

P e l l F r i s c h m a n n

## Kings Heath Wider Impacts Study

### Kings Heath Wider Impacts Study Preferred Options Report

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## Contents

1	Introduction .....	1
1.1	Background.....	1
2	Baseline Analysis.....	3
2.1	Air Quality .....	4
2.2	Collision Data.....	7
2.3	Parking.....	8
2.4	Junctions and Crossings.....	10
2.5	Buses .....	11
3	Traffic Modelling .....	14
3.2	Modelling Outputs.....	14
3.3	Locations identified for Complementary Highway Measures (CHMs).....	17
4	Complementary Highway Measures.....	18
4.1	Long List .....	18
4.2	Sifting Process .....	18
5	Traffic Modelling of CHMs .....	23
6	Air Quality .....	25
7	Concept Designs .....	27
8	Indicative Costs .....	28
9	Network Resilience .....	31
9.1	Summary of Outputs.....	31
10	Summary & Recommendations.....	32
10.1	Summary.....	32
10.2	Recommendations.....	32

### Figures

Figure 1.1:	Phase 2, Option A .....	2
Figure 1.2:	Phase 2, Option D.....	2
Figure 2.1:	Study area .....	3
Figure 2.2:	Diffusion tube locations .....	4
Figure 2.3:	Collision Data, Kings Heath.....	7
Figure 2.4:	Vulnerable road user collisions .....	8
Figure 2.5:	Existing Parking Provision, Kings Heath .....	9
Figure 2.6:	Junctions and Crossings, Kings Heath .....	10
Figure 2.7:	Bus routes and stops, Kings Heath.....	12
Figure 3.1:	DS1 minus Base - Flow Differences AM Peak.....	16
Figure 3.2:	DS1 minus Base - Flow Differences PM Peak.....	16
Figure 5.1:	DS2 minus DS1 - Flow Differences AM Peak.....	24
Figure 5.2:	DS2 minus DS1 - Flow Differences PM Peak.....	24

### Tables

Table 2.1:	Air Quality Data in Kings Heath (2021) .....	6
Table 2.2:	Bus services on the boundary roads .....	11

Table 2.3: Bus Journey Time Comparison .....13  
Table 4.1: Long list of Complementary Highway Measures .....19  
Table 8.1: Indicative Costs Summary .....29

**Appendices**

- Appendix A Long List of Complementary Highway Measures Sifted
- Appendix B Concept Designs
- Appendix C Network Resilience Outputs

# 1 Introduction

Birmingham City Council (BCC) has commissioned Pell Frischmann to undertake an area wide transport study of Kings Heath and the surrounding area to consider current and historic network performance, and the impacts of the Places for People scheme, with a view to identifying further interventions that would contribute singly or cumulatively to improving and managing the flow of traffic through Kings Heath.

This report details the process of developing the proposed measures, undertaking the traffic modelling and the high-level appraisal of the different complementary highway measures. It also includes concept designs and indicative costs.

## 1.1 Background

A key element of the Birmingham Transport Plan (BTP) is 'Prioritising Active Travel in Local Neighbourhoods'. This 'Principle' looks to end the dominance of cars on streets in residential neighbourhoods and improve conditions for active travel and public transport which will in turn reduce air pollution and improve quality of life. This commitment to transforming local neighbourhoods was also reinforced in the Emergency Birmingham Transport Plan. As part of the Government's response to Covid-19, funding was made available to local authorities to deliver measures which encourage walking and cycling. Places for People aims to reduce traffic in residential neighbourhoods so that it is safer for people to walk and cycle. Many residential streets are busy with traffic using side streets to cut through and avoid using the main roads. Places for People traffic management measures will retain access but make it more difficult for drivers to drive straight through the area.

Kings Heath and Moseley was chosen as a pilot area to introduce modal filters including planters and lockable bollards placed on side roads to restrict through trips to vehicles. Places for People Phase 1 in Kings Heath and Moseley was introduced as a trial in Autumn 2020 and remains in place (under an Experimental Traffic Regulation Order (ETRO)) at the time of writing this report. Phase 2 of the scheme will look to expand the traffic restrictions to cover a wider area of Kings Heath and Moseley. Two options for either side of the High Street have been developed by design consultants Jacobs. At the time of undertaking this study the scheme was undergoing public consultation and a preferred option had not been identified. However, it was agreed with BCC that Option A (to the west of the High Street) and Option D (to the east of the High Street) would be assumed for the focus of this study as Option A represents the measures that are currently in place, and Option D will show the worst-case scenario in terms of wider traffic impacts (due to Billesley Lane being closed to through traffic). These options are presented in **Figure 1.1** and **Figure 1.2** respectively.

This study aims to identify a set of complementary measures in support of the Kings Heath and Moseley Places for People scheme, it does not seek to make changes to the scheme itself.

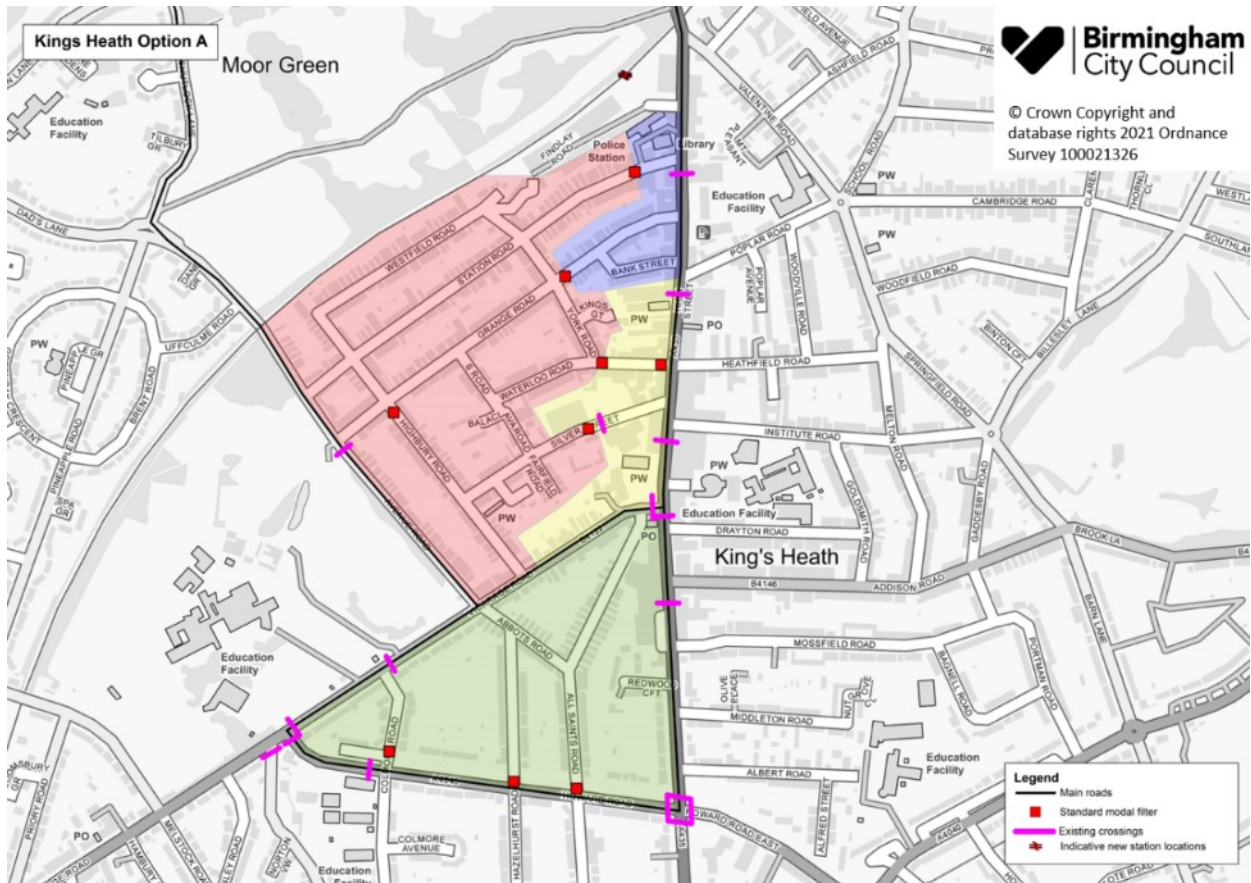


Figure 1.1: Phase 2, Option A

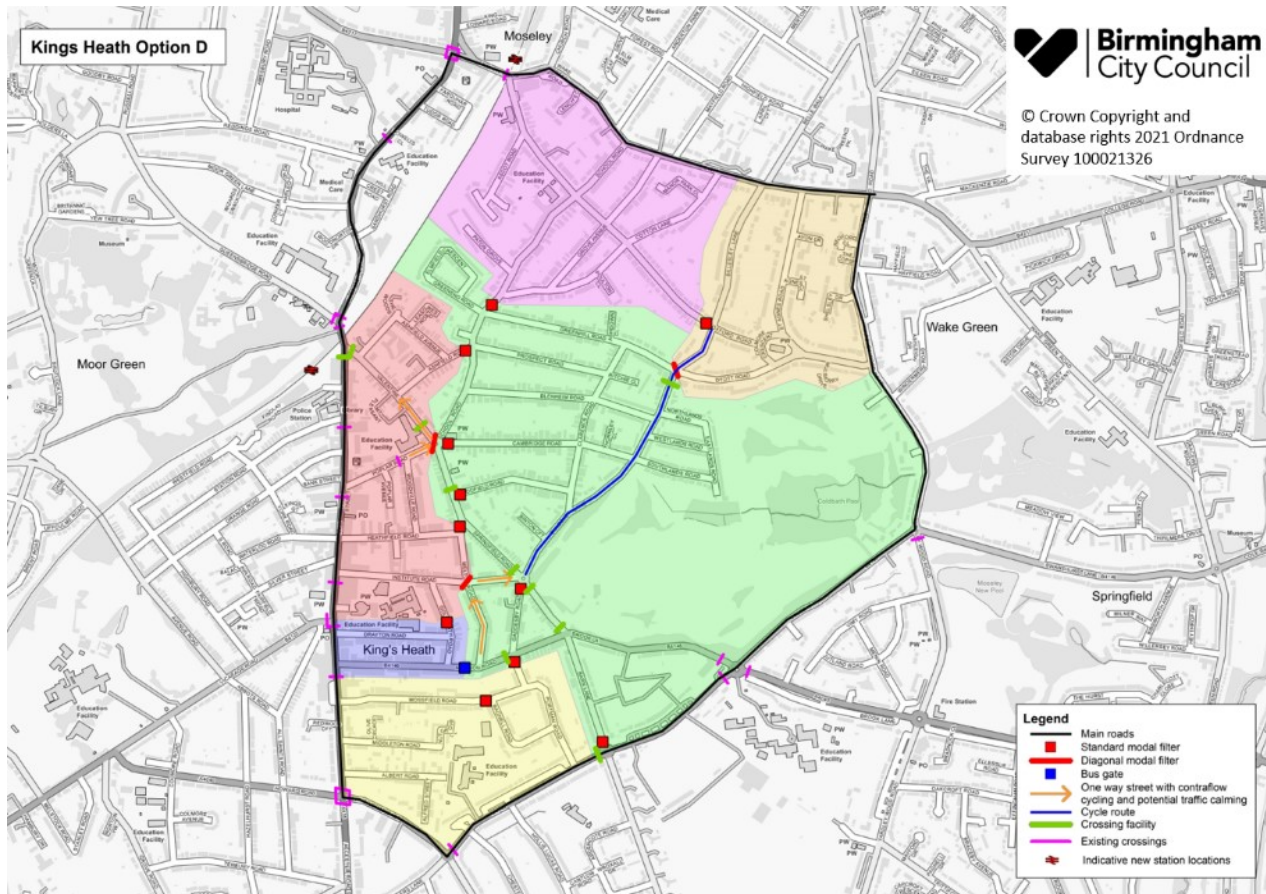
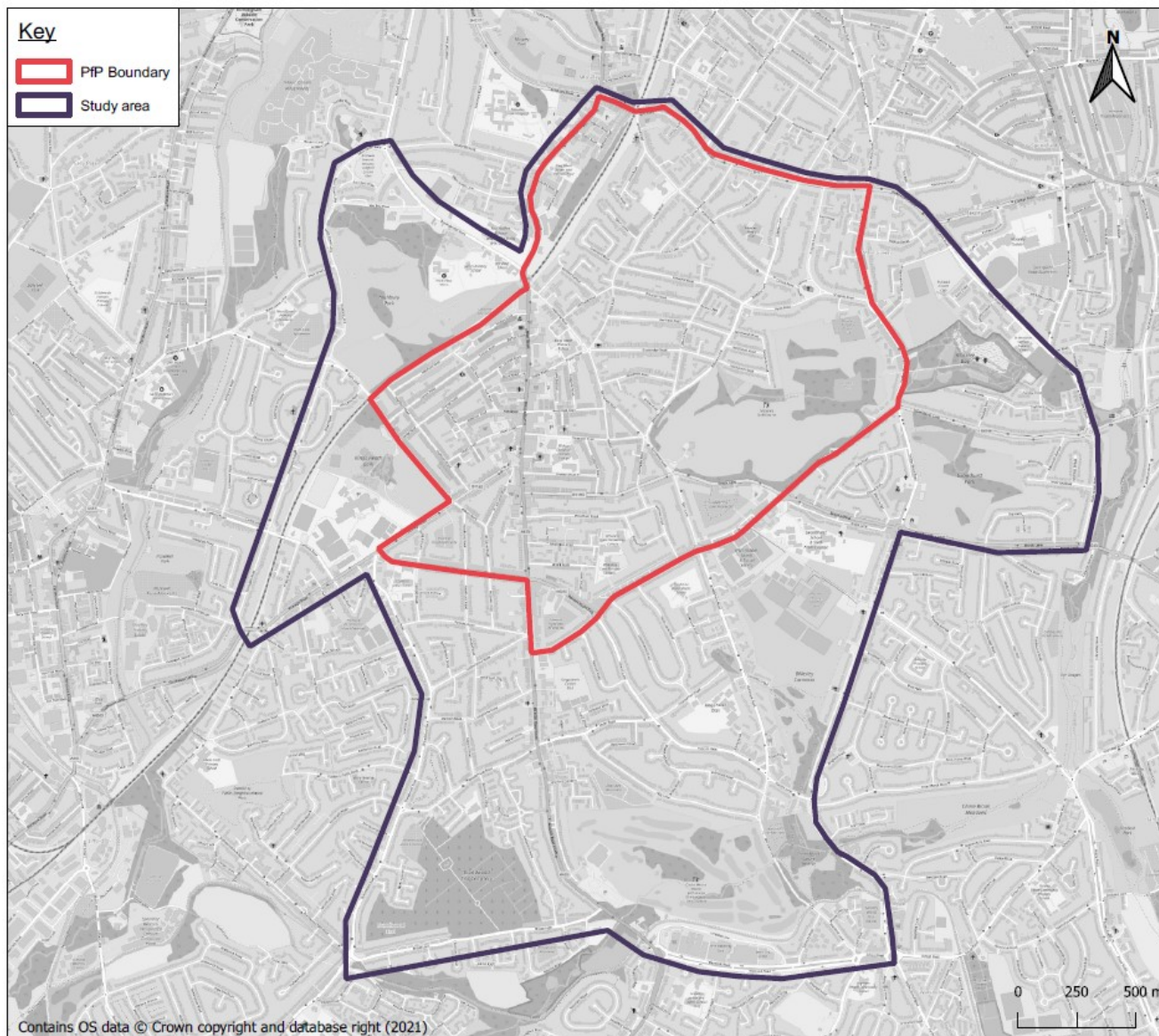


Figure 1.2: Phase 2, Option D

## 2 Baseline Analysis

To understand the wider impacts of the Places for People scheme, a range of data was gathered and analysed. This was supported by a number of site visits to observe existing traffic and highway conditions.

The area of focus for this study is on key roads within and on the periphery of the Kings Heath and Moseley Places for People scheme shown in **Figure 2.1**. This area shown in purple will be referred to as the ‘study area’ throughout the rest of the report.



**Figure 2.1: Study area**

Key observations from the site visits include high levels of congestion along the High Street and Vicarage Road, causing delays to buses. This is in part caused by the pedestrian crossing to the north of Vicarage Road as well as a number of private vehicles and delivery vans stopping along the High Street in both time restricted parking bays and on double yellow lines resulting in blockages to the main carriageway. Baseline data was collected and analysed for:

- Air quality;
- Road traffic collisions;
- Parking facilities;

- Pedestrian crossings;
- Traffic signals;
- Schools – including existing and future car free school street (CFSS) schools;
- Bus routes, frequencies and stops ; and
- Bus and journey times pre- and post-Covid-19.

The following sections provides more detailed analysis of the baseline data collected.

## 2.1 Air Quality

One requirement of the Emergency Active Travel funding was to implement the schemes within strict, short timescales set out by the Department for Transport (DfT), which meant that in most cases robust 'before' data was not available, either for air quality or traffic monitoring purposes. BCC began collecting diffusion tube data for twenty sites within the Kings Heath and Moseley area in December 2020. **Figure 2.2** shows the approximate locations of the diffusion tubes.

Air quality data was supplied by BCC to identify locations with greater concentrations of NO<sub>2</sub> to identify where measures may need to be prioritised to reduce the flow of traffic and in turn reduce the level of NO<sub>2</sub>.



**Figure 2.2: Diffusion tube locations**

Data from diffusion tubes can help assess long term trends in pollution concentrations. However, caution should be taken when comparing air quality data month-by-month as results can vary depending on local meteorological conditions and other factors. The accuracy of data can vary and therefore a bias factor is applied to the annual mean NO<sub>2</sub> concentrations. The data collected from the diffusion tubes is presented in **Table 2.1**. A bias factor has not yet been applied to the raw data as this is based on real time sites published by Defra based on a number of local authority studies. However, previous factors for the particular diffusion



tubes being used have been below one meaning that any averages will reduce further than the raw data suggests.

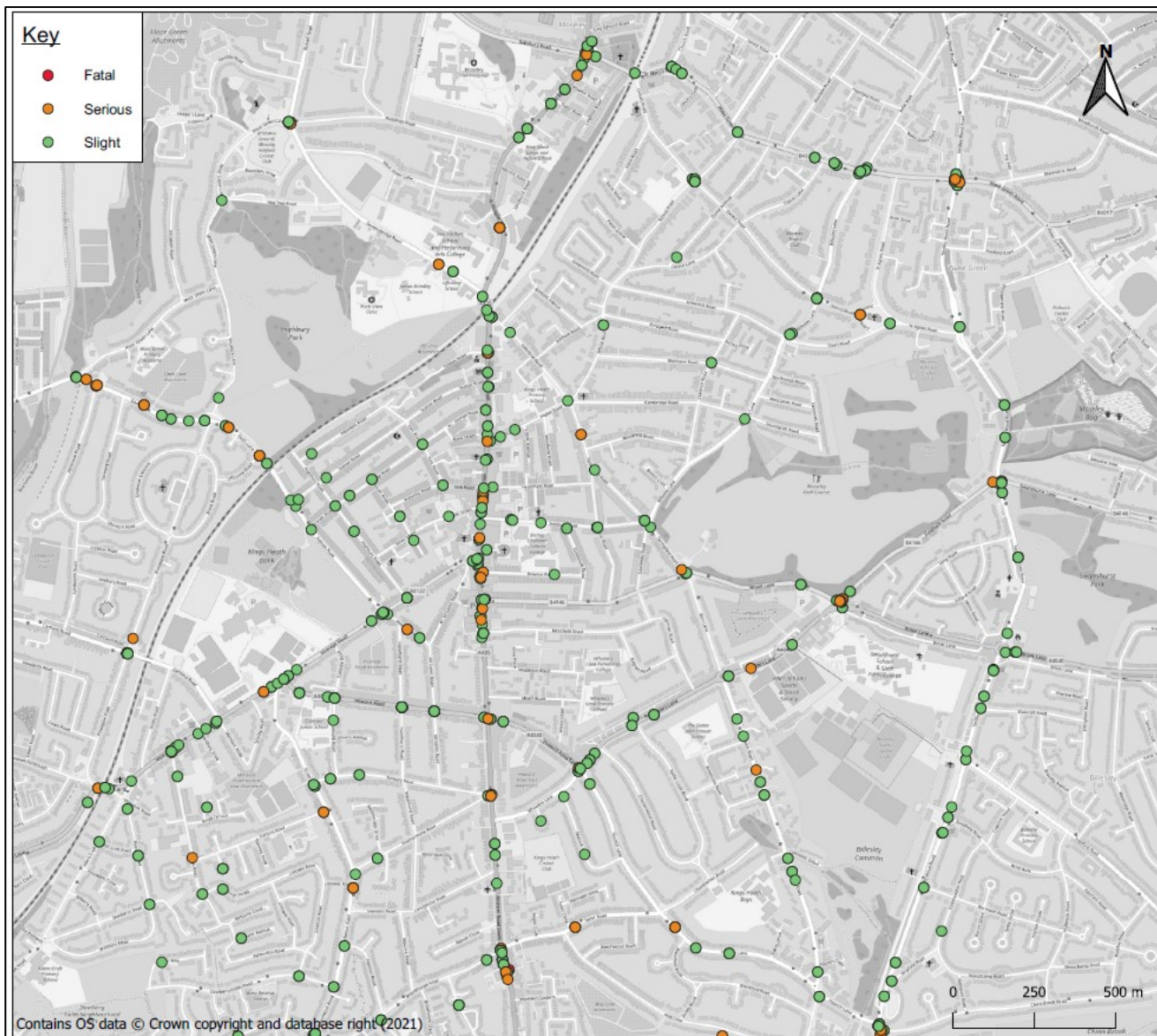
**Table 2.1: Air Quality Data in Kings Heath (2021)**

Site ID	Location	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Annual Mean (no bias applied)	Annual Mean (bias applied)
1	Colmore Junior School (Howard Road)	19.91	21.74	17.56	17.12	19.71	14.45	16.84	N/A	13.33	17.46	14.28			
2	Camp Hill Girls School (Vicarage Road)	21.79	23.56	19.05	17.46	18.33	14.66	14.34	14.01	11.58	18.42	16.22			
3	Bishop Challoner School (Institute Road)	29.94	25.28	21.97	20.38	22.16	16.89	15.40	16.58	13.58	19.53	18.92			
4	St Dunstans (Drayton Road)	22.62	22.36	17.00	15.12	17.67	12.18	13.07	12.57	8.03	14.14	13.99			
5	Kings Heath Primary Road (Poplar Road)	24.48	23.33	18.87	16.60	18.78	13.81	15.22	12.43	10.30	15.88	15.00			
6	Moseley Primary School (Oxford Road)	21.54	22.70	20.23	16.83	20.87	13.77	15.00	13.19	9.80	15.11	13.04			
7	Wheeler Lane Primary (Wheeler Lane)	21.20	19.98	17.79	17.98	16.17	11.50	11.05	12.01	9.34	16.75	13.54			
8	Tenbury Road (Grove road)	20.29	22.73	19.12	15.67	18.24	12.96	13.29	12.15	9.92	13.60	14.30			
9	All Saints Road	16.71	21.61	17.82	16.01	18.76	12.27	12.58	11.29	6.57	14.06	13.13			
10	Avenue Road	24.41	27.04	26.04	22.93	27.67	23.15	21.27	20.31	21.79	26.71	20.32			
11	All Saints Medical Centre (Vicarage Road)	23.64	24.29	24.28	18.02	22.57	18.26	17.44	16.38	10.57	21.09	17.44			
12	High Street (South End)	35.28	35.83	37.30	28.44	38.63	32.26	30.48	29.26	30.64	37.48	26.60			
13	Addison Road	23.67	29.58	23.83	20.25	21.42	17.38	16.43	17.86	14.23	21.62	20.62			
14	York Road	25.30	20.47	22.53	15.87	20.68	18.54	17.54	15.77	11.30	19.27	15.49			
15	Grange Nursery	22.05	19.24	20.91	17.53	21.81	14.77	15.13	13.89	11.11	17.39	14.15			
16	Valentine Road	25.00	24.88	20.32	19.89	21.53	18.30	17.12	16.69	12.07	18.50	17.65			
17	School Road	24.18	26.01	15.83	19.96	20.77	14.70	18.42	13.39	10.30	17.15	15.97			
18	Springfield Road	33.01	34.20	28.03	30.04	32.33	32.80	30.85	28.89	26.17	35.39	30.34			
19	Billesley Lane	21.27	24.13	20.87	20.13	13.34	19.25	16.67	16.49	12.50	20.91	18.24			
20	Barn Lane	23.72	25.61	21.03	19.90	23.96	18.94	17.00	16.30	14.08	20.02	16.33			

## 2.2 Collision Data

Collision data was collected from Transport for West Midlands (TfWM) to help identify clusters of collisions and their cause to identify whether measures could be implemented to improve road safety at these locations and reduce the number of collisions in the future. The data supplied from TfWM does not necessarily include every collision, only those that have been reported. The level of detail recorded for each collision varies, and many of the incidents do not provide a contributory factor for the collision.

The data was extracted for the most recently available five-year period, between 31<sup>st</sup> May 2016 and 31<sup>st</sup> May 2021. During this time, a total of 415 collisions were recorded: 349 slight, 64 serious and two fatal. 81% of all collisions involved a car, and 8% involved a pedal cycle. The collision data is illustrated in **Figure 2.3**.



**Figure 2.3: Collision Data, Kings Heath**

Further analysis of the data was undertaken to identify any collision hotspots, particularly involving vulnerable road users. This is shown in **Figure 2.4**.

The main cluster of collisions involving pedestrians occurred on the High Street. 67% of these collisions occurred at a location where no physical crossing facilities were present within 50m. 14% of the collisions occurred at zebra crossings and 9% at a controlled crossing not during the pedestrian phase. 73% of collisions involving cyclists occurred at a give-way or uncontrolled junction, three of which occurred at the junction of

Brook Lane / Coldbath Road. 62% of motorcycle collisions took place at a give way or uncontrolled junction. Of the eleven collisions involving buses or coaches within Kings Heath, eight occurred on the High Street of which two involved pedestrians between the ages of five and nineteen.

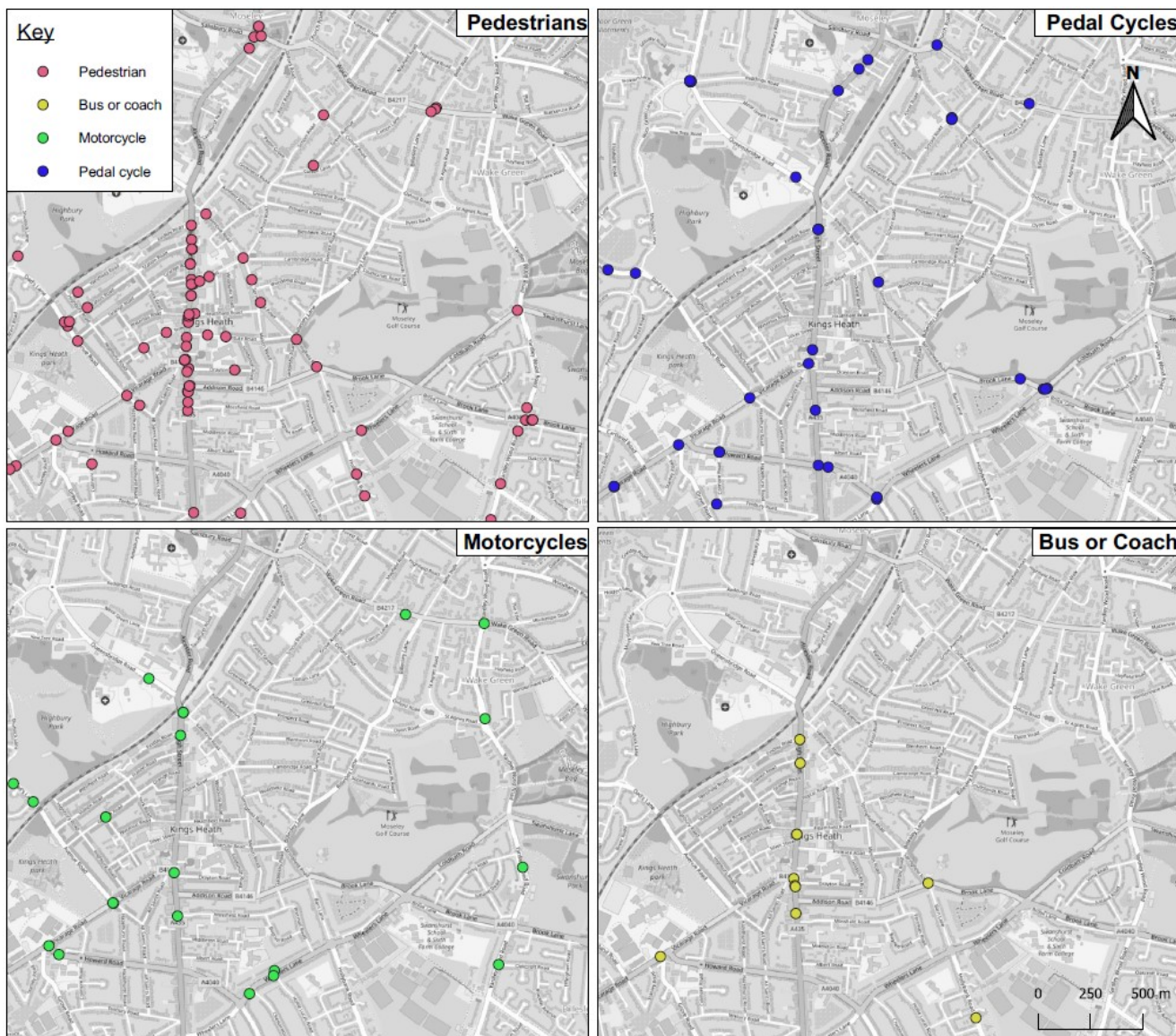


Figure 2.4: Vulnerable road user collisions

### 2.3 Parking

Existing parking provision on the main roads within the study area was collated to understand the type and provision to help identify areas where parking could be rationalised, if deemed appropriate, to improve traffic flow either for the permanent scheme or on a temporary basis, for example during temporary road works.

Figure 2.5 illustrates the type of parking provision around the 'study area'. The majority of streets have unrestricted parking, with the exception of the High Street (Alcester Road) which has some disabled parking, loading facilities and time restricted parking. Observations show that regular use of on-street parking bays can lead to delays and impact on the flow of traffic on the main carriageway.

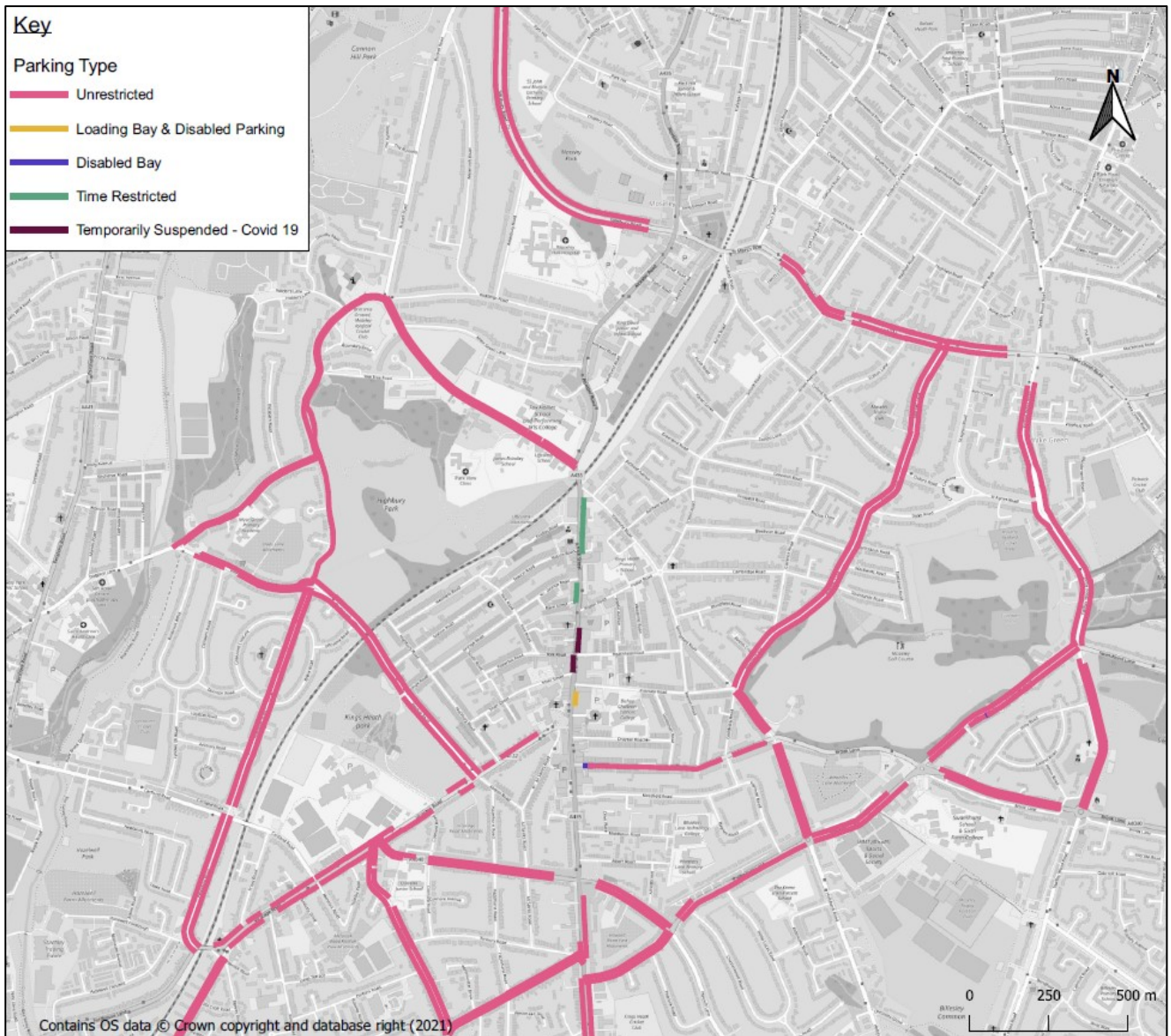


Figure 2.5: Existing Parking Provision, Kings Heath

## 2.4 Junctions and Crossings

Existing signalised crossings and their method of control were identified along with controlled and zebra crossings to help determine whether improvements could be made to signal timings or the method of control to improve the flow of traffic by linking neighbouring signals together. **Figure 2.6** illustrates the existing crossings and signalised junctions. The seven signalised junctions shown are all currently operated by vehicle actuation. The High Street is a heavy footfall area with retail and hospitality businesses on both sides. There are three controlled crossings across the High Street between Valentine Road and Vicarage Road, a stretch of circa 740m. These are south of Station Road and Poplar Road and north of Vicarage Road. The pedestrian crossing north of Vicarage Road was observed causing delays to vehicles along the High Street, particularly in the northbound direction as the timings of the pedestrian phase was not in sync with the signals at Vicarage Road / A435 High Street. This led to queuing blocking back to the junction during the green phase.

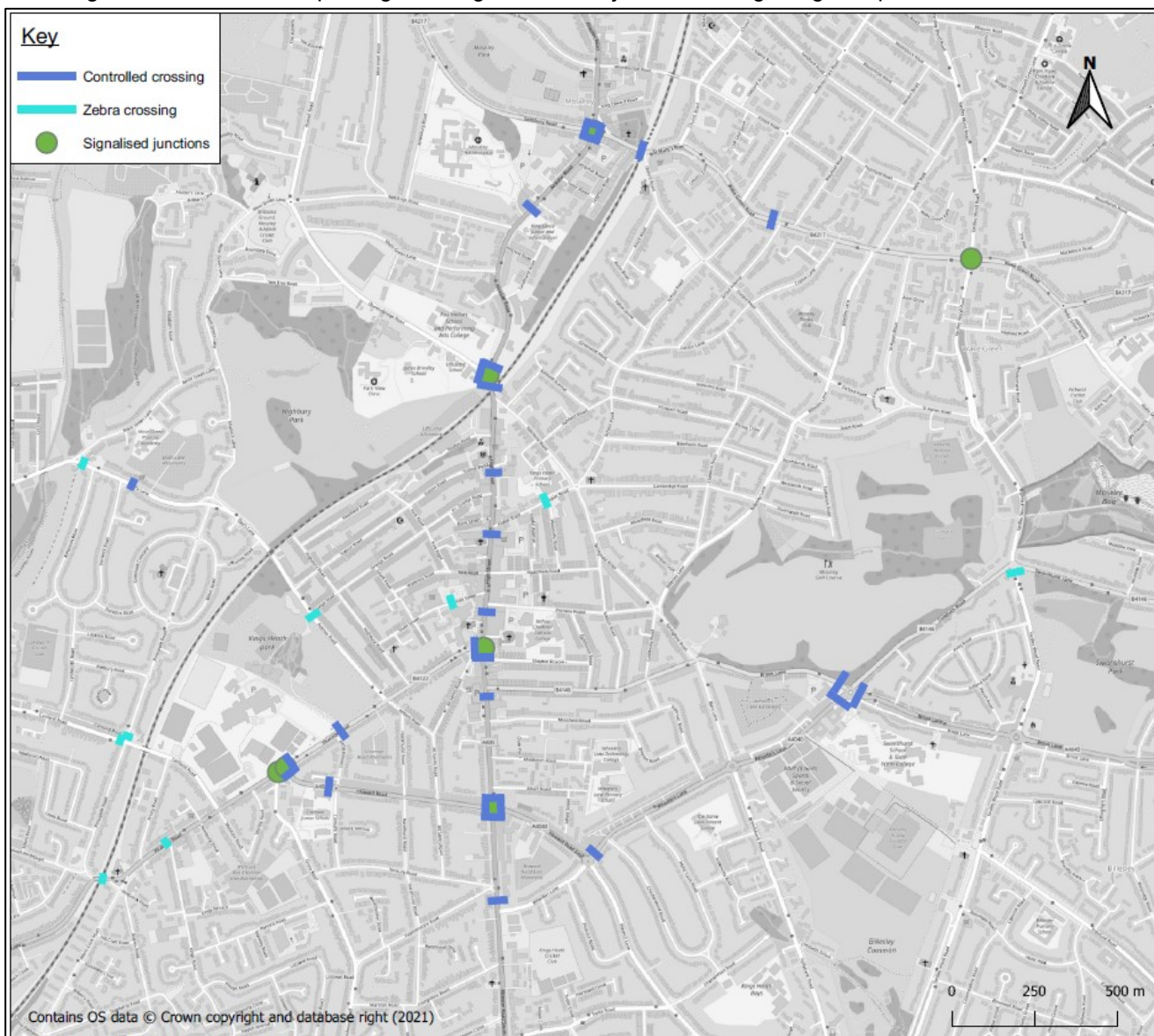


Figure 2.6: Junctions and Crossings, Kings Heath

## 2.5 Buses

### 2.5.1 Stops and Routes

Bus stops and bus routes that pass through Kings Heath and Moseley are shown on **Figure 2.7**. There is a high frequency of buses in Kings Heath, linking to the city centre and other local centres. The number 50 service, which operates between Birmingham City Centre and Druids Heath, is the most frequent, serving the High Street roughly every 5 minutes between 06:30 and 19:30. The 11A / 11C (anticlockwise / clockwise) Outer Circle service operates a circular route around Birmingham from Acocks Green via Erdington, Dudley Road, Selly Oak and Kings Heath. During the weekday, the frequency of the 11A serving Kings Heath is approximately every 10-15 minutes with services operating between 05:49 and 23:57.

There are also services on the boundary roads of the study area which are detailed in **Table 2.2**. These services may also be affected by the changes proposed as part of the Places for People scheme.

**Table 2.2: Bus services on the boundary roads**

Boundary Road	Services	Operator	Start / End Locations	Weekday Frequency
Wake Green Road	41	National Express	Acocks Green – Queen Elizabeth Hospital	1 bus per hour
Yardley Wood Road	2	National Express	Birmingham city centre – Maypole	3 buses per hour
	3	National Express	Birmingham city centre – Yardley Wood	3 buses per hour
Vicarage Road	27	National Express	Cofton Hackett - Maypole	3 buses per hour
	35	National Express	Birmingham city centre - Hawkesley	6 buses per hour
	69	Diamond Bus	Brandwood Park - Solihull	1 bus per hour
	76	National Express	Solihull - Northfield	3 buses per hour

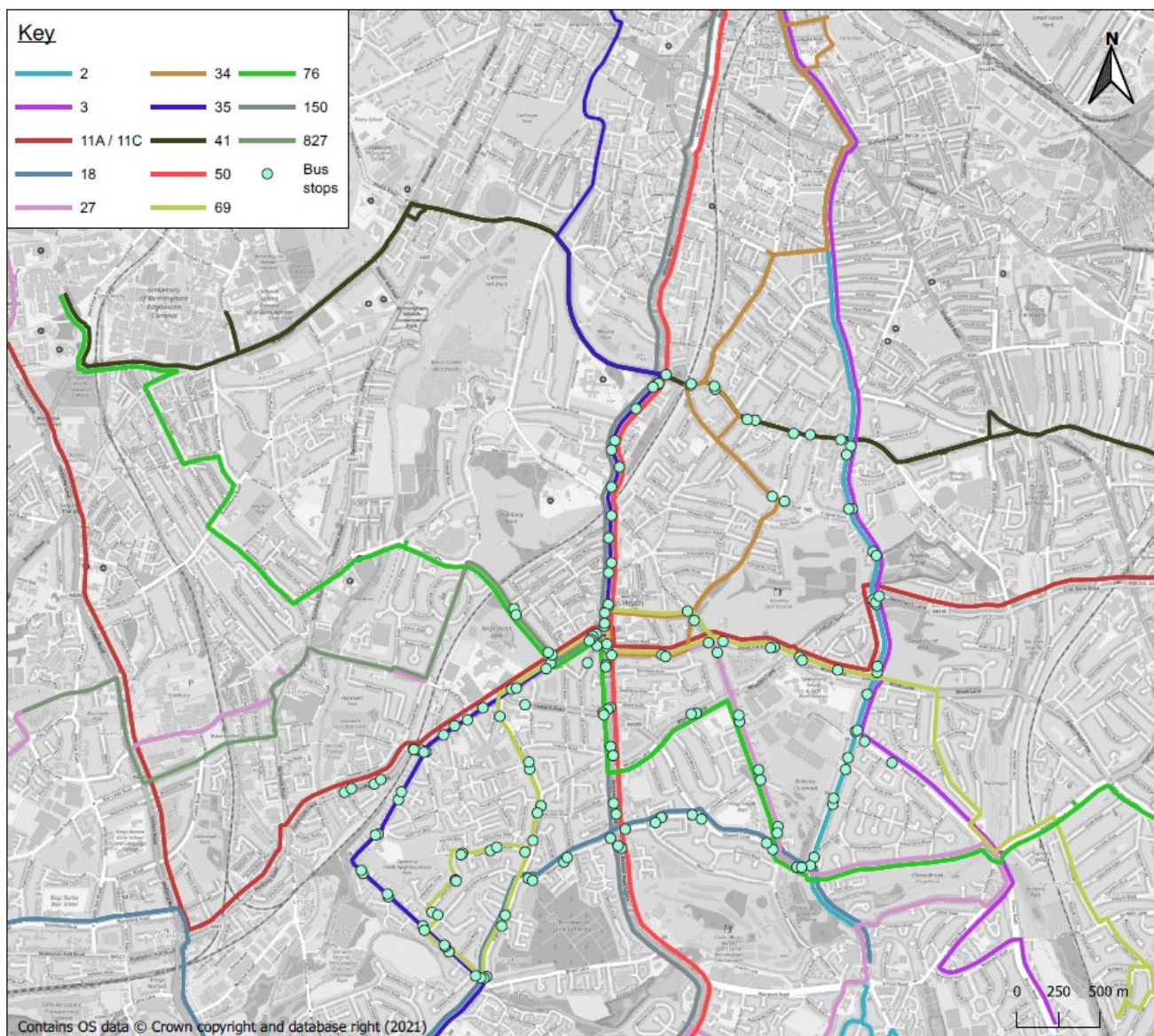


Figure 2.7: Bus routes and stops, Kings Heath

### 2.5.2 Bus Journey Times

Bus journey time data was provided by TfWM for the 50 service (both directions between Birmingham city centre and Bells Lane) and the 11A service (Birmingham Outer Circle anti-clockwise loop). Journey time data was collected for the month of February 2020 as well as between 9<sup>th</sup> September 2021 and 9<sup>th</sup> October 2021 to analyse the change in bus journey times for these services pre and post Covid-19 restrictions. A breakdown of the journey times in minutes and seconds for these routes is shown in **Table 2.3**. It should also be noted that the 11A route was changed in 2021 and so direct comparisons between February 2020 and September / October 2021 cannot be made.



**Table 2.3: Bus Journey Time Comparison**

Service	Direction	Route	February 2020	February 2020	Sept 21 – Oct 21	Sept 21 – Oct 21	Difference	Difference
			(pre Covid-19)	(pre Covid-19)	(post Covid-19)	(post Covid-19)	(post Covid-19 minus pre Covid-19)	(post Covid-19 minus pre Covid-19)
			AM	PM	AM	PM	AM	PM
<b>50</b>	<b>Outbound</b>	Whole route	36:53	49:39	36:19	47:59	-34 seconds	-1 minute 40 seconds
		St Marys Row – Wheelers Lane	08:45	12:27	09:22	13:18	+37 seconds	+51 seconds
	<b>Inbound</b>	Whole route	44:59	46:58	40:43	44:16	-4 minutes 16 seconds	-2 minutes 42 seconds
		Wheelers Lane – St Marys Row	12:24	12:15	12:01	13:05	-23 seconds	-50 seconds
<b>11A</b>	<b>Inbound</b>	Whole route*	01:53:10	02:42:22	01:34:17	02:06:28	-18 minutes 53 seconds	-35 minutes 54 seconds
		Cartland Road – Coldbath Road	07:20	09:02	00:08:02	09:35	+42 seconds	+33 seconds

\*Note: 11A route changed in 2021 and therefore journey times are not directly comparable.

The 50 service experienced improvements in journey times in both directions in the AM (07:30-09:30) and PM (15:30-18:30) peaks across the whole route. However, analysing the journey times within the Kings Heath and Moseley area, specifically between St Marys Row and Wheelers Lane, journey times increased in both peaks in the outbound direction and in the PM peak in the inbound direction by 7%. The journey time in the AM peak between Wheelers Lane and St Marys Row improved by 3%.

## 3 Traffic Modelling

The core Places for People proposals for Kings Heath & Moseley have been modelled using the Birmingham Strategic Transport Model (Saturn) to understand the impact of traffic reassignment that the proposals are likely to have on the wider road network in and around Kings Heath.

The strategic transport model was provided by BCC for this assessment. The model is built in Saturn and version 11.5.05 was used to undertake the modelling. The 2020 highway and transport network was assessed with 2018 matrices. It is assumed there was no background traffic growth between 2018 and 2020. It should be noted that this model is unvalidated and does not represent all physical constraints within the network and therefore cannot accurately represent levels of congestion that is seen in Kings Heath and Moseley. However, the model aims to identify patterns of re-assignment rather than to provide a detailed understanding of network performance.

The Places for People scheme aims to reduce short trips made by car in Kings Heath and Moseley, encouraging the use of sustainable modes. The Saturn model is a highway-only model and cannot account for any potential modal shift that may occur as a result of the scheme being implemented. Therefore any references to changes in traffic flows represent demand in the worst-case scenario.

As this work was being undertaken alongside the public consultation on phase two of the Places for People project, a preferred option had not been identified at this time. Therefore, it was agreed with BCC to model Option A (to the west of Kings Heath High Street) and Option D (to the east of Kings Heath High Street) (see **Figure 1.1** and **Figure 1.2** or more details about these options). Option A was chosen to be modelled as this represented the layout of the filters that was implemented as part of phase one in 2020, and Option D was chosen as this option represented the 'worst-case scenario' as Billesley Lane is closed to through traffic.

### 3.1 Scenarios

The following scenarios have been modelled within Birmingham's Strategic Transport Model:

- Base (2020 network, 2018 matrices) AM & PM peaks – this scenario represents the existing base model without the Places for People scheme;
- Do Something 1 (DS1) (2020 network, 2018 matrices) AM & PM peaks – this takes the base model and makes changes to reflect the proposed Option A and Option D as outlined in **Figure 1.1** and **Figure 1.2**;
- Do Something 2 (DS2) (2020 network, 2018 matrices) AM & PM peaks – this takes the DS1 model and makes changes to reflect the proposed complementary highway measures outlined in **Section 5**; and

### 3.2 Modelling Outputs

Outputs were extracted for the AM and PM 'Base' (without the Places for People scheme) and 'Do Something 1' (Option A & D - with the Places for People scheme) scenarios. The demand flow differences were analysed to understand the change in re-assignment of vehicles as a result of the proposed Places for People scheme.

Demand flows are the amount of traffic wishing to travel between origins and destinations (i.e. the matrix that is assigned to the network), regardless of whether there is sufficient network capacity to accommodate these trips, whereas actual flows take into account the network capacity. Actual flows tend to be lower than demand flows in congested networks, therefore by using demand flows, this assessment can be considered to be a worst-case scenario.

The outputs from the model identified roads and junctions which are likely to see increases in demand as a result of Places for People scheme to be able to develop a list of possible complementary highway measures to improve the flow of traffic. The complementary measures are detailed later in this report, in **Section 4**.

Flow difference plots showing the increases and decreases in traffic in the DS1 scenario compared to the 'Base' option are shown in **Figure 3.1** and **Figure 3.2**.

The green lines represent a reduction in traffic as a result of the Places for People scheme and the red lines represent increases in traffic. The volume of traffic increase/decrease should be interpreted lightly as the results show the change in a single hour over an average of a three hour peak period in passenger car units (PCUs). For reference, one car is equal to one PCU, whereas one heavy goods vehicle is equal to 2.4 PCUs and a bus is 3 PCUs. This therefore means that a change of 100 PCUs does not necessarily equate to a change of 100 vehicles. As the model is a strategic level model, it is difficult to determine the full operational impacts on particular junctions without further junction modelling using suitable operational software.

**DS1 minus Base - AM Flow Differences**

The largest increases are seen on the A435 High Street in both directions between Valentine Road and Wheelers Lane. This is in part due to Valentine Road between Ashfield Road and Springfield Road being made one-way northbound.

Flow decreases are shown on interior roads within the Places for People scheme, particularly on Valentine and Springfield Road. Flow increases are seen on the boundary roads of Wake Green Road, Yardley Wood Road, Coldbath Road and Wheelers Lane.

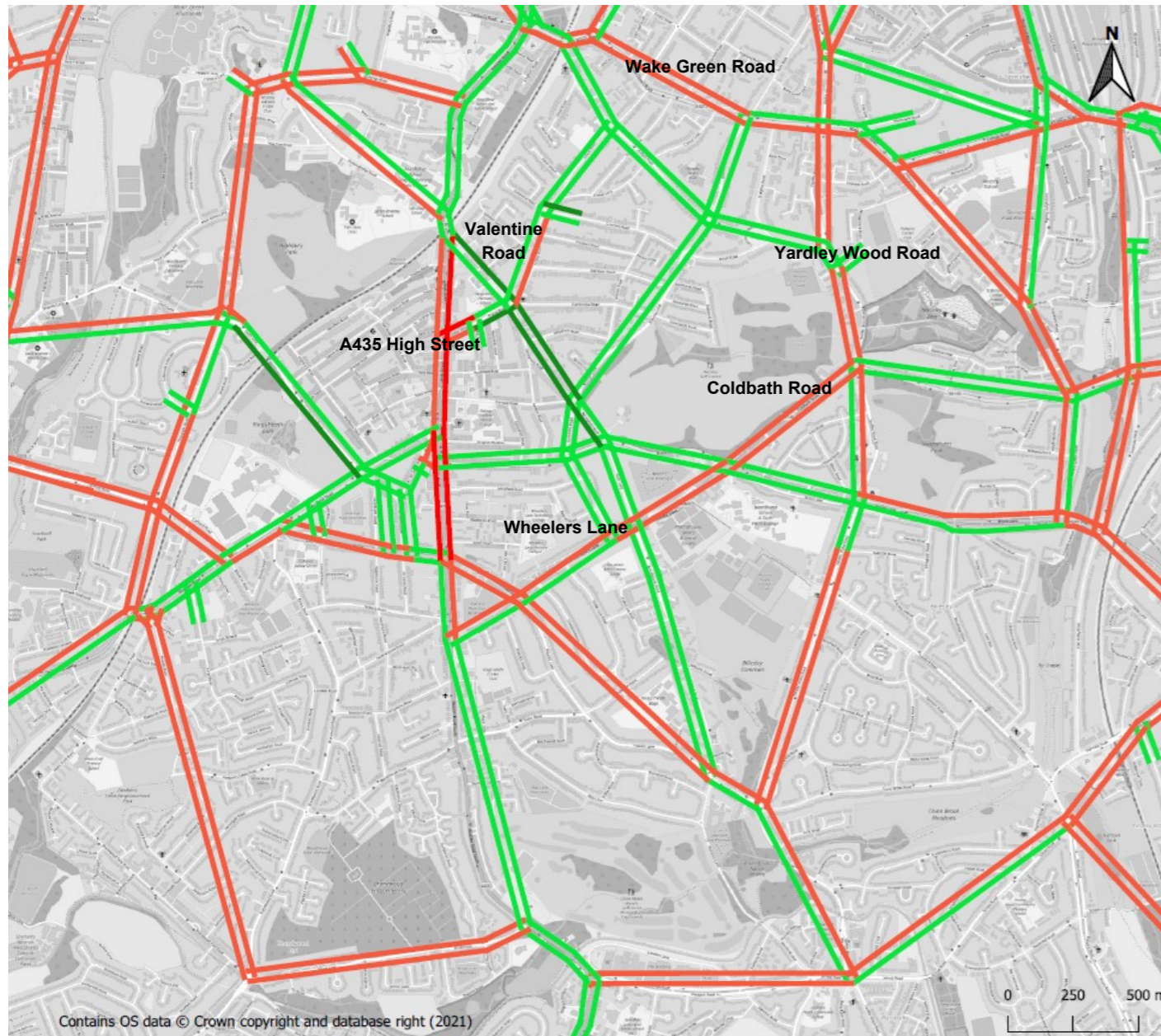
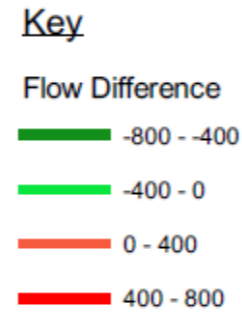


Figure 3.1: DS1 minus Base - Flow Differences AM Peak

**DS1 minus Base - PM Flow Differences**

The changes in traffic distribution are similar to that shown in the AM peak. Notably, there is a larger decrease southbound on Billesley Lane in the PM peak compared with the AM peak.

Flow increases are shown on the A435 High Street particularly in the southbound direction. The boundary roads of Wake Green Road, Yardley Wood Road, Coldbath Road and Wheelers Lane also see increases in traffic.

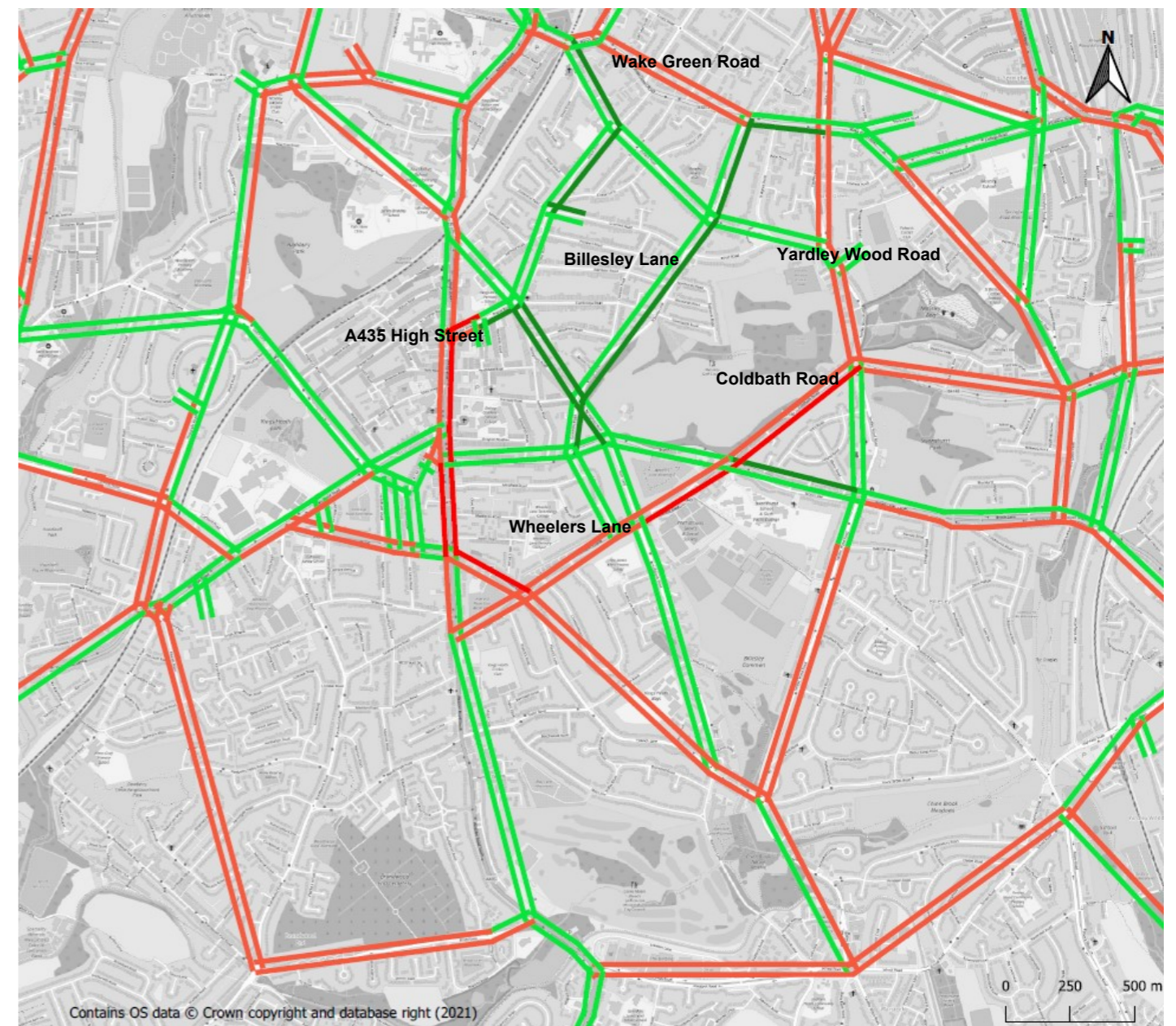
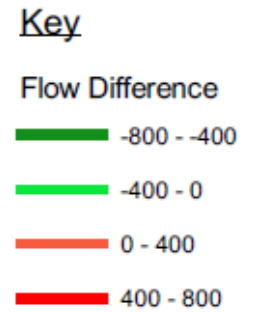


Figure 3.2: DS1 minus Base - Flow Differences PM Peak

Analysis of these plots provides an insight into how traffic flows are likely to change with the Places for People scheme in place, by indicating which alternative routes drivers are likely to take to avoid the modal filters. It should be noted that the model does not capture the likely travel behavioural change e.g. modal shift or changes to working patterns associated with Covid-19 and implementing the Places for People scheme; it will only reassign existing drivers on the network to a new route. Therefore, the traffic flow difference plots are likely to reflect the worst-case scenario and should be used as an indication of the pattern of traffic changes on the road network rather than as guides to the exact volume of change.

The difference plots help identify roads and junctions where increases in traffic are likely to be and would therefore benefit from complementary highway measures being implemented to minimise the impact of change.

### 3.3 Locations identified for Complementary Highway Measures (CHMs)

Analysis of the flow difference plots have identified roads within Kings Heath and Moseley that are likely to see increases in traffic as a result of the Places for People project. These roads include:

- A435 High Street;
- Wake Green Road;
- Yardley Wood Road;
- Coldbath Road;
- Wheelers Lane; and
- Howard Road East.

There are also several roads that do not necessarily show a large increase in traffic volumes; however, existing congestion issues mean that any slight increase may exacerbate the problem. These roads include:

- Vicarage Road;
- Queensbridge Road; and
- Moor Green Lane.

The following section outlines the long-list of CHMs identified.

## 4 Complementary Highway Measures

### 4.1 Long List

Analysing the modelling outputs against the baseline analysis has identified key roads and junctions that will likely experience an increase in traffic demand as a result of implementing the Places for People scheme. Some locations, for example Vicarage Road, will not necessarily experience an increase in traffic as a result of re-assignment; however, current capacity and traffic conditions are constrained and therefore warrant the exploration of complementary highway measures.

### 4.2 Sifting Process

A sifting criteria was developed, and the sifting process was carried out using the broad principles of the Treasury Green Book approach. This was a qualitative assessment based on the following criteria:

- **Cost / Affordability** – low, medium or high cost to deliver and maintain;
- **Deliverability** – including complexity of construction, TROs;
- **Stakeholder acceptability** – wider stakeholders and local residents and businesses;
- **Impact on buses** – impact on bus journey times, reliability and safety;
- **Impact on non-motorised users (NMU's)** – impact on pedestrians and cyclists;
- **Network operation** – impact to the road network; and
- **Air quality** – impact on air quality.

Each of the measures were scored on a scale of 1-5 (1 being low benefit, high cost and 5 being low cost and high benefit). The full scoring sheet is available in **0**.

**Table 4.1** outlines the long list of complementary measures that have been proposed and the justification for being sifted out where applicable.

**Table 4.1: Long list of Complementary Highway Measures**

ID	Location	Complementary Highway Measure	Sifted out	Reason for being sifted out
1	A435 High Street	Review junction layout to accommodate increased right turn flow (at junction of Poplar Road)		
2		Remove the right turn pocket at the junction of Poplar Road and the central hatched area to create space for a bus stop bypass	X	Removing the right turn pocket and creating a bus bypass will not mitigate the queuing.
3		Move inbound bus stop outside Kings Heath Library into the layby and re-configure the two disabled bays		
4		Rationalise bus stops	X	Limited opportunity to rationalise bus stops along the High Street. Also, considered to be not acceptable by bus operators.
5		Reduce the length and re-locate the inbound bus stop closer to the junction of Vicarage Road		
6		Enforce parking restrictions		
7		Re-locate all on-street parking to side streets	X	Unlikely to receive stakeholder buy-in
8		Re-purpose Covid-19 social distancing measures to be multi-purpose widened footway, loading and / or disabled parking		
9		Link the pedestrian crossing (north of Vicarage Road) with the signalised junction at Vicarage Road		
10		Restrict right turn from A435 into Kingsfield Road	X	Would be difficult to enforce. Right turn from Vicarage Road onto A435 High Street is being permitted and therefore, that removes the need for vehicles to turn right into Kingsfield Road to turn around to head southbound on High Street.
11		Create an attractive public realm area outside Kings Heath Library including trees to shield library users from congestion	X	Does not meet the aim of the mitigation measures to improve traffic flow
12	Vicarage Road	Allow buses to travel ahead (NB) in left turn lane (at junction of Vicarage Road)		
13		Reduce the left turn flare on the southern approach to the junction with Vicarage Road by 30m		
14		Provide Advanced Stop Lines (ASLs)		
15		Provide a pedestrian crossing on the northern arm of the junction of A435 High Street / Vicarage Road		
16		Permit the right turn from Vicarage Road onto A435		
17		Review signal timings at A435 / Vicarage Road		
18		Review signal timings at Vicarage Road / Grove Road		
19		Upgrade method of control at A435 / Vicarage Road to MOVA		

ID	Location	Complementary Highway Measure	Sifted out	Reason for being sifted out
20		Upgrade method of control at Vicarage Road / Grove Road to MOVA		
21		Restrict parking during peak periods		
22	High Street / Howard Road East	Review junction layout to accommodate larger right turn pocket (Howard Road East)	X	No space available within the existing junction to create a larger right turn pocket.
23		Review signal timings at A435 / Howard Road East		
24		Upgrade method of control at A435 / Howard Road East to MOVA		
25		Provide Advanced Stop Lines (ASLs) at the junction of A435 / Howard Road East		
26	Coldbath Road	Option 1: Make Coldbath Road one-way north-eastbound		
27		Option 2: Make Coldbath Road one-way north-eastbound with traffic calming (chicanes) and with-flow cycle lane		
28		Option 3: Make Coldbath Road one-way north-eastbound with traffic calming (chicanes) and two-way cycle lane		
29		Option 4: Filter Coldbath Road so it is only available for access with contraflow cycles		
30	Yardley Wood Road	Review signal timings at Yardley Wood Road / Wake Green Road		
31		Upgrade method of control at Yardley Wood Road / Wake Green Road to MOVA		
32		Provide pedestrian crossings on all arms of Yardley Wood Road / Wake Green Road		
33		Provide Advanced Stop Lines (ASLs) at the junction of Yardley Wood Road / Wake Green Road		
34		Restrict parking during peak periods	X	There is not currently an issue with parking along Yardley Wood Road and therefore, parking restrictions would be costly and may offer little to no benefit.
35	St Mary's Row / Wake Green Road	Allow right turn from A435 into St Mary's Row		
36		Review signal timings at A435 / St Mary's Row		
37		Upgrade method of control at A435 / St Mary's Row to MOVA		
38		Provide Advanced Stop Lines (ASLs) at the junction of A435 / St Mary's Row		
39		Restrict parking during peak periods	X	There is not currently an issue with parking along Wake Green Road and therefore, parking restrictions would be costly and may offer little to no benefit.
40	Queensbridge Road	Review signal timings at A435 / Queensbridge Road		



ID	Location	Complementary Highway Measure	Sifted out	Reason for being sifted out
41		Upgrade method of control at A435 / Queensbridge Road to MOVA		
42		Provide Advanced Stop Lines (ASLs) at the junction of A435 / Queensbridge Road		
43		Restrict parking during peak periods	X	Other measures are being looked at as part of a separate study to restrict parking during school drop-off / pick-up.
44		Yellow box at junction of Valentine Road		
45	Allens Croft Road / Brandwood Park Road / Broad Lane	Restrict parking during peak periods	X	This is further away from the PFP area and traffic increases are minimal. It is unlikely that this measure would be accepted by local residents due to limited off-street parking available.
46		Move bus stops into layby where feasible on Brandwood Park Road		
47	Moor Green Lane	Restrict parking during peak periods	X	There is not currently an issue with parking along Moor Green Lane and therefore, parking restrictions would be costly and may offer little to no benefit.
48	Avenue Road	Removal of parking and installation of protected cycle lanes where possible	X	Unlikely to receive stakeholder buy-in
49	Strategic Road Network	Provide signage on the Strategic Road Network (SRN) recommending HGV and coach routes go via A38 Bristol Road. Install signage on Alcester Road stating they are not suitable routes for HGVs and coaches to the city centre		
50	Alcester Road (Moseley)	Extend the hours of operations of existing bus lanes on Alcester Road to at least 7am-7pm or ideally 24 hours to support buses, taxis and cycles		
51	Kings Heath area wide	Improved cycle routes to Kings Heath, Moseley and Hazelwell stations.	X	Does not meet the aim of the CHMs to improve traffic flow. Funding may be available through the Department for Transport's Cycle Rail grant.
52		Provide secure cycle storage (including cycle hangars on residential terraced streets) within the Places for People scheme and at key destinations including schools, community centres and stations	X	Does not meet the aim of the CHMs to improve traffic flow. Some cycle parking is already being delivered in Kings Heath – see section below for details.

A number of other schemes are simultaneously being delivered by Birmingham City Council and Transport for West Midlands that will support and complement the Places for People scheme. These schemes include:

- Cross-city bus – improvements to bus priority between Druids Heath and the city centre. This scheme includes installation of bus lanes and bus priority to the south of Kings Heath along the Alcester Road;
- Cycle parking – Implementation of ‘Sheffield’ cycle stands on Billesley Lane, Dad’s Lane, Swanshurst Lane and Vicarage Road; and
- Car free school streets (CFSS) – implementation of CFSS at St Dunstan’s School and Colmore Infant and Junior Schools. This means that Drayton Road and Colmore Road (between Howard Road and Tenbury Road) will become a pedestrian and cycle zone for agreed times (of between 30 minutes and 1 hour) at the start and end of the school day. Motor vehicles cannot drive in this zone between these times unless they have a permit.

## 5 Traffic Modelling of CHMs

The shortlisted complementary highway measures were modelled, where possible, using the Saturn model to identify the impacts on the road network and assignment of traffic. This is the DS2 scenario. Not all CHMs have been modelled as the Saturn model is a high-level strategic model that does not allow for the assessment of minor changes to the highway network.

The measures that were modelled within Saturn include:

- Increased right turn pocket at Poplar Road;
- Signal optimisation at signalised junctions;
- Permitting the right turn from A435 onto St Mary's Row;
- Permitting the right turn from Vicarage Road onto A435 High Street; and
- Permitting buses to travel ahead (NB) in left turn lane (at the junction of Vicarage Road).

Flow difference plots showing the change from DS1 scenario to DS2 scenario for the AM and PM peaks are shown in **Figure 5.1** and **Figure 5.2** overleaf.

The majority of the complementary highway measures aim to improve traffic flow by increasing capacity and removing / minimising physical bottlenecks. Although many of these measures have not been able to be modelled within Saturn, they are likely to have a positive impact on traffic flow locally.

A measure identified to improve traffic flows at signalised junctions is to upgrade the method of control to MOVA. This is an advanced traffic signal control method, which is more responsive to changes in traffic flows than the more basic fixed time of Vehicle Actuation (VA) methods of control. Using a series of detectors on the approach to a junction, MOVA can calculate which approaches have the longest queues as well as identifying when the flow over a stopline is no longer saturated. Using this information, it looks to switch between signal stages to maximise the throughput of traffic.

It has not been possible to model the impacts of upgrading junctions to MOVA using Saturn; however, studies have shown that MOVA can improve junction performance by 10%<sup>1</sup>. Other studies suggest that MOVA can provide delay savings between 10% and 20%<sup>2</sup>.

As the model is a strategic level model, it is difficult to determine the full operational impacts on particular junctions without further junction assessment using dedicated operational modelling software.

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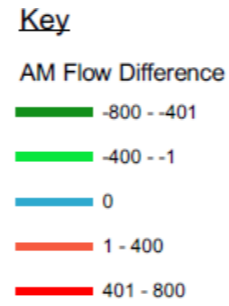
<sup>1</sup> Trlsoftware.com. 2018. Effective & Reliable Traffic Control. [online] Available at: <<https://trlsoftware.com/wp-content/uploads/2018/08/MOVA.pdf>> [Accessed 24 November 2021].

<sup>2</sup> Trlsoftware.com. 2018. Effective & Reliable Traffic Control. [online] Available at: <<https://trlsoftware.com/wp-content/uploads/2018/08/MOVA.pdf>> [Accessed 24 November 2021].

**DS2 minus DS1 - AM Flow Differences**

Permitting the right turn from the A435 onto St Mary's Row creates increased demand on St Mary's Row and Wake Green Road, in particular on the approach to the junction of Yardley Wood Road. As a result, some vehicles wishing to turn right at the junction of Yardley Wood Road may look to re-route via Billesley Lane and St Agnes Road to avoid the queuing.

Increases are also seen southbound on Yardley Wood Road as a result of Coldbath Road being made one-way north-eastbound and vehicles re-routing via Yardley Wood Road and Brook Lane.



**DS2 minus DS1 - PM Flow Differences**

A similar pattern of re-assignment is shown in the PM peak as it is in the AM peak with increases on St Mary's Row and Wake Green Road due to the right turn being permitted from the A435 onto St Mary's Row.

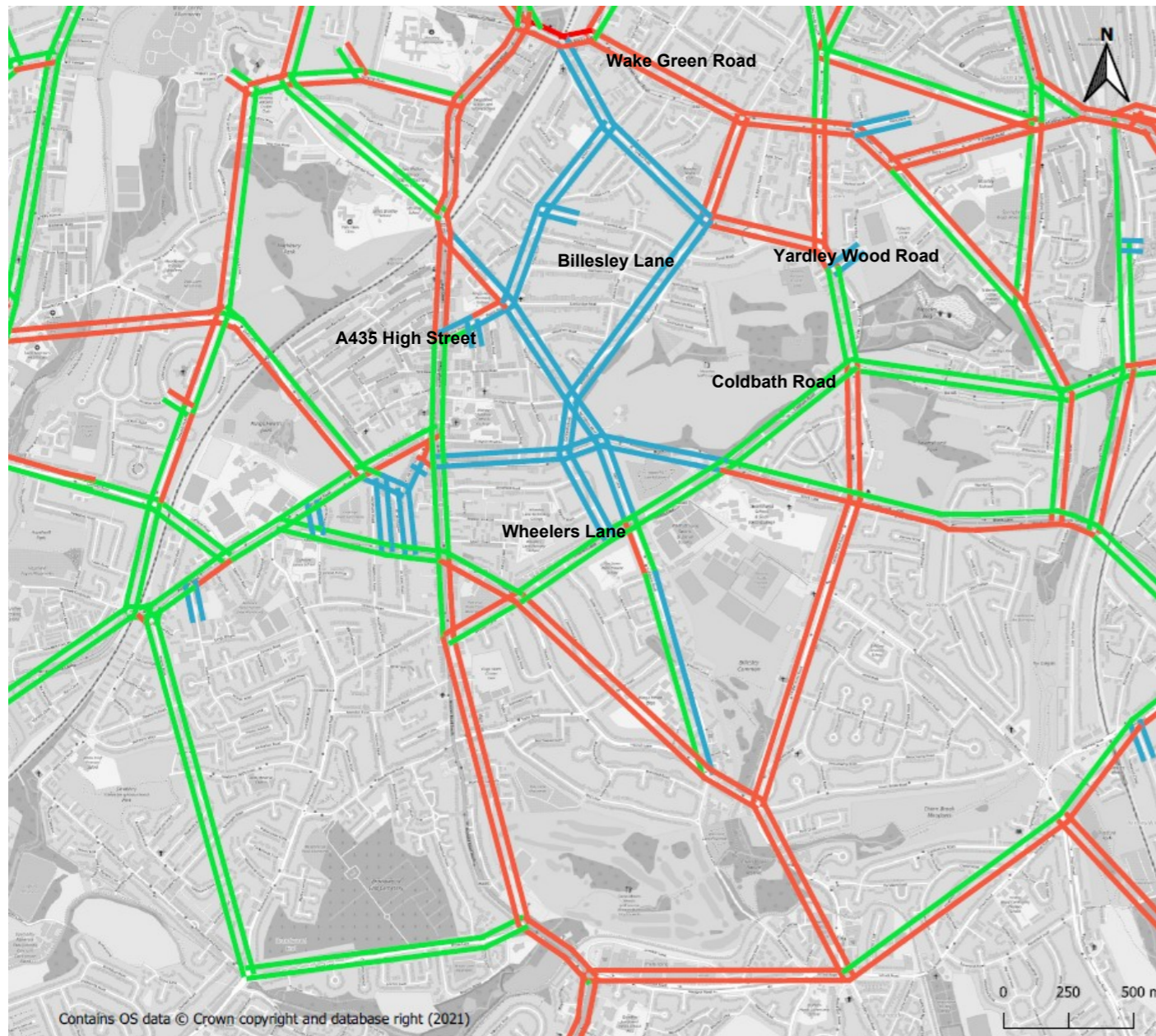
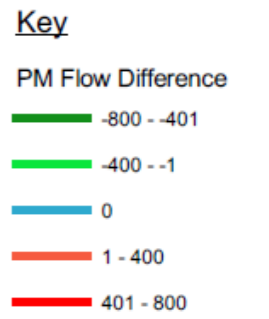


Figure 5.1: DS2 minus DS1 - Flow Differences AM Peak

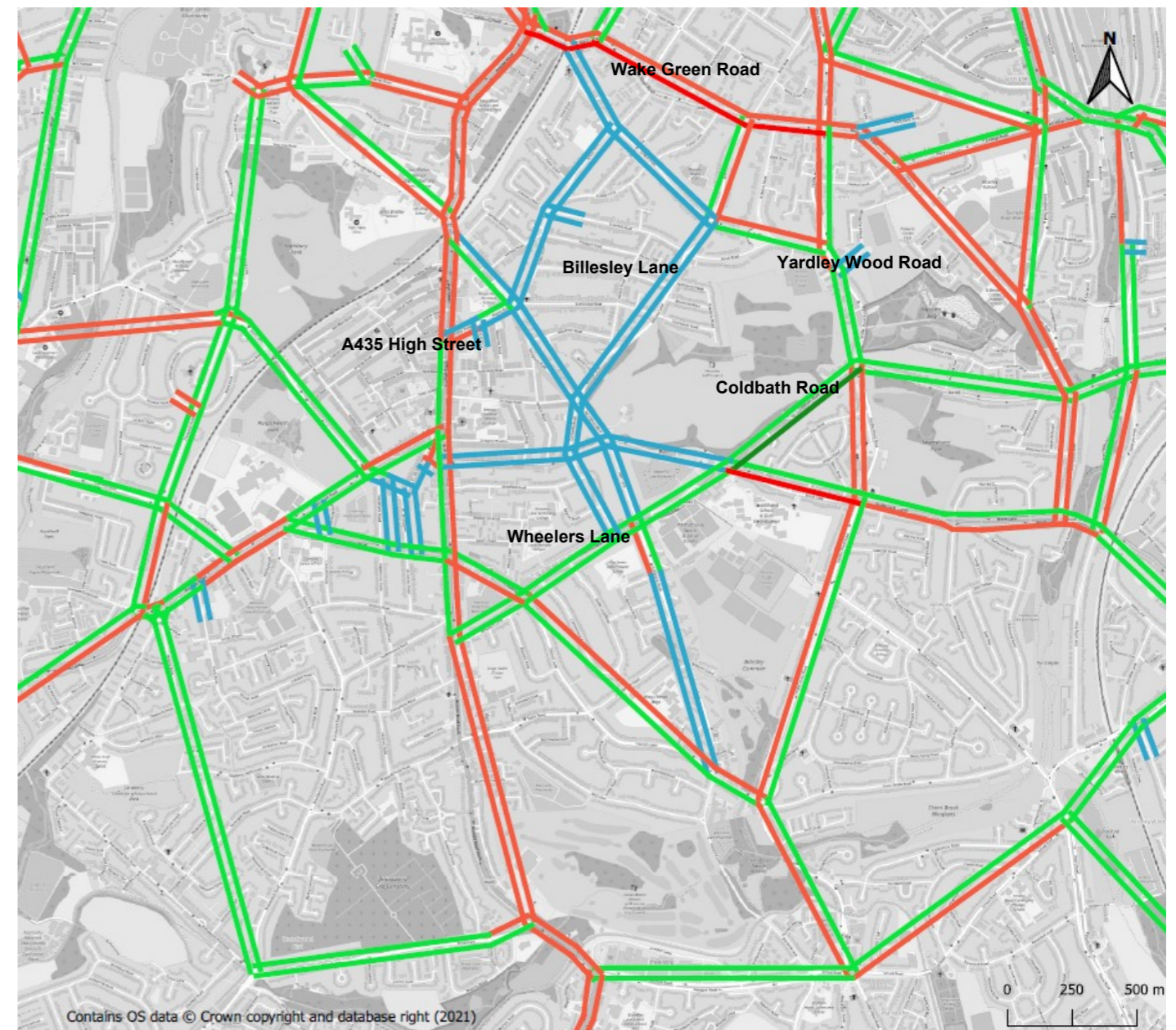


Figure 5.2: DS2 minus DS1 - Flow Differences PM Peak

## 6 Air Quality

This high-level assessment comments, where possible, on the impacts to air quality of the Kings Heath and Moseley Places for People scheme. In the absence of air quality modelling and a comprehensive understanding of the predicted change in traffic volumes, it has not been possible to quantify the predicted level of air quality change as a result of the Places for People scheme, or the addition of the CHMs. The review discusses some schemes in other parts of the UK which have been in place for longer, in order to provide a longer-term view of their likely impacts. A qualitative assessment of the air quality benefits / disbenefits of the CHMs has also been undertaken and summarised in this section.

The assessment of the air quality impacts of interventions such as the Places for People scheme can be challenging for several reasons. The implementation of a scheme rarely occurs in isolation from other changes that affect air quality; for example policy measures which affect traffic flows and / or the fleet mix, changes which may affect traffic flows such as roadworks, or the impacts of travel restrictions to control the Covid-19 pandemic. Traffic changes in response to Places for People schemes may be relatively small and difficult to detect by measured pollutant concentrations. In addition, changes in meteorology will also affect air quality concentrations meaning a reliance on monitoring has confounding factors. Since March 2020 it has been particularly challenging to isolate changes to traffic flows (and resulting air quality) caused by the Covid-19 pandemic. For these reasons, in order to assess air quality changes of these schemes, modelling rather than monitoring is often undertaken. Modelling still has uncertainties associated with it, particularly in relation to input data and how representative it is of a 'before' and 'after' implementation scenario.

The Kings Heath Places for People scheme has been partially implemented concurrent to changing Covid-19 travel restrictions, and at the same time as the Birmingham Clean Air Zone, which is likely to impact changes in both traffic flows and the vehicle fleet at a wider scale than the city centre. Implementation of phase 2 of the scheme is being consulted on. Phase 1 of the Places for People scheme has also been implemented alongside a complementary package of measures set out within the Birmingham Transport Plan.

Air quality modelling has not been undertaken for Kings Heath Places for People, but in order to comment on the likely impacts of the scheme, a brief review of assessments for similar schemes has been undertaken. This review concludes that in Enfield and Lambeth the overall impact on NO<sub>2</sub> was negligible with some receptors experiencing increases and some receptors experiencing decreases.

In the case of Kings Heath, high level strategic traffic modelling for the second phase of the scheme has been undertaken, which details the likely impacts on vehicle numbers on specific road links. However, as mentioned in the previous section, caution should be taken when interpreting the outputs from the model as the model is unconstrained and therefore, does not represent existing conditions in Kings Heath. The model also does not take into consideration modal shift, which longer-term studies have shown does take place over time. Traffic modelling suggests that the predicted levels of change in traffic flow for phase 2 of the Kings Heath Places for People scheme are at a different magnitude to the above schemes. For this reason, it is difficult to draw on the conclusions of previous assessments and apply them to Kings Heath.

The increases in traffic predicted for the Kings Heath Places for People phase 2 along peripheral roads will cause increases in emissions, which in turn will increase concentrations at locations which are adjacent to the peripheral roads. In locations where reductions in traffic is predicted, air quality will improve. It is judged that a scheme of this type should have a quantitative assessment undertaken, which takes into account traffic re-distribution, location of relevant exposure, and dispersion conditions (including 'canyon' effects). It is likely that increases in traffic such as those predicted would also cause changes to speed and congestion on periphery roads, which will also impact emissions.

Diffusion tube data collected in Kings Heath and shown in **Section 2.1**, indicates that current air quality concentrations within the Kings Heath Places for People area are well below air quality objectives for NO<sub>2</sub>.

The CHMs have all been assessed based on their likely air quality benefit, which is set out in **0**. Many of the measures that aim to improve the flow of traffic will have a positive impact on air quality due to a reduction in queuing. However, improvements to the performance of a junction may result in more vehicles using this route and therefore, more vehicles resulting in higher emissions and therefore having an overall neutral impact. Overall, it is likely that the air quality impact on the CHMs will be neutral, as the number of trips are not expected to decrease as a result of the measures.

## 7 Concept Designs

Concept designs have been drawn up for all options that have been shortlisted. The designs present a high-level indicative arrangement for each intervention. These should be refined through subsequent design development stages.

The option to re-purpose Covid-19 social distancing measures to be multi-purpose widened footway, loading and/or disabled parking has not been drawn up as part of this study as this is already being developed by BCC and funding has been identified.

The following concept designs have been developed:

- Increased right turn pocket at the junction of High Street / Poplar Road;
- Realigned inbound bus stop and disabled bays outside Kings Heath Library;
- Re-located and reduced length of inbound bus stop close to Vicarage Road;
- Reduced left turn flare on the southern approach to the junction with Vicarage Road;
- Pedestrian crossing on the northern arm of the High Street / Vicarage Road junction;
- Right turn permitted from Vicarage Road onto A435 Alcester Road South;
- Right turn permitted from A435 onto St Mary's Row;
- Restricted parking during peak periods on Vicarage Road;
- Pedestrian crossing on all arms of Wake Green Road / Yardley Wood Road junction;
- Yellow box at the junction of Alcester Road / Valentine Road;
- Bus stops moved into laybys on Brandwood Park Road;
- Advanced stop lines at:
  - Alcester Road / St Mary's Row;
  - Alcester Road / Queensbridge Road;
  - Wake Green Road / Yardley Wood Road;
  - High Street / Vicarage Road; and
  - A435 Alcester Road South / Howard Road East.

Other measures have been included as annotations on the concept design plans including:

- Linked pedestrian crossing north of Vicarage Road with signalised junction;
- Buses permitted to travel ahead (NB) in left turn lane at junction of Vicarage Road;
- Review signal timings and upgrade method of control to MOVA at:
  - A435 Alcester Road / St Mary's Row;
  - A435 Alcester Road / Queensbridge Road;
  - Wake Green Road / Yardley Wood Road;
  - High Street / Vicarage Road;
  - Vicarage Road / Grove Road; and
  - A435 Alcester Road South / Howard Road East.

Four options have been developed for Coldbath Road as this was identified as a key road which would not be appropriate to accommodate the increases in vehicles as a result of the Places for People scheme. These options range from low cost, simple construction to make Coldbath Road one-way to more sophisticated designs including a two-way cycle lane.

The concept designs are shown in **0**

## 8 Indicative Costs

The indicative costs associated with constructing the short list of measures identified in **Section 7** have been calculated and are shown in **Table 8.1**.

Construction costs have been calculated using the Spons Pricebook for Civil Engineering Works (2021). As the preferred options are only at the concept design stage, for any item not yet designed, such as highway drainage, the costs are based on a set of assumptions. Likewise, allowances have been made for costs associated with preliminaries, statutory undertakers, detailed design, site supervision, traffic management, and restricted working hours. In addition, a 44% risk / contingency allowance has been made, which is a value typically applied transport schemes as an optimism bias at the concept design stage in support of business cases. In this case the same value has been applied to allow for currently unforeseen risks. The costs have been rounded to the nearest £1000.



Table 8.1: Indicative Costs Summary

ID	Description	Civils Cost (incl Preliminaries @ 20%)	Statutory Undertakers (30%)	Design (15%)	Site Supervision (10%)	Traffic Management (20%)	Restricted Working Hours (10%)	Risk / Contingency (44%)	Total (2021 base price)	Total upper cost (2021 base price)
46	Brandwood Park Road (bus stops in layby)	£174,000.00	£52,000.00	£26,000.00	£17,000.00	£35,000.00	£17,000.00	£141,000.00	£462,000	
26	Coldbath Road Option 1	£25,000.00	£8,000.00	£4,000.00	£3,000.00	£5,000.00	£3,000.00	£20,000.00	£68,000.00	
27	Coldbath Road Option 2	£65,000.00	£19,000.00	£10,000.00	£6,000.00	£13,000.00	£6,000.00	£53,000.00	£172,000.00	
28	Coldbath Road Option 3	£292,000.00	£88,000.00	£44,000.00	£29,000.00	£58,000.00	£29,000.00	£238,000.00	£778,000.00	
29	Coldbath Road Option 4	£22,000.00	£7,000.00	£3,000.00	£2,000.00	£4,000.00	£2,000.00	£18,000.00	£58,000.00	
3	High Street (Station Road NB bus stop)	£31,000.00	£9,000.00	£5,000.00	£3,000.00	£6,000.00	£3,000.00	£25,000.00	£82,000.00	
1	High Street / Poplar Rd (increased right turn pocket)	£6,000.00	£2,000.00	£1,000.00	£1,000.00	£1,000.00	£1,000.00	£5,000.00	£17,000.00	
5, 9, 12-16, 21	High Street / Vicarage Road	£71,000.00	£21,000.00	£11,000.00	£7,000.00	£14,000.00	£7,000.00	£58,000.00	£189,000.00	
42, 44	Queensbridge Road / Alcester Road / Valentine Road	£7,000.00	£2,000.00	£1,000.00	£1,000.00	£1,000.00	£1,000.00	£6,000.00	£19,000.00	
35, 38	Alcester Road / St Mary's Row	£7,000.00	£2,000.00	£1,000.00	£1,000.00	£1,000.00	£1,000.00	£6,000.00	£19,000.00	
25	Alcester Road / Howard Road East	£6,000.00	£2,000.00	£1,000.00	£1,000.00	£1,000.00	£1,000.00	£5,000.00	£17,000.00	
32, 33	Yardley Wood Road / Wake Green Road	£58,000.00	£17,000.00	£9,000.00	£6,000.00	£12,000.00	£6,000.00	£47,000.00	£155,000.00	
50	Alcester Road (Moseley) bus lanes	£9,000.00	£3,000.00	£1,000.00	£1,000.00	£2,000.00	£1,000.00	£8,000.00	£25,000.00	
36, 37	Alcester Road / St. Mary's Row (signal costs)	£80,000.00	£24,000.00	£12,000.00	£8,000.00	£-	£8,000.00	£58,080.00	£190,000.00	£238,000.00
		£100,000.00	£30,000.00	£15,000.00	£10,000.00	£-	£10,000.00	£72,600.00		
30, 31	Wake Green Road / Yardley Wood Road (signal costs)	£100,000.00	£30,000.00	£15,000.00	£10,000.00	£-	£10,000.00	£72,600.00	£238,000.00	£356,000.00
		£150,000.00	£45,000.00	£22,500.00	£15,000.00	£-	£15,000.00	£108,900.00		
23, 24	Alcester Road South / Howard Road (signal costs)	£80,000.00	£24,000.00	£12,000.00	£8,000.00	£-	£8,000.00	£58,080.00	£190,000.00	£238,000.00
		£100,000.00	£30,000.00	£15,000.00	£10,000.00	£-	£10,000.00	£72,600.00		
17, 19	Alcester Road / Vicarage Road (signal costs)	£80,000.00	£24,000.00	£12,000.00	£8,000.00	£-	£8,000.00	£58,080.00	£190,000.00	£238,000.00

ID	Description	Civils Cost (incl Preliminaries @ 20%)	Statutory Undertakers (30%)	Design (15%)	Site Supervision (10%)	Traffic Management (20%)	Restricted Working Hours (10%)	Risk / Contingency (44%)	Total (2021 base price)	Total upper cost (2021 base price)
		£100,000.00	£30,000.00	£15,000.00	£10,000.00	£-	£10,000.00	£72,600.00		
18, 20	Vicarage Road / Grove Road (signal costs)	£100,000.00	£30,000.00	£15,000.00	£10,000.00	£-	£10,000.00	£72,600.00	£238,000.00	£356,000.00
		£150,000.00	£45,000.00	£22,500.00	£15,000.00	£-	£15,000.00	£108,900.00		
40,41	Alcester Road / Queensbridge Road (signal costs)	£100,000.00	£30,000.00	£15,000.00	£10,000.00	£-	£10,000.00	£72,600.00	£238,000.00	£356,000.00
		£150,000.00	£45,000.00	£22,500.00	£15,000.00	£-	£15,000.00	£108,900.00		

## 9 Network Resilience

The implementation of Places for People Phase 1, to the west of Kings Heath High Street, coincided with a two-way closure of Shutlock Lane for utilities upgrades, which caused considerable congestion in Kings Heath, which was largely attributed to the restrictions in Kings Heath. This highlighted the need to consider the impact of similar works following the implementation of the wider Places for People scheme, and whether there is sufficient network resilience to cope with changes in travel behaviour during temporary road works.

A number of network resilience options have been modelled within Saturn to understand the potential changes to traffic volumes on key roads around Kings Heath and Moseley, where temporary measures may need to be considered to keep traffic flowing.

Assessing the impact of temporary road closures was modelled in two ways:

- Severing the link to represent a two-way closure; and
- Reducing the link capacity to represent a partial closure with temporary traffic signals allowing two-way movements.

It should be noted that as the model is unconstrained, it does not reflect all physical bottlenecks in the network. This means that the model may reassign traffic to roads close to the closure that do not have sufficient capacity and so in reality reassignment may actually occur across a wider network. Network resilience assessments were carried out for key roads in the area, as listed below. It should be noted that the road closures represent theoretical closures and are not based on any planned works.

- A435 High Street (between Vicarage Road and Poplar Road);
- Yardley Wood Road (between St Agnes Road and Coldbath Road);
- Wake Green Road (between Church Road and Billesley Lane);
- Wheelers Lane (between Howard Road East and Portman Road); and
- Moor Green Lane (between Holders Lane and Dad's Lane).

Flow difference plots have been developed comparing DS2 scenario and DS2 with roadworks scenarios. These are shown in **0**

### 9.1 Summary of Outputs

The outputs shown in **0** show that fully closing sections of road will result in greater re-assignment than partial closures. Decreases in traffic flows are common immediately surrounding the closure, as vehicles re-assign across the wider network. Increases are likely around the boundary roads, in this case, Wake Green Road, Yardley Wood Road and Moor Green Lane with vehicles looking to find alternate routes to avoid the closures. Overall, there is a general re-assignment of traffic onto adjacent routes to the east and west of the closures.

## 10 Summary & Recommendations

### 10.1 Summary

This report details the process of developing complementary highway measures to improve the traffic flow in Kings Heath and Moseley by improving traffic flows through removing physical bottlenecks and optimising signal timings. Alongside increasing capacity to improve the flow of traffic, consideration should be given to developing and promoting sustainable travel alternatives, thus reducing car dominance and alleviating congestion.

Baseline data was collected to help build an understanding of the existing traffic and highway conditions in Kings Heath and the wider study area to identify measures to support traffic flow and sustainable and active modes of transport.

Birmingham Strategic Transport Model (Saturn) has been used to help identify roads and junctions with greater re-assignment as a result of the Places for People scheme, to develop complementary highway measures to improve the flow of traffic. Analysis of the modelling of the Places for People scheme (DS1) suggest that the Places for People scheme will:

- Re-assign journeys to adjacent corridors, creating an increase of vehicles on sections of the A435 High Street, Wake Green Road, Yardley Wood Road and Coldbath Road; and
- Decrease the number of vehicles using local roads within the Places for People area.

While the roads within the Places for People scheme are likely to see improved air quality, the increases in traffic predicted as a result of the Places for People scheme along peripheral roads may cause increases in emissions in these locations, which may in turn increase pollutants at locations adjacent to the peripheral roads. It is recommended to undertake a further quantitative assessment to determine the likely impacts on air quality in Kings Heath and Moseley as a result of the scheme.

The complementary highway measures are likely to have a positive impact on local traffic flow, by improving the flow of traffic, and reducing vehicle emissions. For measures that are to be implemented, further detailed modelling should be undertaken to refine and improve the scheme design and to assess the impacts to the junction or network.

An assessment of the likely traffic reassignment during planned roadworks was carried out. This determined locations where temporary measures should be considered to maintain the flow of traffic.

### 10.2 Recommendations

It is recommended that BCC identify funding sources available to help deliver some of these measures, which will help to improve the flow of traffic in and around Kings Heath and Moseley, whilst supporting sustainable alternatives including walking and cycling. It has been identified that a grant is available from the Department for Transport to improve cycle facilities at railway stations.

Any junction improvements measures to be taken forward will require further junction modelling to determine localised impacts.

It is recommended that a quantitative air quality assessment should be undertaken for a scheme of this magnitude, which takes into account traffic re-distribution, location of relevant exposure, and dispersion conditions (including 'canyon' effects).

## Appendix A Long List of Complementary Highway Measures Sifted

## Appendix B Concept Designs

## Appendix C Network Resilience Outputs