would need to be widened or replaced leading to increased costs and construction works.
- The existing stilt structure supporting the segregated left turn lane from A23 Brighton Road onto A23 London Road would need to be widened or replaced leading to increased costs and construction works. Works taking place within the River Mole floodplain would lead to the loss existing vegetation.

5.4.8 The benefits of this proposal were considered to outweigh the disbenefits and the outcomes resulting from the proposed enlarged roundabout with improved geometry were considered to be preferable, in particular from a road safety perspective, and were also confirmed by VISSIM modelling. As a result, Option 3 has been put forward as the preferred highway mitigation solution for Longbridge roundabout.

6 Structures Proposals

6.1 Overview of Structures Proposals

6.1.1 A high-level summary of the key proposed highway structures identified at this design stage for each junction is provided below. The design of these structures and any additional structural works will be progressed further as part of ongoing design development in advance of the application for development consent.

6.2 South Terminal Junction

6.2.1 The preferred highway layout for the South Terminal Junction, as detailed in Section 5.2, proposes a grade separated junction layout with a flyover to be provided carrying the M23 spur/Airport Way over the proposed south terminal roundabout. The flyover would take the form of a viaduct structure. Retaining walls will be used to retain embankments on the approach/departure from the flyover.

6.2.2 The existing Balcombe Road overbridge would be replaced by three new overbridge structures carrying the M23 spur, M23 spur westbound diverge and M23 spur eastbound merge respectively over Balcombe Road.

6.2.3 Additional retaining walls on the southern side of the Airport Way westbound merge and the northern side of the M23 Spur eastbound merge will be required to minimise the impact on adjacent land parcels.

6.3 North Terminal Junction

6.3.1 The preferred highway layout for the North Terminal Junction, as detailed in Section 5.3, proposes an at-grade traffic signal intersection with an elevated through route between Airport Way Westbound and A23 London Road Northbound. To facilitate the through route a viaduct will be required to carry the carriageway above the North Terminal Junction. Reinforced soil and retaining walls will be used to retain embankments on the approach/departure from the flyover.

6.4 Longbridge Junction

6.4.1 The preferred highway solution for the Longbridge Junction detailed in Section 5.4 would result in an enlarged junction footprint. As a result, the existing elevated stilt structure that supports the junctions segregated left turn lane between A23 Brighton Road and A23 London Road will need to be modified or replaced. The A23 Brighton Road overbridge that passes over the River Mole will also need to be modified or replaced to accommodate changes to the highway footprint on the A23 Brighton Road. The design of these structures and any additional retaining wall requirements at this junction will be progressed at a later design stage.

7 Drainage Proposals

7.1 South Terminal Junction

7.1.1 The South Terminal Junction of Gatwick Airport is located within the bounds of West Sussex County Council, who have been assigned as the Lead Local Flood Authority (LLFA). The Local Authorities requirements and Surface Water Management (SWM) policies have been adopted to form the basis of the drainage design for the proposed highway layout detailed in Section 5.2.

7.1.2 Assessments of the existing drainage conditions indicate that the highway to the east of the B2036 Balcombe Road overbridge outfalls to a tributary of the Burstow Stream via an existing attenuation pond whereas to the west the drainage outfall is to the Gatwick Stream. At this stage, drainage proposals for the South Terminal are assumed to outfall to the same watercourse as the existing highway.

7.1.3 Applying the requirements of the LLFA, the preferred drainage solution for the proposed highway layout is based on the recommended SWM to discharge all storm water for the proposed works to greenfield sites.

7.1.4 The proposed drainage solution assumes that the existing catchment areas for the South Terminal junction are retained, east and west of the Balcombe Road overbridge. To the east the outfall to the existing attenuation pond would be retained. Further assessment will be undertaken to determine if this existing pond will need to be modified. To the west the existing outfall to Gatwick Stream would be retained. In addition, surface water is proposed to discharge into a ditch north of the junction which will direct the runoff into a new attenuation pond adjacent to Balcombe Road. The introduction of a new attenuation pond would require additional land to the North of the roundabout.

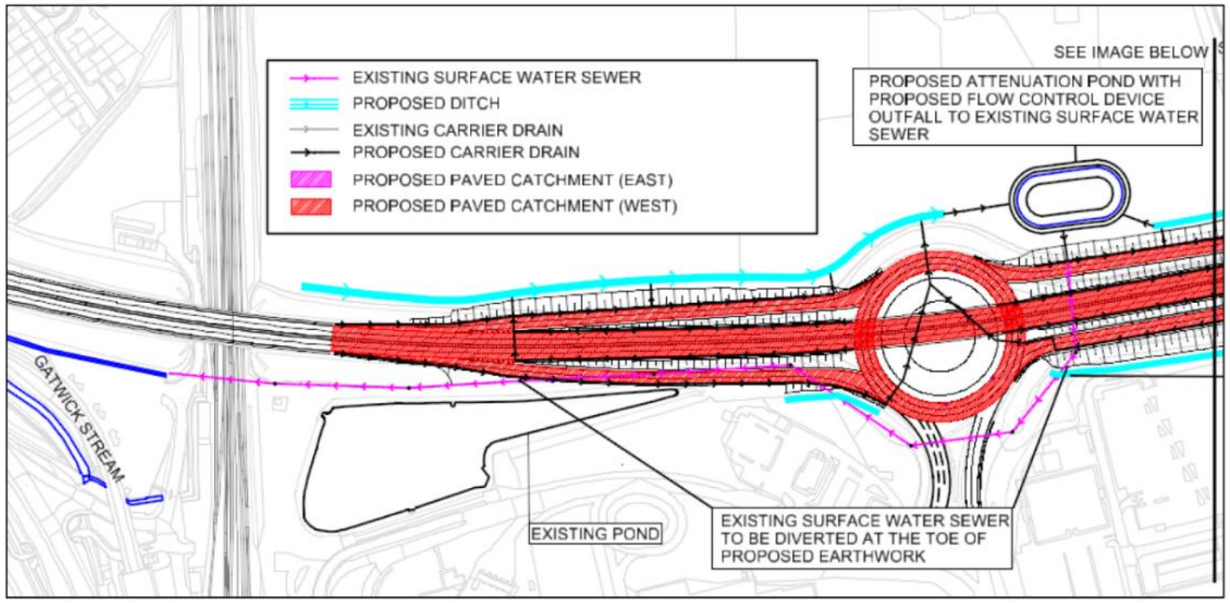

Figure 8: Proposed Drainage Layout - South Terminal

7.2 North Terminal Junction

7.2.1 Gatwick's North Terminal is located within West Sussex County Council which has been assumed as the LLFA. The Local policies for SWM have been adopted to form the basis of the proposed drainage solution for the at-grade free-flow signalised junction described in Section 5.3.

7.2.2 The North Terminal site is bounded by the Gatwick stream to the North and to the West by the River Mole. An assessment of the existing highway drainage appears to outfall to existing ditches which fall towards the River Mole (in some sections through the Gatwick Stream). The proposed drainage is suggested to fall to the same watercourse as existing.

7.2.3 Applying the requirements of the LLFA, the preferred drainage solution for the proposed highway layout is based on the recommended SWM to discharge all storm water for the proposed works to greenfield sites.

7.2.4 The concept drainage layout has been developed comprising of a combination of two attenuation ponds, geocellular storage and box culverts to store surface water collected from the proposed highway layout. The box culvert and attenuation pond would be located within the proposed highway network, connecting to the existing drainage network at the junction. Finally, the geocellular storage is proposed to the west of the scheme, assumed to be located within the Gatwick estate beneath an existing car park.

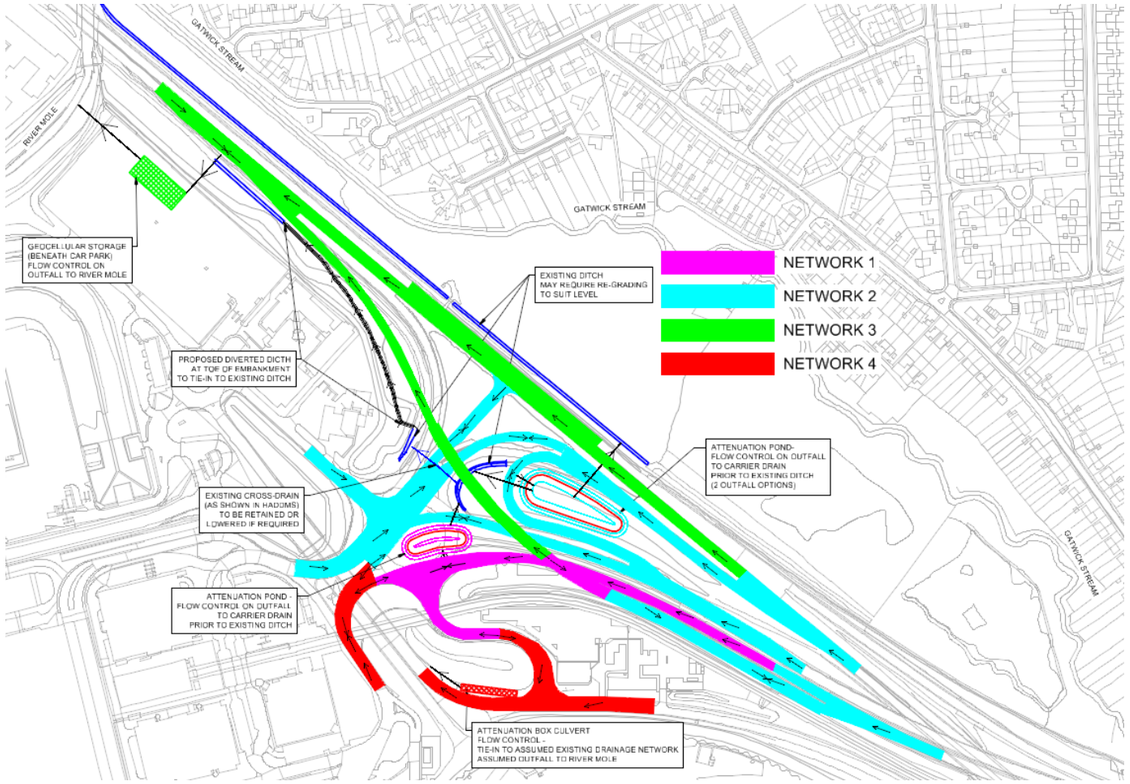

Figure 9: Proposed Drainage Layout - North Terminal

7.3 Longbridge Junction

7.3.1 The Longbridge Junction is located on the border between West Sussex County Council and Surrey County Council therefore both Councils have been assigned as the LLFA. Local SWM policies from these Local Authorities have formed the basis of the drainage design proposals. The existing drainage arrangement has been assumed to outfall into the River Mole.

7.3.2 Applying the requirements of the LLFA, the preferred drainage solution for the proposed highway modifications detailed in Section 5.4 is based on the recommended SWM, discharging all storm water for the proposed works to greenfield sites.

7.3.3 A drainage layout has been developed to facilitate the recommended SWM described above, storing surface water via a combination of attenuation ponds, box culverts and existing ditches. Box culverts are proposed to be located within the highway verge however additional land take would be required to install attenuation ponds adjacent to the junction. Principally the proposed drainage solution assumes that surface water drainage cannot be carried across the Brighton Road overbridge therefore it is proposed that two attenuation ponds are provided for water outfall South and North of the Brighton Road overbridge. The requirement to provide two attenuation ponds would result in increased footprint of the highway infrastructure.

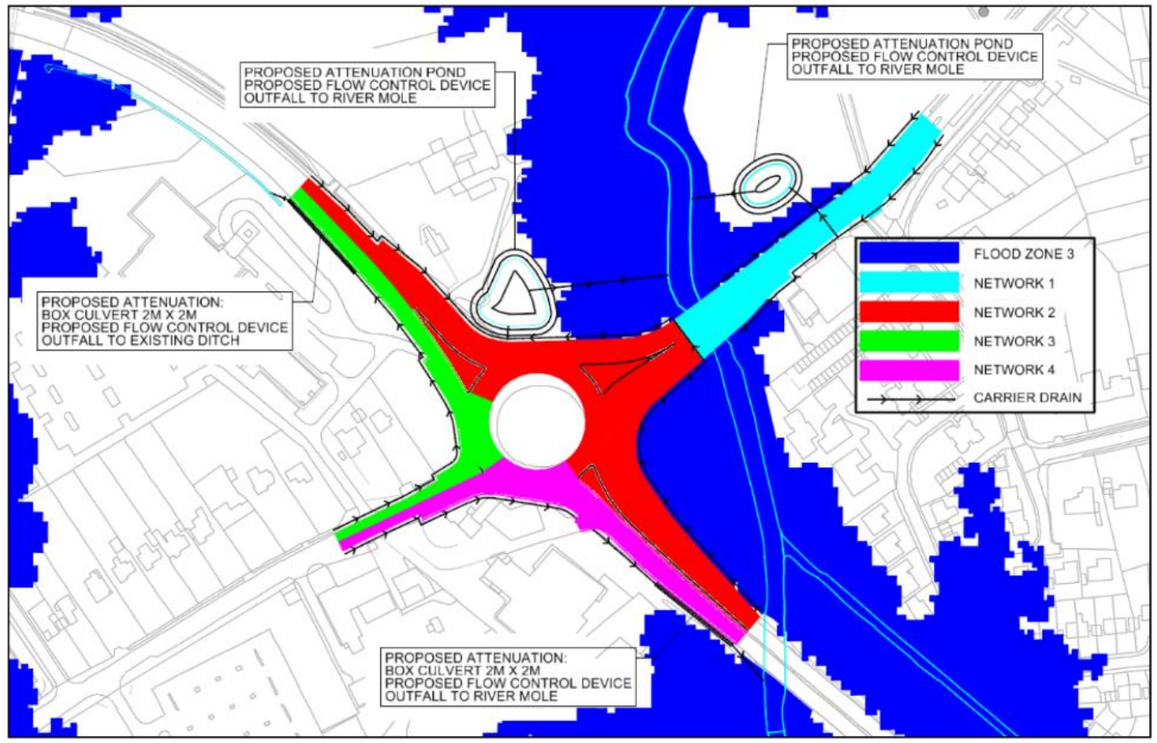

Figure 10: Proposed Drainage Layout - Longbridge Roundabout

8 Additional Design Considerations

8.1 Geology and Geotechnical Considerations

Geological Setting

8.1.1 Artificial Deposits or Made Ground forms the existing embankments from just west of Junction 9 of the M23 to the North Terminal Roundabout. Land northwest of the North Terminal Roundabout, south of London Road is also constructed on Made Ground. Made Ground is also found at Longbridge Roundabout, land south of Longbridge roundabout and west of the North Terminal Roundabout. Within the proposed study area infilled ground can also be identified at the North Terminal Roundabout, an infilled balancing pond and former channels of the River Mole and the Gatwick Stream, land between the London to Brighton railway line and the South Terminal Roundabout is shown as worked ground and landscaped ground.

8.1.2 Superficial deposits consisting of Alluvium and River Terrace Deposits criss cross the proposed study area. Alluvium is shown crossing the route at four different locations. These coincide with the former Mole River channels and the former channel of the Gatwick Stream. Alluvium may consist of clay, silt, sand and gravel. River Terrace Deposits are shown to outcrop from the Junction 9 of the M23 Motorway to the South Terminal Roundabout and south of Airport Way from the South Terminal Roundabout to the London to Brighton Railway Line. The River Terrace Deposits are indicated to consist of sand and gravel.

8.1.3 The Weald Clay Formation, which is the solid geology or bedrock, underlies the entire length of the proposed study area beneath the superficial and artificial deposits. The Weald Clay Formation forms part of the Wealden Group. It consists of dark grey thinly-bedded mudstones (shales) and mudstones with subordinate siltstones, fine- to medium-grained sandstones, including calcareous sandstone (eg the Horsham Stone Member), shelly limestones (the so called "Paludina Limestones") and clay ironstones and ironstone nodules. The Weald Clay Formation is expected to be between 180m – 210m thick and is known to dip approximately 2 degrees from south to north.

Preliminary Engineering Assessment

8.1.4 The proposed works may require modification to a limited number of existing cuttings in order to accommodate changes, for example the alignment of the A23 London Road and the provision of the Airport Way Westbound flyover. Where regrading of existing cuttings is proposed, further ground investigation is required to understand the ground conditions in these areas. This will further inform stability of the regraded cuttings.

8.1.5 To inform the design of new embankments, further examination of the proposed construction soils and any proposed borrow pits from which the materials will be sourced will be undertaken. In addition, further investigation of the foundation soils beneath current and proposed embankments will also be undertaken. Soft compressible soils such as un-engineered Made Ground and Alluvium may need to be removed prior to construction of new embankments.

8.1.6 The Project includes the provision of a number of new structures as well as modifications to a number of existing structures. Further ground investigation and examination of existing foundations will be undertaken to inform the design of these structures.

8.1.7 There are limited proposed excavations/cuts on the Project to generate fill material so much of the material for the proposed embankments will be sourced from suitable quarries and borrow pits.

8.2 Signage Strategy

8.2.1 At this stage the proposed signage for the highway network is assumed to be verge mounted including the M23 Spur east of the South Terminal Junction in line with the signage associated with the recent Smart Motorway upgrade.

8.2.2 To facilitate the proposed modifications to the highway network, Advanced Direction Signs would be provided at all junctions between all-purpose trunk roads and routes classified as ‘B’ and above. These direction signs would include map type sign faces where possible.

8.2.3 The preferred junction layout for Longbridge Roundabout currently proposes no changes to the number of lanes on each of the approaches to the roundabout. Similarly, the junction arrangement does not affect the lane required to traverse the roundabout to reach the required destination. Therefore, at this stage it is assumed that the existing signage at the Longbridge Junction can be retained or relocated as necessary.

8.3 Street Lighting

8.3.1 At this stage concept street lighting proposals have been developed and will be refined at a later design stage. Future design development will account for site specific lighting requirements including traffic flows, accident data, safety audits and road speeds. These factors will contribute to the selection of lighting levels. A survey will also be conducted to understand current existing lighting and electrical arrangements which should be undertaken prior to detailed design with an aim to providing a seamless tie-in between proposed and existing equipment. Sensitive receptors such as residential properties adjacent to the highway works will be subject to a lighting impact assessment in accordance with ILP GN01.

8.4 Technology and Traffic Signals

8.4.1 A number of existing highway technology assets such as CCTV cameras and traffic counter loops will be impacted by the proposed scheme. The design and layout of the scheme’s technology assets will be developed at a later design stage.

8.4.2 Longbridge junction will remain signal-controlled following the junction capacity improvements and a number of new signal-controlled junctions will be introduced at North Terminal. The design and layout of the scheme’s signal controlled junctions is subject to change as part of design development.

8.5 Noise

8.5.1 An assessment of the noise impacts associated with the proposed scheme has been undertaken and can be found in Chapter 14: Noise and Vibration of the PEIR.

8.6 Pavement

8.6.1 The pavement design is still under development and will be finalised at a later design stage.

8.7 Utilities

8.7.1 There are a number of significant utility diversions that will be required under the scope of the works. These will be designed in consultation with the relevant statutory undertakers at a later design stage.

9 Construction

9.1 Construction Programme

9.1.1 The programme of works that has been developed covers all of the construction activities related to the Project and when these will occur. The programme will likely evolve and change however the initial timings are presented in Chapter 5: Project Description of the PEIR .

9.2 Construction compounds

9.2.1 Potentially up to three off airport locations are to be used as satellite contractor compounds for construction activities related to highway works at South Terminal, North Terminal and Longbridge roundabout. Separate construction compounds will be used for the airside construction works. Indicative construction compound locations are illustrated in Figure 11.

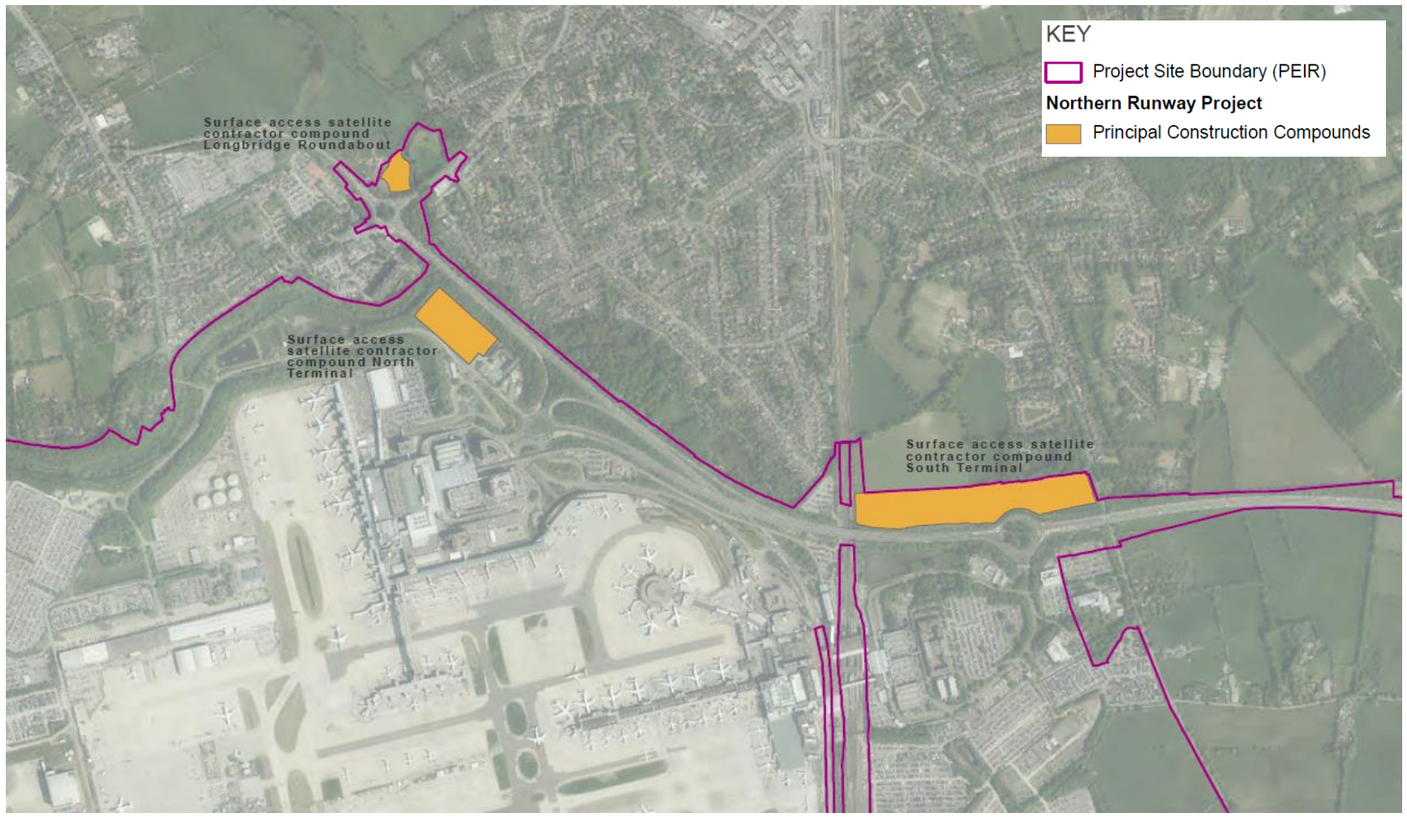

Figure 11: Proposed Construction Compounds

9.3 Sequencing and Impacts of Highway Construction

- All highways construction activities tend to follow a broadly similar construction sequence, with the duration and detail dependent upon the scale and complexity of the scheme in question, as follows.
- Activities normally start with delineation of the boundary to the work, site clearance where required for the work and protection or diversion of utilities affected by the scheme.
- Prior to site clearance, any trees or vegetation to be retained is identified and safe paths maintained through or around the works for pedestrians, cyclists and other non-motorised users of the network who may be affected by the construction activities.
- Once the site is cleared, topsoil and possibly also subsoil will be removed where roads are widened, or new roads are to be built. Soils are placed in stockpiles for re-use.
- Structure foundations are then built and earth or other materials removed to sufficient depth to prepare the ground for new road embankments or road pavement layers. Various ancillary items can be constructed at this stage including access chambers, sign and gantry foundations, draw pits, drainage pipes and ducts for highway communications systems or traffic signals.
- The next stage comprises above ground structures such as bridge piers or abutments and bridge decks, as well as the laying and compaction of road pavement sub-base materials.
- Kerbs are then installed and new road pavements constructed.
- Finishing works include verges, re-soiling of earthworks side-slopes and the installation and commissioning of vehicle restraint systems, street furniture, traffic lights, road lighting, wayfinding and the like. Final tasks include road markings, diversion of traffic onto the new road layout, removal and making good of redundant sections of road, soft landscaping and the removal and restoration of any temporary contractor's compounds or other facilities.

9.4 Traffic Impacts

9.4.1 The traffic impacts of constructing highway mitigation have been assessed for a conservative construction phase which envisages works at both South and North Terminal junctions at the same time. Details of this assessment can be found in the PTAR, Appendix 12.9.1 of the PEIR. Further scenarios will need to be considered in conjunction with Highways England and local highway authorities prior to DCO submission.

9.4.2 Gatwick Airport's Construction Traffic Management Plan will accompany the application for development consent and will provide further details on traffic management arrangements for the Project.

10 Glossary

10.1 Glossary of terms

Term	Description
DCO	Development Consent Order
GAL	Gatwick Airport Limited
HGVs	Heavy Good's Vehicles
ITTS	Inter-Terminal Transit System
LLFA	Lead Local Flood Authority
Mppa	Million Passenger Per Annum
MSCPs	Multi-Storey Car Parks
PEIR	Preliminary Environmental Report
PINS	Planning Inspectorate
PTAR	Preliminary Transport Assessment Report
SATURN	Simulation and Assignment of Traffic to Urban Road Networks
SCC	Surrey County Council
SLTL	Segregated Left Turn Lane
SWM	Surface Water Management
WSCC	West Sussex County Council

11 Appendix A – Alternative Junction Design Options

11.1 A1.1: Alternative South Terminal Junction Design Options

Option 1a - Grade Separated Junction - M23 Spur/Airport Way Flyover (40mph)

11.1.1 Option 1a is similar to the preferred Option 1b for South Terminal. The key design features can be summarised as follows:

- An at-grade roundabout would be retained.
- A new flyover would carry the M23 Spur/Airport Way over the proposed roundabout. The flyover would have a reduced speed limit of 40mph, compared to Option 1b, which has been designed to be suitable for a 50mph speed limit.
- Access to the South Terminal would be maintained as existing and slip roads would be provided to link the existing roundabout circulatory carriageway to the elevated M23 Spur/Airport Way.
- The hard shoulder of the eastbound carriageway of the M23 Spur, between the South Terminal roundabout and M23 Junction 9, would be converted to a permanent running lane to provide three lanes of traffic.
- Similar retaining wall provision to Option 1b would be required to reduce the footprint of the design proposals.

11.1.2 One of the key aims of Option 1a was to examine whether it would be feasible to retain the existing M23 spur overbridge at B2036 Balcombe Road. This would require the vertical alignment of the eastern end of the proposed M23 flyover to tie in to the existing carriageway surface levels in advance of or in close proximity to the existing bridge structure. For this reason, the M23 spur flyover was designed using a reduced design speed suitable for a speed limit of 40mph. However, it was determined that it would not be possible for the carriageway to tie-in in advance of the structure. The surface level difference and corresponding increase in loading at the bridge structure would be too great to retain the existing structure in its current form. The bridge would likely need to be replaced. Key factors influencing the vertical alignment of the flyover included the headroom clearance requirements for the proposed viaduct over the South Terminal roundabout.

11.1.3 Key benefits of this option include:

- The provision of a flyover would create a free flow movement between the M23 Spur Motorway and Airport Way, removing non-airport traffic from the junction to maximise the capacity of the existing junction and accommodate the forecasted increase in traffic volume.
- The provision of the M23 Spur flyover would reduce the number of conflict points for through traffic compared to an at-grade junction, leading to a number of safety benefits for road users.
- Retaining an at-grade roundabout would minimise construction works and the associated disruption to the existing network during construction in comparison to proposals to elevate the circulatory carriageway. This is a result of being able to retain the southern arm of the junction, reducing the impact to the infrastructure associated with the South Terminal.
- The reduced footprint compared to an elevated roundabout design would lead to reduced environmental impacts compared to other options examined.
- The geometry design provides flexibility in positioning the proposed Airport Way 40mph speed limit transition.
- The proposed design does not preclude future amendments to the roundabout to accommodate potential future developments to the north of the junction.

11.1.4 Key disbenefits of this option include:

- The existing M23 Spur overbridge at B2036 Balcombe Road would likely need to be replaced.
- The geometry design reduces flexibility in positioning the proposed Airport Way 40mph speed limit transition.

11.1.5 Option 1a and Option 1b are comprised of similar design proposals. Option 1b was considered preferable on the basis of the additional design flexibility that it allows for the next design stage in terms of positioning the mainline speed limit transition. For this reason Option 1a was not put forward as the preferred design option.

Option 1c - Grade Separated Junction (including northern access arm) - M23 Spur/Airport Way Flyover (50mph)

11.1.6 This option was developed using South Terminal Option 1b as a baseline therefore the two options share similar horizontal alignment, vertical alignment and cross sections for the main line and slip roads. The purpose of this option was to accommodate an additional northern access arm accounting for potential future developments to the north of the South Terminal. The key differences to the Option 1b design can be summarised as follows:

- The design would include a new northern arm on the at-grade roundabout to access such potential future developments. The access provision would include the provision of two new segregated left turn lanes to facilitate traffic entering and exiting the northern arm.
- The capacity of the M23 Spur eastbound merge slip road would be increased through the provision of a second lane and an increase in the proposed length of the slip road. The slip road lanes would merge into a single lane in advance of the merge with the M23 Spur eastbound traffic.
- A new segregated left turn lane would be provided for traffic turning left from the M23 Spur westbound diverge onto Ring Road South.

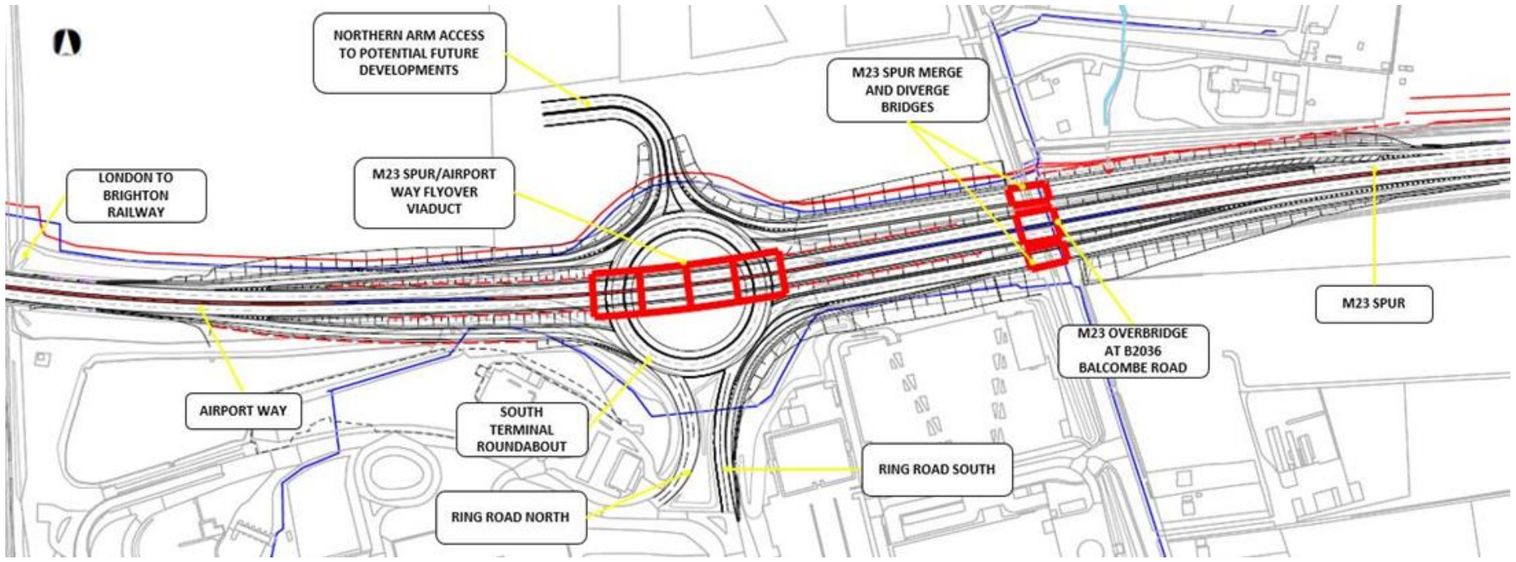

Figure 12: Option 1c M23 Spur/Airport Way Flyover including a Northern Arm Access to Potential Future Developments

11.1.7 The key benefits of this option include:

- The provision of a flyover would create a free flow movement between the M23 Spur Motorway and Airport Way, removing non-airport traffic from the junction to maximise the capacity of the existing junction and accommodate the forecasted increase in traffic volume.
- The provision of the M23 Spur flyover would reduce the number of conflict points for through traffic compared to an at-grade junction, leading to a number of safety benefits for road users.
- Retaining an at-grade roundabout would lead to a reduced scope of construction works and the associated disruption to the existing network compared to proposals to elevate the circulatory carriageway.
- The geometry design provides flexibility in positioning the proposed Airport Way 40mph speed limit transition.
- The proposed design would facilitate potential future developments to the north of the junction.

11.1.8 The key disbenefits of this option include:

- The existing M23 Spur overbridge at B2036 Balcombe Road would need to be replaced.
- The increased earthworks footprint of the proposed design would require additional permanent land from adjacent land parcels and would lead to the loss of a greater area of existing vegetation compared to Options 1a and 1b.
- The increased scope of construction works compared to Options 1a and 1b would lead to slightly greater disruption to road users, for example due to the works associated with the construction of the new segregated left turn lane for traffic turning left from the M23 Spur westbound diverge onto Ring Road South.

11.1.9 As the requirement for future potential developments to the north of the junction has not been confirmed at this design stage, this option was not put forward as the preferred design option. The preferred design option doesn't preclude future development to the north.

Option 2 - Grade Separation - Elevated Roundabout Option

11.1.10 Under this option, the circulatory carriageway of the South Terminal roundabout would be elevated introducing an at-grade through route for the M23 Spur/Airport Way. Access to the South Terminal, car parking and hotels/offices would be maintained to the south and slip roads would be provided to link the roundabout circulatory carriageway back to the existing M23 Spur/Airport Way. The proposed design speed for the through alignment and slip roads would be suitable for a 40mph speed limit under the assumption that the same speed limits would be applied to key routes at the North Terminal.

11.1.11 Where possible the through route would follow the existing ground level to minimise construction works and the impact to the existing highway network. Four new bridge structures would be required, two at the roundabout over the M23 Spur through route and two new bridge structures over B2036 Balcombe Road to facilitate the M23 Spur eastbound merge and westbound diverge slip roads. Substantial earthworks and retaining wall provision would be required to facilitate the elevated roundabout design as well as the associated slip roads.

11.1.12 Ring Road North and South would need to be realigned and raised to retain the existing access to Gatwick's South Terminal and connect to the elevated roundabout. Retaining walls would be required to minimise the footprint of these works and reduce the impact on surrounding infrastructure and buildings.

11.1.13 To minimise the scope of construction works, the alignment of the Airport Way westbound merge and eastbound diverge slip roads would tie in with the existing carriageway to the east of the Network Rail London to Brighton Railway overbridge on Airport Way. Whilst the M23 Spur through route would remain at grade, modifications to the cross section of the existing M23 Spur overbridge at B2036 Balcombe Road would be required to accommodate the provision of the M23 Spur Eastbound merge and M23 Spur eastbound diverge slip roads.

11.1.14 The hard shoulder of the eastbound carriageway of the M23 Spur, between the South Terminal roundabout and M23 Junction 9, would be converted to a permanent running lane to provide three lanes of traffic.

11.1.15 The key benefits of this option include:

- The provision of a through route between the M23 Spur/Airport Way would mitigate the forecasted increase in traffic volume at the junction by enabling eastbound/westbound traffic to flow freely, maximising the capacity of the roundabout junction for airport traffic.
- The provision of the M23 Spur through route would reduce the number of conflict points for through traffic compared to an at-grade junction, leading to a number of safety benefits for road users.
- The existing M23 Spur overbridge at B2036 Balcombe Road could be partially retained as a result of the M23 Spur being retained as an at-grade route.

11.1.16 The key disbenefits of this option include:

- To achieve the elevated roundabout necessary to accommodate the through route it is anticipated that substantial earthworks and retaining structures would be required. It is also likely that the construction works associated with the slip roads to the north of the junction would result in requirements for additional permanent land outside of the existing highway boundary
- Modifications to the M23 Spur overbridge at B2036 Balcombe Road would be required to accommodate the provision of the M23 Spur slip roads.
- Construction sequencing would be more complex in comparison to alternative solutions to provide an at-grade roundabout with M23 Spur/Airport Way Flyover leading to increased disruption to road users.
- Minimising the requirement for additional permanent land for this option would require the provision of substantial additional retaining wall provision. For example, substantial retaining wall provision would be required at the realigned Ring Road North and Ring Road South to minimise the impact on surrounding airport infrastructure and adjacent buildings. Even with such retaining wall provision, there is a risk that this option would lead to the partial loss of the forecourt housing McDonalds and the BP Station.
- The increased junction footprint would lead to an increased loss of existing vegetation in the vicinity of the junction.

11.1.17 In comparison to other options considered, Option 2 would introduce numerous additional disbenefits including increased scope of structures works and increased disruption to road users during construction. Considering the combined benefits and disbenefits, Option 1b was considered to be preferable so Option 2 was not put forward as the preferred design option for this junction.

11.2 A1.2 Alternative North Terminal Junction Design Options

Option 1a - Grade Separated Junction (Constrained) – 40mph

11.2.1 The Option 1a design would lead to the existing Northern Terminal roundabout being replaced with an elongated Gyratory junction with connections to adjacent roads being modified accordingly. The concept layout consists of a largely at-grade gyratory roundabout with a 2-lane circulatory carriageway. A similar layout to existing would be retained for the southwestern segment of the roundabout and therefore access to/from the North Terminal estate via Northway and North Terminal Approach will remain unchanged with only local improvements necessary. Additionally, the existing Northgate Road underpass would be unchanged.

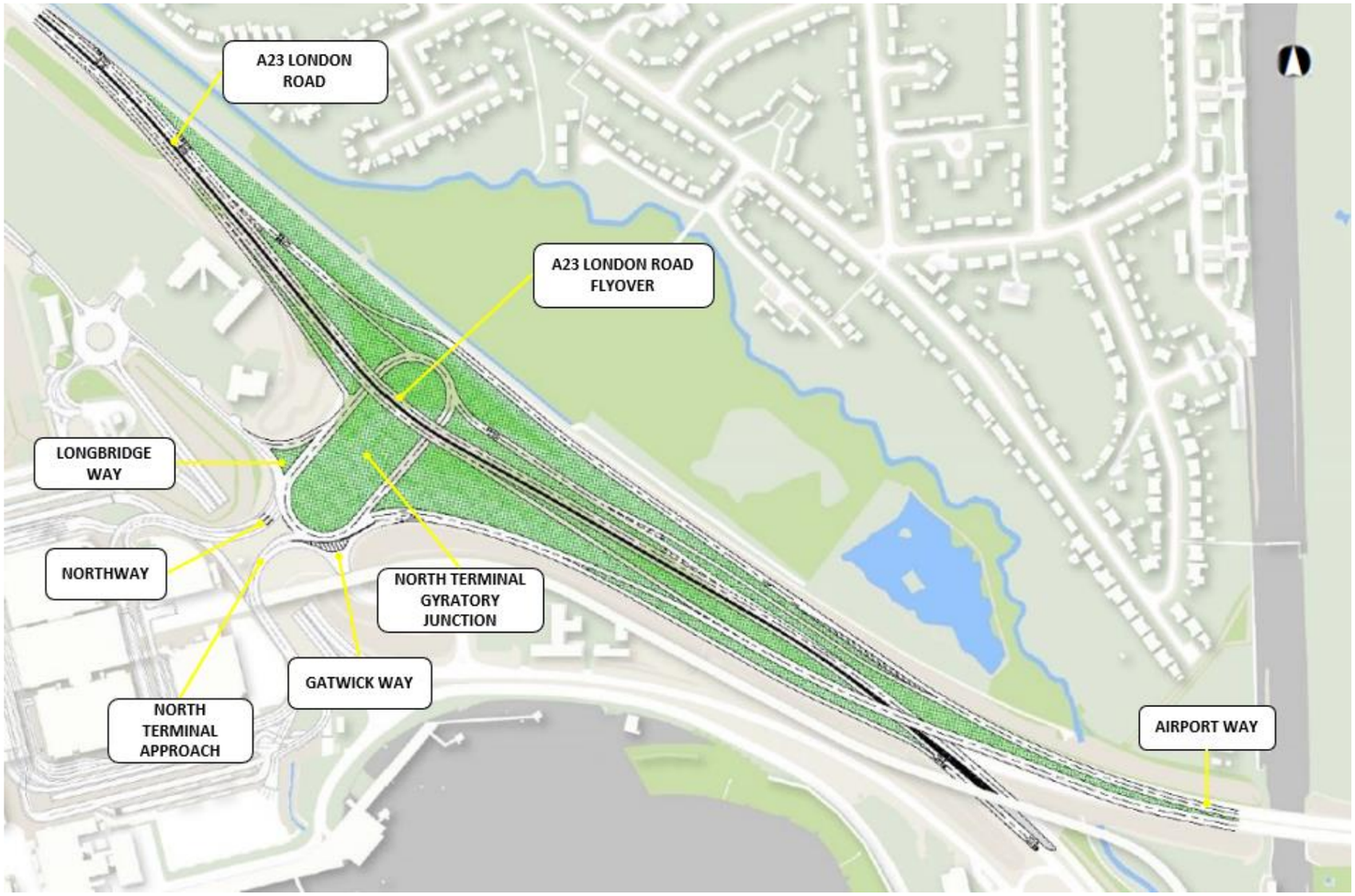

Figure 13: Option 1a North Terminal Grade Separated Junction Concept Layout.

11.2.2 A grade-separated junction arrangement would introduce a through route for the A23 London Road, raising the carriageway over the Gyratory junction via a four-span viaduct. Tie ins to the existing alignment are proposed to the west of the existing underbridge at Airport Way and east of the Longbridge junction respectively. The through route for the A23 London Road would enable non-airport traffic to bypass the North Terminal junction to mitigate the increasing traffic flow and maximise capacity of the junction. Retaining walls would be required at locations where insufficient space is available to accommodate 1V:2.5H earthworks side slopes.

11.2.3 Proposed changes to Airport Way include introducing substantial separation between the eastbound and westbound carriageways. The westbound alignment would largely follow the current Airport Way alignment and retain the existing bridge over the A23 London Road. However, the eastbound carriageway would no longer tie directly into the roundabout junction, instead it would coincide with the existing A23 London Road southbound adjacent to Riverside Garden Park. Airport Way eastbound would return to the existing alignment west of the London to Brighton Road Railway bridge.

11.2.4 Single lane slip roads are proposed to connect the Gyratory junction to Airport Way and the A23 London Road.

11.2.5 Whilst Options 1b, 2b and 3b are comprised of similar layouts, the distinguishing feature of Option 1a is the application of a design speed suitable for a reduced speed limit of 40mph with the intention of limiting the impact of the scheme within the existing highway and GAL estate. Additionally, the proposed design speed for the through alignment and slip roads would be designed to accommodate a 40mph speed limit and access to the terminal would be maintained with a 30mph speed limit.

11.2.6 Access to the North Terminal forecourt would be achieved primarily at the main roundabout but also at the secondary junction located south of Airport Way on the A23 London Road, via Perimeter Road North. This junction would be upgraded to provide additional junction capacity and allow for additional turning movements.

11.2.7 The key benefits of this option include:

- The alignment of the link and connector roads associated with the new gyratory junction close to the A23 London Road mainline would ensure that the new junction layout would largely remain within the existing highway boundary. Constraining the proposed highway improvements within highway land would minimise the impact to the Riverside Garden Park located north of the existing junction.
- To further reduce the impact to the existing infrastructure associated with Gatwick, this option proposes that the A23 London Road mainline is realigned to the North. These amendments would reduce the impact to the Premier Inn site.
- The provision of the A23 London Road flyover would enable non-airport traffic to bypass the junction and would reduce the number of conflict points for through traffic compared to an at-grade junction, leading to a number of safety benefits for road users.

11.2.8 The key disbenefits of this option include:

- Tight spatial constraints would lead to substantial retaining wall requirements and potentially lead to requirements for departures from standard for highway geometry.
- In this design option the proposed slip road approaching the junction from the A23 London Road Northbound cannot be accommodated between the existing Airport Way bridge and the ITTS. Therefore, it is likely that modifications would be required to the ITTS viaduct structure.
- Complex construction sequencing would lead to substantial disruption to road users during construction.
- Extensive structures works and complex construction sequencing would lead to higher costs than at-grade layouts.

11.2.9 The combined benefits and disbenefits of this option were considered in comparison to the other design options examined. Considering issues such as disruption to road users during construction and impact to the ITTS structure, this option was not considered preferable and has therefore not been taken forward as the recommended solution for the next design stage.

Option 1b - Grade Separated Junction (Constrained) – 50mph

11.2.10 Option 1b is largely similar to Option 1a, constraining the junction layout within the existing highway boundary and therefore minimise the impact to the Riverside Garden Park. However, an increased design speed suitable for a speed limit of 50mph has been adopted for the A23 London Road mainline.

11.2.11 As a result, the length of the proposed A23 London Road flyover alignment has been increased and the tie ins to the existing carriageway have moved slightly north and south. This would result in an increase in earthworks volumes and retaining wall provision to construct the approaches to the viaduct structure. Changes to the vertical geometry of the mainline impact the connecting slip roads and link roads which would be modified to align with the new A23 mainline geometry.

11.2.12 The key benefits of this option include:

- As per Option 1a but the increased speed limit on the A23 London Road would accommodate the same speed limit as per the existing layout which may be favoured by the local highway authority.

11.2.13 The key disbenefits of this option include:

- As per Option 1a but the increased length of the A23 London Road flyover and associated retaining walls and approach embankment earthworks would lead to higher costs.

11.2.14 Similarly to Option 1a, the disbenefits associated with the constrained at-grade junction resulted in the decision to not take this option forward as the preferred design solution.

Option 2b - Grade Separated Junction (Unconstrained)– 50mph

11.2.15 Option 2b was developed as a variant of the Option 1b proposal without the constraint of keeping the footprint of works within existing highway land. The design assumes that the junction improvement works could encroach into Riverside Garden Park. The design speeds applied for Option 1b were retained.

11.2.16 Primarily this option would realign the A23 mainline to the northeast to enable more flexibility for the links to the south of the junction which connect the A23 London Road and Airport Way to the Gatwick Estate. Reducing the constraints of the links to the Gyratory Junction would allow improvements to the highway geometry and increase the distance between successive slip roads. Additionally, relocating the A23 northwards would provide more space to locate the slip road between the Gyratory junction and the A23 London Road northbound. As a result, the impact of the proposed junction improvements on the Premier Inn Hotel would be minimised.

11.2.17 However, to accommodate the northern realignment of the A23 London Road mainline, slip roads connecting the North Terminal Junction to the southbound carriageway of the A23 and Airport Way eastbound would encroach into the Riverside Garden Park. Further, the at-grade gyratory carriageway would also extend north into the park in order to tie in with the connecting roads whilst remaining coincident with the southwestern quadrant of the existing roundabout.

11.2.18 In addition, changes proposed to the A23 London Road connector road, linking the northbound carriageway to the North Terminal junction, would likely result in an increased impact to the ITTS structure. To ensure suitable visibility and area to develop the slip road to the gyratory junction it is likely that the four existing spans would be affected and require replacing with two longer spans.

11.2.19 Access to the North Terminal forecourt would be achieved primarily at the main roundabout but also at the secondary junction located south of Airport Way on the A23 London Road, via Perimeter Road North. This junction would be upgraded to provide additional junction capacity and allow for additional turning movements.

11.2.20 The key benefits of this option include:

- The provision of the A23 London Road flyover would enable non-airport traffic to bypass the junction and would reduce the number of conflict points for through traffic compared to an at-grade junction, leading to a number of safety benefits for road users.
- Extending the junction footprint into the park would benefit the scheme in comparison to Options 1a and 1b in terms of improving highway geometry; reducing the complexity of construction phasing; and reducing disruption to road users during construction. However, substantial disruption for road users would remain.
- Impacts to the Premier Inn site would be minimised.

11.2.21 The key disbenefits of this option include:

- The increased footprint of works including permanent land requirements within the extents of Riverside Garden Park would lead to negative environmental impacts including an increased loss of existing vegetation compared to Options 1a and 1b.
- Substantial modifications to the existing ITTS viaduct would be required leading to increased costs and disruption to airport passengers and operations.

- Whilst retaining wall requirements would be slightly less than for Option 1b substantial retaining wall provision would still be required.

11.2.22 The combined benefits and disbenefits of this option were considered in comparison to the other design options examined. Considering issues such as the negative environmental impacts associated with permanent land requirements within Riverside Garden Park and impacts to the ITTS structure, this option was not considered preferable and has therefore not been taken forward as the recommended solution for the next design stage.

Option 3b - Grade Separated Junction (Unconstrained) – 50mph

11.2.23 Option 3b was developed as a further variant of Option 1b. As per Option 2b this proposal was developed without the constraint of keeping the footprint of works within existing highway land. However, this design assumes that the works can impact additional land within Gatwick and the associated infrastructure south of the junction. Infrastructure to the South of the junction includes the Premier Inn Hotel, the Police Station, ITTS and Perimeter Road. Little or no impact to the Riverside Garden Park is anticipated with this proposal.

11.2.24 Removing the constraints to the south provides additional land to develop links to the gyratory junction from the A23 London Road and Airport Way, allowing for improved road geometry on the approach to the junction. Additionally, the unconstrained nature of the proposal may reduce network disruption and improve construction phasing. Similarly, to Option 1b, design speeds suitable for 50mph and 40mph speed limits on the A23 London Road mainline and slip roads respectively were adopted for this option.

11.2.25 The A23 London Road mainline would be realigned southwards compared to Option 1b, allowing increased flexibility for the positioning of the links north of the mainline which connect the A23 London Road southbound, Airport Way and the gyratory junction. The additional land would enable improved geometry for these links. The southward shift of the mainline would also ensure that the junction footprint does not encroach on the Riverside Garden Park.

11.2.26 Further, extending the junction footprint south would result in a diversion to the existing ITTS viaduct, proposed to follow the line of the existing Perimeter Road. This would also impact Perimeter Road which would be realigned to accommodate the diverted ITTS, encroaching onto the airside boundary

11.2.27 In contrast to the previous options, Option 3b proposes to close the existing A23 London Road / Perimeter Road North junction to the south of the North Terminal and create an alternative access at the existing Queen's Gate roundabout approximately 70m further South.

11.2.28 The key benefits of this option include:

- The provision of the A23 London Road flyover would enable non-airport traffic to bypass the junction and would reduce the number of conflict points for through traffic compared to an at-grade junction, leading to a number of safety benefits for road users.
- The use of additional land to the south would enable improved geometry for the proposed links compared to Options 1a and 1b.
- The use of additional land to the south would lead to improved buildability of the highway works compared to Options 1a and 1b with corresponding reductions in disruption to road users.
- The southward shift of the mainline would also ensure that the junction footprint does not encroach on the Riverside Garden Park.

11.2.29 The key disbenefits of this option include:

- Realigning the A23 mainline would result in the North Terminal junction slip road connecting to A23 London Road northbound moving south impacting the existing Shell Filling Station at this location.
- This option would significantly impact the Premier Inn Hotel site.
- A diversion of the ITTS viaduct would be required leading to increased costs and disruption to airport passengers and operations.
- Whilst retaining wall requirements would be less than for Options 1b and 2b, substantial retaining wall provision would still be required.

11.2.30 The combined benefits and disbenefits of this option were considered in comparison to the other design options examined. Considering issues such as impacts to commercial sites and impacts to the ITTS structure, this option was not considered preferable and has therefore not been taken forward as the recommended solution for the next design stage.

Option 5 - At-Grade Offline (South) Signal-Controlled Roundabout

11.2.31 This option proposes an at-grade solution, modifying the existing North Terminal roundabout junction and introducing a new offline roundabout at the existing GAL Staff Car Park Y.

11.2.32 The existing North Terminal roundabout would be enlarged slightly to improve the geometry of the approach links to the junction and to provide greater separation between arms. To achieve this, it is proposed that the A23 London Road links to the existing roundabout would be removed and connected to a new offline roundabout. This would allow the Airport Way, Longbridge Way and Gatwick Way connections to be realigned onto an enlarged circulatory carriageway.

11.2.33 A new offline roundabout would be positioned at Gatwick Airport Staff Car Park Y, located to the northwest of the North Terminal, adjacent to the existing A23 London Road carriageway. The primary function of this roundabout would be to provide a connection between the A23 London Road northbound and southbound to the GAL estate. Additionally, a segregated through route would be considered to remove southbound traffic from the roundabout. Connection to the GAL estate would be facilitated by a realigned Perimeter Road North, linking the new roundabout to the existing roundabout on Longbridge Way. The existing Longbridge Way roundabout would require improvements to accommodate the anticipated increase in traffic flows resulting from A23 London Road user accessing the North Terminal through this route.

11.2.34 The reconfigured Airport Way would retain a two-lane dual-carriageway approach to the North Terminal Roundabout to accommodate the anticipated approach traffic flows. Gatwick Way would stay as a single carriageway two-way road, and North Way and North Terminal Approach would each have a similar carriageway layout to existing. However, improvements to the Longbridge Way roundabout and the increased traffic flow would require the Longbridge Way carriageway to be increased to three lanes northbound and two lanes southbound, creating a short section of urban dual carriageway.

11.2.35 The purpose of this option was to examine whether removing the direct connection between A23 London Road and North Terminal roundabout would lead to improved traffic flows by redirecting A23 London Road north terminal traffic to the new roundabout, and then into the GAL internal road network. This however introduces issues within the GAL internal road network, which would require a significant upgrade to cope with the increased traffic using Perimeter Road North and Longbridge Way on approach to the North Terminal Roundabout. The new roundabout shifts the flow of traffic but redirects it to the existing North Terminal Roundabout, albeit from a different approach. It is anticipated that this approach would demonstrate issues with queuing on Perimeter Road North and Longbridge Way and could block the exit from North Terminal. Additionally, the close proximity of the new offline roundabout to the Longbridge Way roundabout may cause issues with queuing and would provide little opportunity for lane changing to get to a required destination. There is also potential for queuing traffic to back up the GAL internal highway network and the surrounding road network.

11.2.36 With a significant through flow from Airport Way to A23 London Road it is expected this at-grade solution at North Terminal roundabout would struggle to cope with the volume of traffic.

11.2.37 The key benefits of this option include:

- Traffic volumes using the North Terminal roundabout would be reduced slightly by redirecting A23 London Road north terminal traffic to the new roundabout, and then into the upgraded GAL internal road network.
- The at-grade solution would minimise the scope of structures works leading to reduced construction duration and costs.
- The junction works footprint would not encroach on Riverside Garden Park.

11.2.38 The key disbenefits of this option include:

- It is expected that this solution would cause numerous issues with congestion at the proposed roundabouts and on the GAL internal road network, impacting both airport and non-airport traffic.
- Most of GAL Staff Car Park Y would be lost due to the construction of the new roundabout. These spaces would need to be replaced elsewhere.
- The proposed changes to Longbridge Way roundabout, Perimeter Road North and Longbridge Way would likely impact surrounding airport infrastructure and the Premier Inn hotel land.
- With minimal separation of airport and non-airport traffic, this option wouldn't achieve the safety benefits associated with grade separated solutions that minimise conflict points for through traffic.

11.2.39 The disbenefits of this option were considered to outweigh the benefits. Therefore, this option was not put forward as the recommended design option for this junction.

11.3 A1.3 Alternative Longbridge Junction Design Options

Option 1 - Signal-controlled Junction

11.3.1 To accommodate the forecasted increase in traffic flow at the Longbridge junction and mitigate congestion during peak times, a proposal to upgrade the existing junction to a signal-controlled intersection was developed. To achieve this, upgrades would be required to each of the four arms of the junction. The concept layout of the signal-controlled junction is presented in Figure 14.

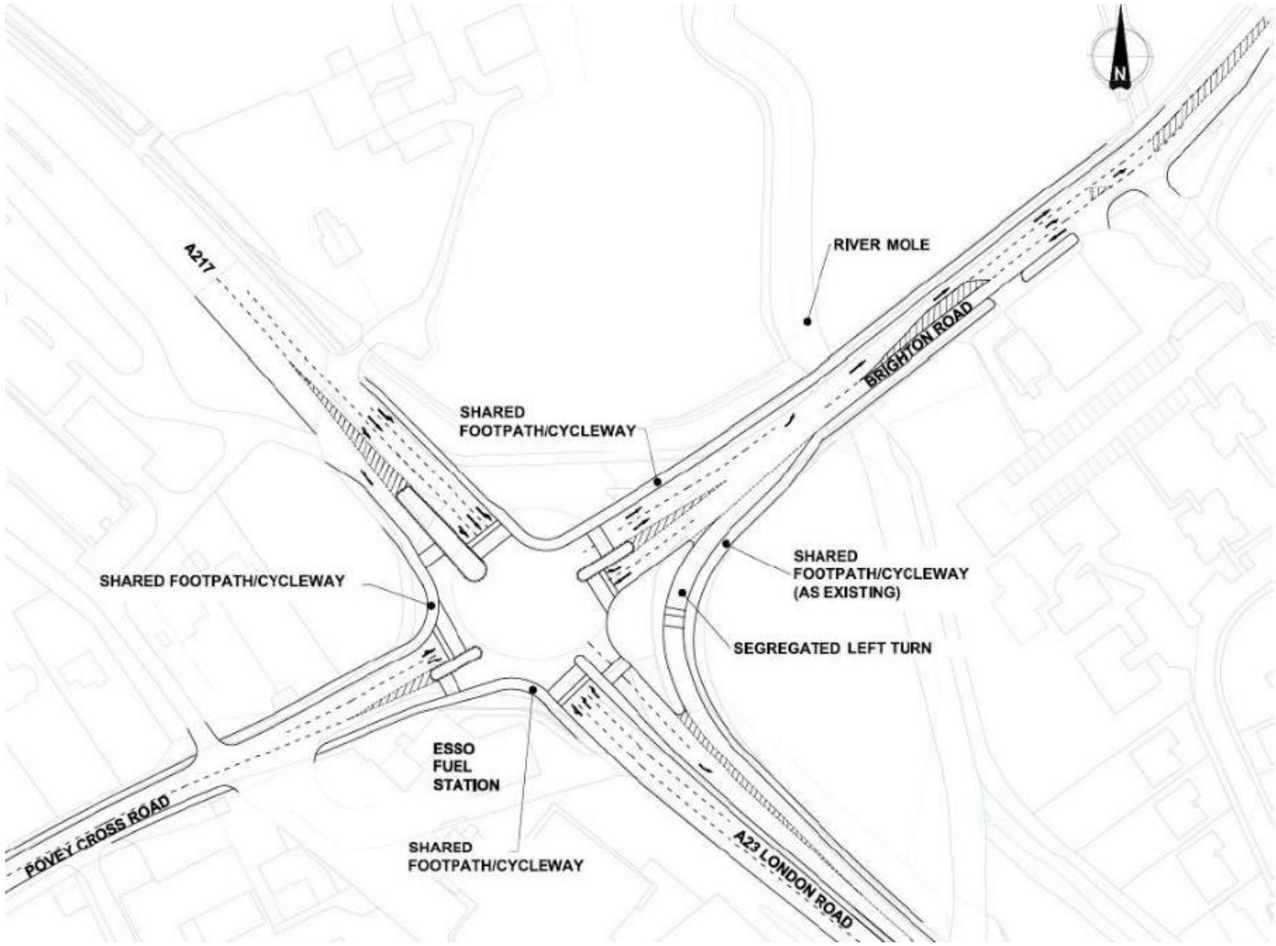

Figure 14: Longbridge Signal-controlled Junction Concept Layout

11.3.2 The A23 London Road northbound approach to the intersection would consist of three lanes, two of which provide a dedicated right turn leading to the A23 Brighton Road facilitating the primary traffic demand. The nearside lane would allow a straight through movement to the A217 and a left turn to Povey Cross Road.

11.3.3 Povey Cross Road and the A217 would largely remain as per the existing layout with minor amendments to align with the amended junction layout and provide additional queuing capacity on the junction approach.

11.3.4 A23 Brighton Road would also have a similar layout to existing, comprised of a single westbound lane widening to two lanes on the junction approach, two eastbound lanes at the junction exit merging to one lane in advance of the bridge at the River Mole, and a modified segregated left turn lane leading to the A23 London Road. Changes are proposed to the east of the river mole where a ghost island would be used to develop a right turn lane to provide access to the service station and Woodroyd Avenue. Widening of Brighton Road and the bridge at the River Mole would be required to support these changes to provide improved traffic flow.

11.3.5 Pedestrian and cyclist facilities would be retained at each arm of the junction via staggered signal-controlled crossings.

11.3.6 The key benefits of this option include:

- The changes to the junction layout would provide safety benefits compared to the existing layout, in particular by making the junction more suitable for HGV turning movements.
- The existing stilt structure supporting the segregated left turn lane from A23 Brighton Road onto A23 London Road would likely be retained minimising construction costs and impacts to existing vegetation in the vicinity of the junction.

11.3.7 The key dis-benefits of this option include:

- Based on the anticipated traffic volumes, this layout would not provide sufficient junction capacity for the design year traffic flows.
- The existing A23 Brighton Road overbridge crossing the River Mole would need to be widened or replaced leading to increased costs and construction works.
- The substantial changes to the junction layout by changing from a roundabout to a signal-controlled intersection would lead to relatively complex construction sequencing and substantial disruption to road users during construction.

11.3.8 As this option would not provide adequate mitigation for the Project, this option was not put forward as the recommended design option for this junction.

Option 2 – Signal-controlled Roundabout

11.3.9 Proposals to increase the capacity of the existing Longbridge junction with minimal design interventions were considered to determine if they could accommodate the forecasted increase in traffic volume. The aim of this design option was to increase stacking capacity on the A217 southbound, Povey Cross Road and the circulatory carriageway in addition to traffic signals improvements to mitigate the increased traffic volume.

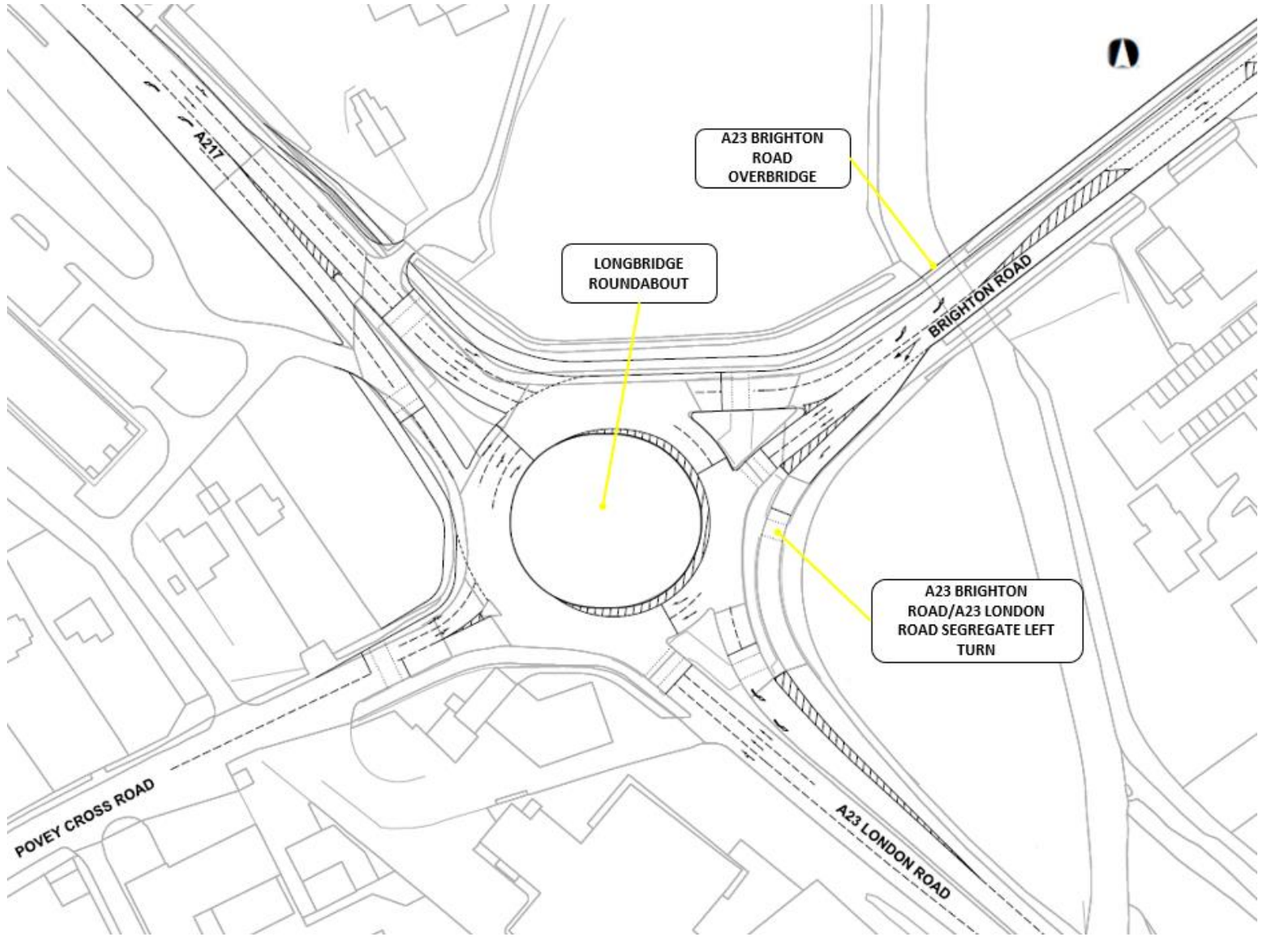

Figure 15: Longbridge Junction Signal-Controlled Roundabout Concept Layout

11.3.10 Under this option the existing roundabout central island was to be retained, avoiding design changes that would result in requiring additional land. This design aims to minimise the impact to adjacent residential and commercial properties and avoid impacting the existing segregated left turn lane and the associated stilt structure. However, changes to the circulatory carriageway are proposed, increasing the carriageway width adjacent to the A217 arm to introduce a third lane and increase storage capacity. Additionally, new traffic signals are proposed at this location. As a result, the eastern and northern kerb line of the roundabout would be widened to accommodate the increased circulatory carriageway width.

11.3.11 Changes to the circulatory carriageway would result in widening of the A217 splitter island to provide suitable stacking space.

11.3.12 The existing stilt structure supporting the A23 Brighton Road to A23 London Road segregated left turn lane would be retained however localised widening to the Brighton Road northbound kerb line would be required to ensure compliant highway geometry for the exit from the roundabout.

11.3.13 No substantial changes are proposed to the A23 London Road for this option.

11.3.14 The key benefits of this option include:

- The limited scope of design changes associated with this option would minimise construction costs and disruption to road users during construction.
- The existing stilt structure supporting the segregated left turn lane from A23 Brighton Road onto A23 London Road would likely be retained minimising construction costs and impacts to existing vegetation in the vicinity of the junction.

11.3.15 The key disbenefits of this option include:

- This option wouldn't address safety issues present in the existing layout related to insufficient circulatory carriageway width. Based on vehicle tracking exercises and site observations of damage to roundabout kerbs, the existing layout is not considered to provide adequate space for HGV turning movements.
- As a result of insufficient circulatory carriageway width, this option would likely not provide sufficient capacity to accommodate the anticipated increase in traffic volumes.
- The existing A23 Brighton Road overbridge crossing the River Mole would need to be widened or replaced leading to increased costs and construction works.

11.3.16 As this option would not provide appropriate lane widths on the circulatory, this option was not put forward as the recommended design option for this junction.