Technical Note 08: ILHL Transport Response Document

Project:	Tavistock Place / Torrington Place TRO
Prepared by:	John Russell
Approved by:	
Date:	17th October 2017

84 North Street
Guildford
Surrey
GU1 4AU

Tel: 01483 531300
www.motion.co.uk

1.0 Introduction

1.1 This technical note provides a response to transport evidence submitted by the London Borough of Camden ("the Council") in relation to the Inquiry being held into the *"The Camden (Torrington Place to Tavistock Place) (Prescribed Routes, Waiting and Loading Restrictions and Loading Places) Traffic Order [2017]"*. Specifically it responds to the following documents:

i. Proof of Evidence – Louise McBride

ii. Proof of Evidence – Simi Shah

iii. Proof of Evidence – Tony Dichev

iv. Proof of Evidence – David Carter

v. LBC Response Document dated 5th October 2017

2.0 Transport Modelling

2017 Transport Model

2.1 The 2017 transport model prepared by the Council does not assess the Trial, modifications to the Trial or alternatives to the Trial. The modelling has been used to provide forecast traffic volumes on streets following network interventions. Having reviewed the above documentation I remain unable to locate a subsequent assessment of the impacts arising from the forecast changes in traffic volumes.

2.2 The transport model has not been used to identify the changes in through traffic on local streets in the Bloomsbury Box. By the Bloomsbury Box I describe an area which is bound by Euston Road in the north, Grays Inn Road in the east, A40 in the south and Tottenham Court Road in the west.

2.3 The model has not been used to identify changes in route choice made by local traffic. I define local traffic as traffic that has an origin and / or a destination within the Bloomsbury Box. I understand that the 2017 transport modelling has been undertaken primarily to predict traffic volumes on roads following the implementation of the West End Project (WEP). I understand this purpose to have been to allow the Inspector to compare the relative merits of the Trial, modifications to the Trial and alternatives to the Trial following the implementation of the WEP.

2.4 The traffic forecasts provided on figure 5 and figure 6 of Mr Carter's evidence show the change in traffic volumes on streets which might be expected to occur if the direction of traffic along the Corridor is reversed relative to the traffic volumes which might be expected to occur should the Trial be made permanent.

2.5 The transport modelling presented in Mr Carter's evidence does not show changes in traffic volumes which are expected to occur as a consequence of the Trial relative to the non-Trial situation. The evidence provided by Mr Carter does not enable the Inspector to compare the relative merits of the Trial, modifications to the Trial and alternatives to the Trial following the implementation of the WEP.

2015 Transport Model

2.6 I understand that the 2015 transport modelling was intended to inform the Council what the changes in traffic volumes on streets might be as a consequence of introducing the Trial. The 2015 transport modelling provided traffic volume forecasts with and without the WEP implemented.

2.7 The 2015 transport modelling considered the Trial only. No modifications to the Trial or alternatives to the Trial were considered.

2.8 No assessment of the traffic or environmental impacts arising from the changes in traffic volumes predicted by the 2015 transport modelling was undertaken.

2016 Transport Model

2.9 Mr Carter confirmed that there was a transport model prepared in late 2016 / early 2017. I understand from Mr Carter that information from this 2016 transport model was used to inform the Cabinet Report of 22nd February 2017. The completeness and robustness of the 2016 transport model is unknown. The data extracted from the 2016 transport model is unknown.

Transport Modelling Summary

2.10 The Council had an opportunity in 2015 to use the 2015 transport model to assess the relative merits of the Trial, modifications to the Trial and alternatives to the Trial using traffic volume forecasts and traffic pattern data extracted from the 2015 transport model. The Council did not undertake this assessment work.

2.11 The Council had an opportunity in early 2017 to use the 2016 transport model to assess the relative merits of the Trial, modifications to the Trial and alternatives to the Trial using traffic volume forecasts and traffic pattern data extracted from the 2016 transport model. The Council did not undertake this assessment work.

2.12 The Council had an opportunity in mid-2017 to use the 2017 transport model to assess the relative merits of the Trial, modifications to the Trial and alternatives to the Trial using traffic volume forecasts and traffic pattern data extracted from the 2017 transport model. The Council did not undertake this assessment work.

2.13 As a consequence there is no assessment of the impacts of changes in road traffic arising from the Trial, modifications to the Trial or alternatives to the Trial presented to this Inquiry in order that the relative merits of the Trial, modifications to the Trial or alternatives to the Trial can be considered.

2.14 It is therefore not possible for the Inspector or other parties at the Inquiry to reach an informed conclusion on the relative merits of the Trial, modifications to the Trial and alternatives to the Trial in terms of the traffic and environmental impacts arising from the changes in traffic flows based on the transport model information presented to this Inquiry. As an example the diagram shown on ILHL43 shows that with the Trial in place and traffic travelling in an eastbound direction only along the Corridor that there is expected to be an increase in westbound traffic on Euston Road between Grays Inn Road and Judd Street. However there is no further assessment of what this traffic constitutes – e.g. local traffic diverting or through traffic.

3.0 Survey Data

Automatic Traffic Counts

3.1 The Council collected one week's worth of classified traffic data in May 2015 before the Trial was implemented using automatic traffic counters (ATC's) located at 78 locations. Having one week's data allows changes in the day to day volumes of traffic to be considered and an average weekday traffic (AWT) value to be determined. The use of AWT evens out changes in the day to day volumes of traffic over the course of a week and time periods during the surveys when the ATC counters were not functioning.

3.2 The Council collected two week's worth of classified traffic data in May 2016 during the Trial using ATCs at the same 78 locations that the 2015 ATC data was collected at. Again this data can be used to determine AWT.

3.3 It is possible to compare the traffic data collected in May 2015 (before the Trial was implemented) and May 2016 (during the Trial) to obtain an understanding of changes in traffic volumes between these two dates (increases and decreases) on the 78 streets on which ATC data was collected and from this an understanding of what the changes in traffic volumes on streets attributable to the Trial might be.

Traffic Queue surveys

3.4 The Council has provided me with traffic queue survey data which was collected during the Trial on Tuesday 10th May 2016 at seven locations. For the Tavistock Square / Bedford Way and Woburn Place / Tavistock Square junctions the length and pattern of queues is similar to the queue surveys independently undertaken by ILHL on 24th May 2016.

3.5 There were no traffic queue surveys undertaken before the Trial was implemented.

3.6 There is therefore no surveyed traffic queue data to show how queues might have altered (magnitude and location) during the Trial compared to before the Trial was implemented.

Journey Time Surveys

3.7 No journey time surveys were undertaken either before the Trial was implemented or during the Trial.

3.8 There is therefore no observed data to show how journey times might have altered during the Trial compared to before the Trial was implemented.

Classified Turning Counts

3.9 The Council undertook classified turning counts (CTC) at 23 junctions in May 2016 during the Trial. The CTCs provide information on the volume and type of traffic making each turning manoeuvre at the junctions at which the CTCs were undertaken. They therefore provide more information on vehicle patterns than the ATC data which simply counts the traffic passing a point on street in each direction.

3.10 There were no CTC surveys undertaken prior to the Trial being implemented.

3.11 There is therefore no surveyed traffic data to show how traffic patterns at the 23 junctions surveyed during the Trial might have altered (magnitude and location) during the Trial compared to before the Trial was implemented.

Determination of through traffic

3.12 There were no automatic number plate recognition (ANPR) surveys or equivalent undertaken either before the Trial was implemented or during the Trial.

3.13 There is therefore no observed data to determine the volume of through traffic prior to the Trial being implemented and how through traffic has reacted to during the Trial.

Traffic Data Collection Summary

3.14 There was insufficient (see 4.2 below) data collected before the Trial was implemented and during the Trial (I note that more data was collected during the Trial but this has no pre-Trial reference data) to enable the changes in road traffic volumes and changes in traffic patterns arising between 2015 (pre-Trial) and 2016 (during the Trial) to be analysed and an assessment undertaken of what the traffic impacts of the Trial might be.

4.0 Traffic Impacts of the Trial

4.1 I agree with both Mr Dichev and Mr Carter that implementing an experimental order provides an outstanding opportunity to assess the impacts of transport infrastructure interventions such as the Trial in order to determine what the effects of that intervention might be. I further agree that the assessment of transport infrastructure interventions implemented through an experimental order provides more reliable evidence than the assessment of infrastructure interventions using mathematical modelling techniques.

4.2 However as there has been insufficient factual data collected pre-Trial and during the Trial the following remains unknown:

i. The volume of through traffic pre-Trial;

ii. The volume of through traffic during the Trial;

iii. Changes in journey times; and

iv. Changes in queues and delays.

4.3 In essence the survey data available is insufficient to determine if the Trial has been a success in reducing the volume of through traffic within the Bloomsbury Box or if there has been, the extent to which there has been a positive or detrimental impact on traffic queues and delays. In this context, a conclusion on the traffic impacts of the Trial based on observed evidence will need to rely substantially on anecdotal evidence regarding changes in traffic patterns.

4.4 In the absence of before and during Trial data for comparison, the traffic assessment of the Trial, modifications to the Trial and alternatives to the Trial could be undertaken within the 2017 transport model. The 2017 transport model could be modified to create a "reference case" against which the Trial, modifications to the Trial and alternatives to the Trial could be compared in order to establish the relative merits of the Trial, modifications to the Trial and alternatives to the Trial. For clarity the reference case would comprise the pre-Trial highway layout (two-way) for the Corridor.

4.5 Systra in their evidence has compared modifications to the Trial and alternatives to the Trial against the Trial only. That is insufficient. Therefore a further traffic modelling exercise will need to be undertaken in any event in order to assess the Trial, modifications to the Trial and alternatives to the Trial in the context of implementation of WEP. The 2017 transport model could be modified to create a "future reference case" against which the Trial, modifications to the Trial and alternatives to the Trial could be compared in order to establish the relative merits of the Trial, modifications to the Trial and alternatives to the Trial. For clarity the future reference case would comprise the pre-Trial highway layout (two-way) for the Corridor, WEP and Brunswick Square.

4.6 As it stands, there is:

i. No comparison of changes in traffic flows and patterns arising from the Trial, modifications to the Trial and alternatives to the Trial on a common pre-Trial base.

ii. No comparison of changes in traffic flows and patterns arising from the Trial, modifications to the Trial and alternatives to the Trial on a common pre-Trial base with WEP implemented.

4.7 The Inspector is therefore faced with a dichotomy of anecdotal evidence regarding traffic impact which is:

i. The Council, University of London, London Cycling Campaign, Camden Cycling Campaign and other supporters claim that there has been little change in journey times. This assertion is based on a combination of anecdotal evidence and review of google maps data. There is no recorded evidence provided regarding actual vehicle journey times on street either during the Trial or before the Trial; and

ii. ILHL, London Ambulance Service (Camden Ambulance Station), London Taxi Driver's Association, the National Union of Rail, Maritime and Transport, Confederation of Passenger Transport UK, University College Hospital and other objectors claiming that there has been an increase in delay and journey times. This assertion is based on anecdotal evidence of commercial drivers travelling in the area on a daily basis and businesses scheduling deliveries. There is no recorded evidence provided regarding actual vehicle journey times on street either during the Trial or before the Trial

4.8 One area of common ground by all parties is that there has not been a reduction in journey times.

5.0 Validation and Calibration

Fit for Purpose

5.1 The poor fit of the pre-matrix estimation calibration (see meeting notes which form ILHL9 with the term "poor fit" being the Council's description not mine) caused me concern. In the lack of validation against independent data I asked to see the pre- and post matrix estimation zone value differences. Review of pre- and post matrix estimation zone values provides a check that no individual zone has a suffered unexpected increase or decrease in trips to and from that zone as a result of the matrix estimation process. This could indicate a problem with the network / zoning system.

5.2 At the time of preparing this response note I had received a spreadsheet showing percentage change in the number of trips in a zone pre- and post matrix estimation. I did not have any actual numbers in order to determine whether the percentage change was material or not. Importantly I had not been provided with a legible zone plan for referencing which geographic area each zone represented. I provide what I received at **Appendix 1**.

5.3 My concerns regarding the matrix estimation therefore remain.

5.4 I understand from the evidence presented by Mr Carter that an independent validation exercise is being undertaken now.

5.5 On receipt of the validation data, and subject to that validation showing that it meets industry best practice, I may be able to be satisfied that the base model is fit for purpose.

Modelling Anomalies

5.6 Notwithstanding whether the model is fit for purpose or not, I remain concerned with model route choice for:

i. Great Russell Street – the model plot at ILHL43 appears to show no change in westbound traffic with the Trial implemented;

ii. Euston Road between Judd Street and Grays Inn Road - the model plot at ILHL43 appears to show an increase in westbound traffic with the Trial implemented; and

iii. Judd Street - the model plot at ILHL43 appears to show no change in northbound traffic with the Trial implemented.

5.7 I appreciate that the Inquiry has only been provided limited traffic forecast information from the modelling exercise and that the traffic forecasts have come from a model that assumes that the WEP is implemented. Notwithstanding this I am concerned in these three instances that the traffic modelling appears not to be replicating what the Council's traffic surveys suggest has happened in "real life" which is that traffic has increased westbound on Great Russell Street and north bound on Judd Street and that traffic volumes have not materially altered in the westbound direction on Euston Road between Judd Street and Grays Inn Road.

5.8 There may well be an explanation why the model is forecasting route choice as it is at these three locations. However despite asking, I have not been provided with this explanation nor has the Inspector been provided with this reason.

6.0 Consideration of Reverse Trial against the Trial

6.1 Louise McBride in her evidence sets out the following three reasons for introducing the Trial:

1.9 Due to the high use of the route by cyclists, there were a number of concerns associated with the pre-trial layout on the Corridor. The trial was developed to address these problems:

a) The two-way cycle track was too narrow to cope with the volume of cyclists using the route and as a result, there was over-crowding, instances of collisions between cyclists, and observed and reported near misses. Thus, it was likely that the existing width of the cycle track was discouraging more people from cycling. The Trial was intended to make cycling along the Corridor safer and less stressful, thereby making it accessible to more people, of all ages and abilities.

b) Further, the pre-Trial road layout did not provide a safe and attractive environment for the large number of people walking in the area and had a poor casualty record, as set out in the Council's July 2015 decision report (see CD6/1). The Trial was intended to improve the environment for pedestrians, making the street more intuitive to navigate, and easier to cross.

c) Finally, as part of the approval for the WEP, centred around Tottenham Court Road, the Council decided to bring forward proposals for the Trial which were already in development, as it was felt that the Trial layout would help to reduce the anticipated effects of rerouting traffic.

6.2 Considering each of these three reasons in the context of reversing the flow of traffic along the Corridor so that motor traffic can only travel westbound between Judd Street and Gower Street:

a. The cycle lane configuration implemented during the Trial would be retained. The significantly increased Cycle Level of Service that I agree with the Council that the Trial has delivered would be retained contributing towards making cycling along the Corridor safer and less stressful, thereby making it accessible to more people, of all ages and abilities.

b. The potential to improve infrastructure for pedestrians through the provision of wider footways would be retained. I agree with the Council that this potential to improve infrastructure for pedestrians would significantly improve the low level of service pedestrians currently experience along the Corridor.

c. According to Figures 5 and 6 of Mr Carter's evidence, Torrington Place would continue to benefit from relief of through traffic with a direct route retained for local traffic with an origin or destination on Huntley Street.

6.3 In addition to these benefits, reversing the flow of traffic along the Corridor so that motor traffic can only travel westbound between Judd Street and Gower Street would also:

i. Retain full, safe access to the taxi rank on Tavistock Place for groups protected by the Equality Act (2010) through physical disability. This would be achieved through taxis being able to stop immediately adjacent to the footway on the passenger side of the vehicle on which side specialist equipment is located to assist physically disabled people to enter and exit the vehicle.

ii. Result in a lower volume of traffic displacing from the Corridor to adjacent local streets compared to the Trial with the associated traffic impacts and traffic related environmental impacts. It is an agreed position by all participants that traffic volumes along the Corridor were higher in the westbound direction than the eastbound direction with the westbound direction accounting for around 60% of daily traffic volumes.

iii. Reinstate highway capacity on streets connecting to the Corridor that has been removed as a consequence of the eastbound only direction of traffic thereby reducing the intensity of queues that have been observed during the Trial and which anecdotal evidence from local residents and businesses suggest were not so intense prior to the Trial being implemented.

6.4 Having regard to these three matters in comparative terms the eastbound only layout has demonstrable disadvantages.

6.5 I accordingly again invite the Inspector, on the strength of the evidence available, to recommend that the Council does not make the Order but trials a westbound only scheme and carries out an assessment of its traffic effects and of the air quality effects of the Trial scheme and the westbound scheme on the study area as a whole for comparative assessment purposes.

6.6 In the alternative and in the light of the acknowledgement in Appendix D 2.1.2 (**CD6/2**)

"removing one direction of motor traffic from the Torrington Place to Tavistock Place 'corridor' (the corridor) would increase the usable width potentially available for pedestrians and cyclists while providing an adequate lane width for motor traffic in a single direction; and that this would be the case "in its current configuration [eastbound motor traffic only] or reversed [westbound motor traffic only]"; and

"that the proposal to reverse the direction of the one-way motor traffic flow in the corridor posed 'no major geometric design changes' to the ETO layout"

6.7 I would urge the Inspector to recommend the 'modification' of the Trial scheme to provide for westbound motor traffic only and its confirmation with that traffic arrangement.

7.0 Other Matters

Information Note on Modelling

7.1 Following my meeting with the Council on 29th June 2017 (notes of this meeting are provided as **ILHL9**) I was provided with a list of the options that the Council were intending on testing. This list is provided at **Appendix 2**. The list clearly sets out a sequential test in which a future reference case model is developed first which includes the WEP and the Brunswick Square project. The Trial and the modification to the Trial such that traffic flows are reversed to westbound only are then each assessed separately against this future reference case so the relative merits of each can be directly compared.

7.2 On 24th August 2017 I received further correspondence from the Council enclosing a copy of a draft report entitled "Torrington Tavistock Corridor Modelling" and dated 27th June 2017 (provided at **Appendix 3**). I had discussed the contents of this report with the Council when I met them on 29th June 2017 and 16th August 2017. Again this draft report clearly sets out a sequential test in which a future reference case model is developed first which includes the WEP and the Brunswick Square project. The Trial and the modification to the Trial such that traffic flows are reversed to westbound only are then each assessed separately against this future reference case so the relative merits of each can be directly compared.

7.3 It is in this context that I had been seeking to reach agreement with the Council with regards to transport modelling on the lead up to the Inquiry; that is with the Trial and the reversed Trial (and any other modifications or alternatives the Council wished to test) tested against a common reference case so that the relative merits of the Trial and reversed Trial could be considered on a common basis.

7.4 The evidence provided by Mr Carter in figures 3, 4, 5, 6, 7 and 8 of his evidence however compares modifications and alternatives to the Trial against a reference case which includes the Trial. This is contrary to the approach that the Council advised me would be taken and which I had fully supported (see **ILHL9**).

Pedestrian Comfort

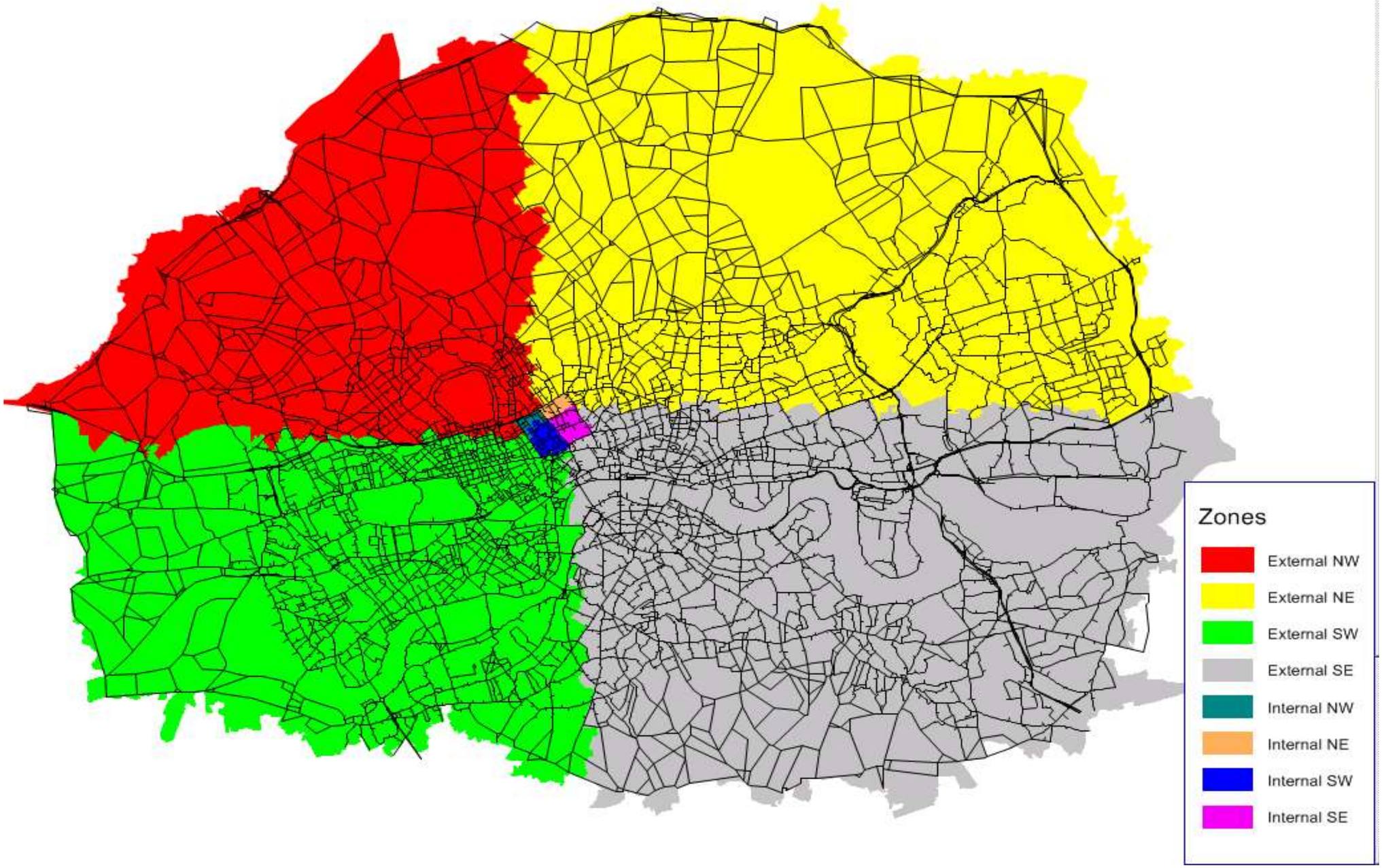
7.5 I understand that under cross-examination, Mr Hartley of London Living Streets referred to pedestrian "comfort". The standard approach in London to assessing pedestrian comfort is set out in the document "Pedestrian Comfort Guidance for London" which is published by Transport for London.

7.6 I note that the assessment of pedestrian comfort set out Pedestrian Comfort Guidance for London does not take road traffic volumes into consideration. The application of Pedestrian Comfort Guidance for London to the Corridor is set out in the evidence of Mrs Shah (appearing for the Council) in paragraphs 4.18 to 4.30 of her evidence during which Mrs Shah makes no reference to road traffic volumes.

7.7 The application of the Pedestrian Comfort Guidance for London to the Corridor would therefore result in the same level of pedestrian comfort whether road traffic is restricted to eastbound only (as the Trial) or westbound only (the Trial but with road traffic flows reversed) notwithstanding that it is common ground between the Council and ILHL that there would be a higher volume of traffic using the Corridor if road traffic were restricted to westbound movements only.

Appendix 1

Matrix Information


Zones
External NW
External NE
External SW
External SE
Internal NW
Internal NE
Internal SW
Internal SE

64	Name	Name	Car+Taxi	LGV	HGV
1	External NE	External NE	19	-1	-1
2	External NE	External NW	-17	3	-31
3	External NE	External SE	93	3	-2
4	External NE	External SW	-75	-5	-272
5	External NE	Internal NE	3	-1	-10
6	External NE	Internal NW	-28	0	-17
7	External NE	Internal SE	177	36	-1
8	External NE	Internal SW	-42	6	-10
9	External NW	External NE	59	8	-36
10	External NW	External NW	35	4	-5
11	External NW	External SE	209	9	-19
12	External NW	External SW	48	-1	-22
13	External NW	Internal NE	-23	0	-2
14	External NW	Internal NW	71	11	-2
15	External NW	Internal SE	27	-1	-1
16	External NW	Internal SW	126	36	22
17	External SE	External NE	-32	-12	1
18	External SE	External NW	97	-60	-45
19	External SE	External SE	89	4	-5
20	External SE	External SW	-401	29	-105
21	External SE	Internal NE	0	0	1
22	External SE	Internal NW	55	0	2
23	External SE	Internal SE	39	0	-9
24	External SE	Internal SW	-19	12	5
25	External SW	External NE	16	-8	-56
26	External SW	External NW	107	7	48
27	External SW	External SE	97	1	-45
28	External SW	External SW	-68	6	-20
29	External SW	Internal NE	-7	0	-12
30	External SW	Internal NW	34	7	5
31	External SW	Internal SE	-4	-1	-48
32	External SW	Internal SW	50	27	6
33	Internal NE	External NE	1	0	-1
34	Internal NE	External NW	-5	3	-3
35	Internal NE	External SE	-2	8	-8
36	Internal NE	External SW	-15	3	-14
37	Internal NE	Internal NE	-4	0	0
38	Internal NE	Internal NW	-2	0	0
39	Internal NE	Internal SE	19	0	1
40	Internal NE	Internal SW	-7	0	0
41	Internal NW	External NE	-20	5	0
42	Internal NW	External NW	-41	9	3
43	Internal NW	External SE	-4	1	-4
44	Internal NW	External SW	-21	18	9
45	Internal NW	Internal NE	-3	0	0
46	Internal NW	Internal NW	-8	0	0
47	Internal NW	Internal SE	1	0	0
48	Internal NW	Internal SW	11	0	0
49	Internal SE	External NE	64	2	0
50	Internal SE	External NW	-10	-2	-4
51	Internal SE	External SE	21	3	2
52	Internal SE	External SW	-29	1	-30
53	Internal SE	Internal NE	49	0	0
54	Internal SE	Internal NW	24	0	1
55	Internal SE	Internal SE	76	0	0
56	Internal SE	Internal SW	8	1	6
57	Internal SW	External NE	-13	1	-9
58	Internal SW	External NW	-22	-8	-14
59	Internal SW	External SE	22	1	-14
60	Internal SW	External SW	-29	18	-17
61	Internal SW	Internal NE	-8	0	-1
62	Internal SW	Internal NW	18	0	2
63	Internal SW	Internal SE	-17	0	-2
64	Internal SW	Internal SW	51	1	6

64	Name	Name	Car+Taxi	LGV	HGV
1	External NE	External NE	0%	0%	0%
2	External NE	External NW	0%	0%	-2%
3	External NE	External SE	1%	0%	0%
4	External NE	External SW	-4%	-3%	-32%
5	External NE	Internal NE	2%	-72%	-41%
6	External NE	Internal NW	-69%	17%	-71%
7	External NE	Internal SE	128%	630%	-2%
8	External NE	Internal SW	-42%	36%	-33%
9	External NW	External NE	1%	1%	-3%
10	External NW	External NW	0%	0%	0%
11	External NW	External SE	17%	6%	-6%
12	External NW	External SW	1%	0%	-1%
13	External NW	Internal NE	-28%	1%	-12%
14	External NW	Internal NW	50%	435%	-8%
15	External NW	Internal SE	23%	-39%	-5%
16	External NW	Internal SW	103%	259%	271%
17	External SE	External NE	-1%	-1%	0%
18	External SE	External NW	11%	-29%	-16%
19	External SE	External SE	0%	0%	0%
20	External SE	External SW	-6%	4%	-7%
21	External SE	Internal NE	-1%	0%	8%
22	External SE	Internal NW	207%	127%	79%
23	External SE	Internal SE	22%	-6%	-27%
24	External SE	Internal SW	-14%	169%	38%
25	External SW	External NE	1%	-6%	-20%
26	External SW	External NW	1%	1%	3%
27	External SW	External SE	2%	0%	-4%
28	External SW	External SW	0%	0%	0%
29	External SW	Internal NE	-26%	2%	-68%
30	External SW	Internal NW	136%	366%	105%
31	External SW	Internal SE	-5%	-18%	-69%
32	External SW	Internal SW	57%	204%	36%
33	Internal NE	External NE	3%	3%	-29%
34	Internal NE	External NW	-7%	103%	-27%
35	Internal NE	External SE	-10%	242%	-63%
36	Internal NE	External SW	-30%	288%	-73%
37	Internal NE	Internal NE	-15%	-11%	-37%
38	Internal NE	Internal NW	-74%	-100%	-92%
39	Internal NE	Internal SE	93%	-52%	93%
40	Internal NE	Internal SW	-51%	-90%	99%
41	Internal NW	External NE	-57%	247%	0%
42	Internal NW	External NW	-37%	350%	33%
43	Internal NW	External SE	-22%	366%	-71%
44	Internal NW	External SW	-28%	785%	56%
45	Internal NW	Internal NE	-52%	545%	-99%
46	Internal NW	Internal NW	-32%	689%	-4%
47	Internal NW	Internal SE	8%	104%	-96%
48	Internal NW	Internal SW	47%	186%	355%
49	Internal SE	External NE	131%	341%	-8%
50	Internal SE	External NW	-19%	-64%	-32%
51	Internal SE	External SE	14%	74%	24%
52	Internal SE	External SW	-30%	41%	-66%
53	Internal SE	Internal NE	86%	601%	2%
54	Internal SE	Internal NW	512%	200%	406%
55	Internal SE	Internal SE	96%	124%	-2%
56	Internal SE	Internal SW	21%	591%	939%
57	Internal SW	External NE	-33%	17%	-89%
58	Internal SW	External NW	-20%	-48%	-48%
59	Internal SW	External SE	24%	12%	-71%
60	Internal SW	External SW	-12%	95%	-32%
61	Internal SW	Internal NE	-75%	68%	-95%
62	Internal SW	Internal NW	75%	296%	680%
63	Internal SW	Internal SE	-53%	39%	-93%
64	Internal SW	Internal SW	48%	100%	1177%

64	Name	Name	Car+Taxi	LGV	HGV
1	External NE	External NE	29	0	0
2	External NE	External NW	-68	0	-14
3	External NE	External SE	203	14	0
4	External NE	External SW	-164	21	-60
5	External NE	Internal NE	20	0	-4
6	External NE	Internal NW	-4	0	-4
7	External NE	Internal SE	171	1	-3
8	External NE	Internal SW	20	14	-4
9	External NW	External NE	4	6	-36
10	External NW	External NW	-25	5	-2
11	External NW	External SE	90	14	-19
12	External NW	External SW	107	22	6
13	External NW	Internal NE	-13	0	-3
14	External NW	Internal NW	112	1	6
15	External NW	Internal SE	4	0	-6
16	External NW	Internal SW	59	16	2
17	External SE	External NE	-89	-1	-9
18	External SE	External NW	-161	-4	-86
19	External SE	External SE	139	10	2
20	External SE	External SW	-483	-14	-72
21	External SE	Internal NE	66	1	1
22	External SE	Internal NW	-5	0	1
23	External SE	Internal SE	119	1	-5
24	External SE	Internal SW	-8	3	-1
25	External SW	External NE	-366	3	-152
26	External SW	External NW	2	14	-6
27	External SW	External SE	-175	2	-62
28	External SW	External SW	-171	1	-9
29	External SW	Internal NE	-29	1	-14
30	External SW	Internal NW	71	0	4
31	External SW	Internal SE	23	-1	-23
32	External SW	Internal SW	-42	6	-3
33	Internal NE	External NE	12	1	-4
34	Internal NE	External NW	-17	2	-5
35	Internal NE	External SE	-7	0	-3
36	Internal NE	External SW	-27	5	-5
37	Internal NE	Internal NE	-1	0	0
38	Internal NE	Internal NW	-9	0	0
39	Internal NE	Internal SE	25	0	0
40	Internal NE	Internal SW	-3	0	0
41	Internal NW	External NE	4	8	0
42	Internal NW	External NW	-53	8	0
43	Internal NW	External SE	-4	0	3
44	Internal NW	External SW	-9	1	0
45	Internal NW	Internal NE	11	0	2
46	Internal NW	Internal NW	7	0	0
47	Internal NW	Internal SE	17	0	0
48	Internal NW	Internal SW	4	0	0
49	Internal SE	External NE	111	2	-3
50	Internal SE	External NW	-16	0	-2
51	Internal SE	External SE	4	0	-1
52	Internal SE	External SW	-32	4	0
53	Internal SE	Internal NE	105	0	1
54	Internal SE	Internal NW	-8	0	0
55	Internal SE	Internal SE	110	0	0
56	Internal SE	Internal SW	39	0	1
57	Internal SW	External NE	14	-2	-10
58	Internal SW	External NW	39	2	1
59	Internal SW	External SE	-29	0	-9
60	Internal SW	External SW	102	9	7
61	Internal SW	Internal NE	9	0	0
62	Internal SW	Internal NW	45	0	1
63	Internal SW	Internal SE	5	0	0
64	Internal SW	Internal SW	71	0	3

64	Name	Name	Car+Taxi	LGV	HGV
1	External NE	External NE	0%	0%	0%
2	External NE	External NW	-1%	0%	-2%
3	External NE	External SE	2%	3%	0%
4	External NE	External SW	-8%	27%	-23%
5	External NE	Internal NE	52%	-74%	-36%
6	External NE	Internal NW	-20%	135%	-81%
7	External NE	Internal SE	293%	72%	-23%
8	External NE	Internal SW	19%	247%	-41%
9	External NW	External NE	0%	2%	-3%
10	External NW	External NW	0%	0%	0%
11	External NW	External SE	9%	18%	-8%
12	External NW	External SW	1%	10%	1%
13	External NW	Internal NE	-23%	4%	-28%
14	External NW	Internal NW	103%	386%	122%
15	External NW	Internal SE	5%	19%	-44%
16	External NW	Internal SW	55%	384%	19%
17	External SE	External NE	-1%	0%	0%
18	External SE	External NW	-15%	-7%	-30%
19	External SE	External SE	0%	1%	0%
20	External SE	External SW	-7%	-4%	-7%
21	External SE	Internal NE	198%	224%	9%
22	External SE	Internal NW	-10%	27%	21%
23	External SE	Internal SE	144%	69%	-27%
24	External SE	Internal SW	-5%	29%	-12%
25	External SW	External NE	-15%	3%	-26%
26	External SW	External NW	0%	5%	0%
27	External SW	External SE	-3%	1%	-5%
28	External SW	External SW	0%	0%	0%
29	External SW	Internal NE	-41%	88%	-73%
30	External SW	Internal NW	116%	127%	54%
31	External SW	Internal SE	26%	-69%	-61%
32	External SW	Internal SW	-22%	125%	-20%
33	Internal NE	External NE	35%	61%	-52%
34	Internal NE	External NW	-25%	138%	-40%
35	Internal NE	External SE	-22%	-5%	-43%
36	Internal NE	External SW	-35%	368%	-50%
37	Internal NE	Internal NE	-17%		-32%
38	Internal NE	Internal NW	-79%		-60%
39	Internal NE	Internal SE	622%		-31%
40	Internal NE	Internal SW	-25%		-6%
41	Internal NW	External NE	5%	869%	5%
42	Internal NW	External NW	-28%	254%	-2%
43	Internal NW	External SE	-21%	-43%	229%
44	Internal NW	External SW	-9%	96%	6%
45	Internal NW	Internal NE	220%		713%
46	Internal NW	Internal NW	39%	0%	299%
47	Internal NW	Internal SE	411%		98%
48	Internal NW	Internal SW	77%		335%
49	Internal SE	External NE	223%	102%	-21%
50	Internal SE	External NW	-21%	45%	-12%
51	Internal SE	External SE	3%	-10%	-5%
52	Internal SE	External SW	-35%	439%	2%
53	Internal SE	Internal NE	1960%		93%
54	Internal SE	Internal NW	-68%		-5%
55	Internal SE	Internal SE	711%		16%
56	Internal SE	Internal SW	212%		167%
57	Internal SW	External NE	20%	-22%	-77%
58	Internal SW	External NW	26%	39%	4%
59	Internal SW	External SE	-17%	-3%	-70%
60	Internal SW	External SW	60%	272%	51%
61	Internal SW	Internal NE	251%		-15%
62	Internal SW	Internal NW	398%		550%
63	Internal SW	Internal SE	30%		-49%
64	Internal SW	Internal SW	94%		391%

Appendix 2

SYSTRA note setting out list of options for testing in Transport Model

Appendix A – Option Definitions

A series of options were identified for testing and were coded into the updated ONE model. These options were then utilised to develop a set of comparisons to facilitate analysis of the impact of a combination of scheme proposals. The options tested were:

- West End Project only (Option 0);
- West End Project and Brunswick Square (Option A);
- West End Project, Brunswick Square and Trial (Option B);
- West End Project, Brunswick Square and Judd Street Closure (Option C);
- West End Project, Brunswick Square, Trial and Judd Street Closure (Option D);
- West End Project, Brunswick Square and Trial in reversed direction (Reversed Trial) (Options E);
- West End Project, Brunswick Square, Reversed Trial and Judd Street Closure (Option F);
- West End Project, Brunswick Square, Trial and 2-way sections (Option G);
- West End Project, Brunswick Square, Trial, 2-way sections and Judd Street Closure (Option H);
- West End Project and Trial (Option I); and
- West End Project, Trial and Judd Street Closure (Option J).

The table below summarises the contents of the various options:

OPTION	WEP	BRUNSWICK SQUARE	TRIAL	REVERSED TRIAL	JUDD STREET CLOSURE	2-WAY SECTIONS
0	x					
A	x	x				
B	x	x	x			
C	x	x			x	
D	x	x	x		x	
E	x	x		x		
F	x	x		x	x	
G	x	x	x			x

OPTION	WEP	BRUNSWICK SQUARE	TRIAL	REVERSED TRIAL	JUDD STREET CLOSURE	2-WAY SECTIONS
H	x	x	x		x	x
I	x		x			
J	x		x		x	

The various option comparisons presented in this report are formulated through comparing two of the above options . The list below shows which options have been compared for each impact assessment comparison in Section 2 of the report.

- **Impact of implementing the Brunswick Square scheme**

  Option A – Option 0: Impact of Brunswick Square | (WEP + Brunswick) - WEP

- **Impact of implementing the Trial plus the Brunswick Square scheme**

  Option B – Option A: Impact of the Trial when WEP and Brunswick Square are in place | (WEP + Brunswick + Trial) – (WEP + Brunswick)

- **Impact of the Trial reversed with the Brunswick Square scheme in place**

  Option E – Option A: Impact of reversed Trial if WEP and Brunswick Square are in place | (WEP + Brunswick + Reversed Trial) – (WEP + Brunswick)

- **Impact of Judd St closure with the Brunswick Square scheme in place**

  Option C – Option A: Impact of Judd Street closure if WEP and Brunswick Square are in place | (WEP + Brunswick + Judd St Closure) – (WEP + Brunswick)

- **Impact of Judd St closure with the Trial and the Brunswick Square scheme in place**

  Option D – Option B: Impact of Judd Street closure if WEP, Brunswick Square and Trial are in place | (WEP + Trial + Brunswick + Judd St Closure) (WEP + Brunswick + Trial)

- **Impact of adding 2-way section to the Trial with the Brunswick Square scheme in place**

  Option G – Option B: Impact of 2-way sections if WEP with Brunswick Square and Trial are in place | (WEP + Brunswick + Trial + 2-way Sections) – (WEP + Brunswick + Trial)

- **Impact of Judd St closure with the Brunswick Square scheme and the Trial reversed are in place**

Option F – Option E: Impact of Judd Street closure if WEP with Brunswick Square and Reversed Trial are in place | (WEP + Brunswick + Reversed Trial + Judd St Closure) – (WEP + Brunswick + Reversed Trial)

- **Impact of Judd St closure with the Brunswick Square scheme and the Trial with 2-way section in place**

  Option H – Option G: Impact of Judd Street closure if WEP with Brunswick Square, Trial and 2-way section are in place | (WEP + Brunswick + Trial + 2-way Sections + Judd St Closure) – (WEP + Brunswick + Trial + 2-way Sections)

- **Combined impact of the Brunswick Square scheme, the Trial and Judd St closure**

  Option D – Option O: Impact of Brunswick, Trial and Judd Street closure | (WEP + Brunswick + Trial + Judd St Closure) – (WEP)

- **Combined impact of the Brunswick Square scheme, the Trial reversed and Judd St closure**

  Option D – Option O: Impact of Brunswick Square, Reversed Trial and Judd St Closure| (WEP + Brunswick + Reversed Trial + Judd St Closure) – (WEP)

- **Impact of the Brunswick Square scheme with the Trial**

  Option B – Option I: Impact of Brunswick Square closure if WEP and Trial are in place | (WEP + Brunswick + Trial) – (WEP + Trial)

  Impact of Judd St closure with the Trial

  Option J – Option I: Impact of Judd Street closure if WEP and Trial are in place | (WEP + Trial + Judd St Closure) – (WEP + Trial)

Appendix 3

SYSTRA Note dated 27th June 2017

INFO NOTE

TORRINGTON TAVISTOCK CORRIDOR MODELLING

TORRINGTON PLACE/TAVISTOCK PLACE (TPTP) TRIAL VISUM OPTION TESTING

IDENTIFICATION TABLE	
Client/Project owner	London Borough of Camden
Project	Torrington Tavistock Corridor Modelling
Title of Document	Torrington Place/Tavistock Place (TPTP) Trial VISUM Option Testing
Type of Document	Draft Note presented at the meeting of 29th June
Date	23/12/2016
Reference number	103952/20/06
Number of pages	37

TABLE OF CONTENTS

1.	**INTRODUCTION**	**3**
1.2	**2016 ONE MODEL NETWORK UPDATE**	**3**
1.3	**CALIBRATION UPDATE**	**4**
1.4	**OPTIONS**	**6**
2.	**COMPARISON OF OPTIONS**	**8**
2.1	**IMPACT OF IMPLEMENTING THE BRUNSWICK SQUARE SCHEME**	**8**
2.2	**IMPACT OF IMPLEMENTING THE TRIAL WITH BRUNSWICK SQUARE SCHEME**	**9**
2.3	**IMPACT OF THE TRIAL REVERSED WITH THE BRUNSWICK SQUARE SCHEME IN PLACE**	**11**
2.4	**IMPACT OF JUDD ST CLOSURE WITH THE BRUNSWICK SQUARE SCHEME IN PLACE**	**13**
2.5	**IMPACT OF JUDD ST CLOSURE WITH THE TRIAL AND THE BRUNSWICK SQUARE SCHEME IN PLACE**	**15**
2.6	**IMPACT OF ADDING 2-WAY SECTION TO THE TRIAL WITH THE BRUNSWICK SQUARE SCHEME IN PLACE**	**17**
2.7	**IMPACT OF JUDD ST CLOSURE WITH THE BRUNSWICK SQUARE SCHEME AND THE TRIAL REVERSED IN PLACE**	**18**
2.8	**IMPACT OF JUDD ST CLOSURE WITH THE BRUNSWICK SQUARE SCHEME AND THE TRIAL WITH 2-WAY SECTION IN PLACE**	**20**
2.9	**COMBINED IMPACT OF THE BRUNSWICK SQUARE SCHEME, THE TRIAL AND JUDD ST CLOSURE**	**21**

2.10	COMBINED IMPACT OF THE BRUNSWICK SQUARE SCHEME, THE TRIAL REVERSED AND JUDD ST CLOSURE 23	
2.11	IMPACT OF THE BRUNSWICK SQUARE SCHEME WITH THE TRIAL IN PLACE	24
2.12	IMPACT OF JUDD ST CLOSURE WITH THE TRIAL	29
3.	SUMMARY	32

APPENDIX A – OPTION DEFINITIONS

1. INTRODUCTION

1.1.1 SYSTRA was commissioned by the London Borough of Camden (LB Camden/"the Council") to provide transport modelling input into the investigation of improvement options along the Torrington Place/Tavistock Place (TPTP) corridor relating to the ongoing TPTP Trial (referred to as "the Trial") seeking to improve cyclist provision and maximise pedestrian space.

1.1.2 The trial introduced one way operation eastbound along the corridor between the junctions with Gower St and Judd St and introduced two cycle lanes, one in each direction along the corridor.

1.1.3 The traffic modelling exercise assessed the possible impacts of making the interventions currently in place on the TPTP corridor as part of the Trial permanent. The exercise investigated the possible redistribution of motor traffic when the Trial interventions are combined with future committed and planned schemes in the surrounding area.

1.1.4 Transport for London (TfL) have been involved throughout this process and have agreed the method adopted for the assessment and confirmed that the traffic model is fit for purpose.

1.1.5 The modelling exercise including updating the existing 2016 ONE (Operational Network Evaluation) model within the study area to reflect the existing highway layout and improve the level of flow calibration (i.e. goodness of fit between observed and modelled traffic flows). Subsequent to this, a number of options were tested in order to understand the potential impact on the highway network.

1.1.6 This note presents a summary of the updates to the 2016 ONE model and the results from the option testing undertaken, including comparative analysis to help understand the impact of the various scheme proposals.

1.2 2016 ONE Model Network Update

1.2.1 The model used in this study is the strategic ONE (i.e. Operational Network Evaluation) model owned by Transport for London (TfL). The model covers all of central London and has been developed using the VISUM software package to allow the network impacts of potential schemes to be assessed across the central London area. It uses actual traffic data from a number of locations including traffic volumes and origin-destination information. It is a tool used to provide an assessment at a high level of how traffic might behave and what routes drivers would likely take should a change to the road network be introduced.

1.2.2 The existing 2016 ONE model has been used as a starting point for the development of a 2016 model reflective of current site conditions. The current model contains the TPTP trial as well as other schemes which are not currently on site and have thus been removed from the model network and the layout defined as per existing site conditions. Through discussions with TfL, these schemes have been identified as:

- Baker Street Two-Way project; and
- Cycle Superhighway 11.

1.2.3 While the primary objective of this report is to test predicted impacts of making the Trial permanent, it is noted that there are other planned schemes within the vicinity of the project area. Therefore a number of different scenarios have been tested to ensure that the assessment is robust. This includes variations of multiple planned schemes to consider their predicted impacts individually and cumulatively. However, it should be noted that the model assumes the West End Project (WEP) is in place as this project has received approval and construction is expected to start early this year. Therefore the results will differ somewhat from what is being exhibited on the street as part of the Trial.

1.2.4 The King's Cross scheme, which relates to junction improvements at the Pancras Road/Midland Rd and Pancras Road/Camley St/Goods Way junctions, is included in the Base model and the scheme models although it is not built yet.

1.3 Calibration Update

1.3.1 Subsequent to the removal of the schemes listed above, the flows from this updated 2016 model have been compared against the 2016 observed flows using the GEH criteria. The observed traffic flow data was collected during May 2016 for a number of links throughout the area using automatic traffic counters (ATCs).

1.3.2 According to the standards specified in the Design Manual for Roads and Bridges (DMRB) Volume 12a Part 1 'Traffic Appraisal in Urban Areas', the criteria outlined in Table 1 need to be met for the model to be deemed calibrated and validated.

Table 1. DMRB Calibration and Validation Criteria

Criteria and Measures	Acceptability Guidelines
GEH statistics: individual flows: GEH<5	>85% of cases
GEH statistics: screenlines: GEH<4	All (or nearly all) screenlines
Individual flows within 100 vph for flows < 700vph	>85% of cases
Individual flows within 15% for flows <700-2700vph	
Individual flows within 400 vph for flows > 2700vph	
Total screenline flows to be within 5%	All (or nearly all) screenlines
Journey times within 15% (or 1 minute, if higher)	>85% of cases

Note: vph – vehicles per hour

1.3.3 The principal measures to gauge model accuracy are through comparisons of modelled flows with surveyed traffic flows. The guidelines contain two different measures that can be used to compare modelled and observed traffic flows. As well as making a direct comparison of the flows, the GEH statistic (a form of the Chi-squared statistic) is used to compares two values and weights the difference according to the average of the two flows.

1.3.4 The weighting is not linear but takes the form of a square root function:

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

Where:

M = Modelled Flow

C = Observed Flow

1.3.5 The lower the GEH value, the better the fit between observed and modelled flows, with a GEH value of less than 5 considered a good and sufficient fit between modelled and observed traffic flows.

1.3.6 It should be noted that WebTAG unit M3.1 states in paragraph 3.2.7 that comparisons that meet either the GEH or the flow criteria should be deemed satisfactory.

1.3.7 In the AM, only 36% of the sites attained a GEH of 5 or lower. In the PM, 39% attained this criteria. This represents a poor goodness of fit relative to the required standards (85% as set out in Table 1 above). As this cannot be considered as fit for purpose, a demand update has been undertaken to improve the goodness of fit between modelled and observed flows using matrix estimation (through the TFlowFuzzy module in VISUM). This process seeks to improve the comparison between the modelled and observed traffic flows.

1.3.8 Tables 2 and 3 below show that 71% of assessed links meet the GEH criteria (GEH < 5) in the AM and 66% in the PM (across all vehicles). When considering the number of sites attaining either the GEH or DMRB flow criteria, the AM achieves 87% whilst the PM achieves 76%. Consideration of the sites with GEH<8 shows that the majority of links achieve this criteria, especially in the AM period, showing that most sites not achieving the calibration/validation criteria are not significantly outside the criteria.

Table 2. Calibration AM

AM	LIGHT (CAR+TAXI+0.5MC)	LGV	HGV	TOTAL	DMRB FLOW	DMRB FLOW/GEH
Total Link Counts	102	102	100	102	102	102
GEH<5	81	91	89	72	47	89
%age	79%	89%	89%	71%	46%	87%
GEH<8	94	100	100	92	(%age OK)	(%age OK or GEH<5)
%age	92%	98%	100%	90%		

Table 3. Calibration PM

PM	LIGHT (CAR+TAXI+0.5MC)	LGV	HGV	TOTAL	DMRB FLOW	DMRB FLOW/GEH
Total Link counts	102	102	100	102	114	114
GEH<5	72	94	93	67	47	87
%age	71%	92%	93%	66%	41%	76%

PM	LIGHT (CAR+TAXI+0.5MC)	LGV	HGV	TOTAL	DMRB FLOW	DMRB FLOW/GEH
GEH<8	88	100	97	83	(%age OK)	(%age OK or GEH<5)
%age	86%	98%	97%	81%		

1.3.9 These results show that the level of calibration of the model within the study area has been significantly improved. Given the timescales for this option testing and the strategic nature of the model, the model has been deemed fit for purpose and acceptance for its use in option testing provided by TfL. The rest of the model outside the study area remained at the same calibration/validation level as the original model which was considered valid by TfL.

1.4 Options

1.4.1 Once the model has been deemed fit for purpose, a series of options were identified for testing and were coded into the updated ONE model. These options were then utilised to develop a set of comparisons to facilitate analysis of the impact of a combination of scheme proposals. The options tested are set out in Appendix A. The comparisons undertaken of the options were:

- Impact of implementing the Brunswick Square scheme;
- Impact of implementing the Trial with the Brunswick Square scheme;
- Impact of the Trial reversed with the Brunswick Square scheme in place;
- Impact of Judd St closure with the Brunswick Square scheme in place;
- Impact of Judd St closure with the Trial and the Brunswick Square scheme in place;
- Impact of adding 2-way section to the Trial with the Brunswick Square scheme in place;
- Impact of Judd St closure with the Brunswick Square scheme and the Trial reversed in place;
- Impact of Judd St closure with the Brunswick Square scheme and the Trial with 2-way section in place;
- Combined impact of the Brunswick Square scheme, the Trial and Judd St closure;
- Combined impact of the Brunswick Square scheme, the Trial reversed and Judd St closure;
- Impact of the Brunswick Square scheme with the Trial; and
- Impact of Judd St closure with the Trial.

1.4.2 All options forming these comparisons include the West End Project (WEP), the improvements at the Pancras Road/Midland Rd and Pancras Road/Camley St/Goods Way junctions (as part of the Kings Cross Scheme) and Active Traffic Management (ATM). According to TfL, ATM monitors London traffic and manages the flows in real time to ensure that the bus network is protected, exit blocking prevented and key junctions do not lock up.

1.4.3 All but the last comparison in the above list contain the Brunswick Square scheme – the reasoning is set out in Section 2.1 below.

1.4.4 Further details of the options tested and the formulation of the comparisons is provided in Appendix A.

1.4.5 The coding of the main schemes was done as follows:

- The WEP transforms the one way system on Tottenham Court Road and Gower Street with two-way tree-lined streets, some protected cycle lanes and new public spaces.
- The Trial has been coded as per the existing layout implemented on site.
- When reversing the Trial all banned turns were applied in the other direction.
- The two-way section along the trial corridor has been coded between Woburn Place and Gordon Square west.
- The Judd Street closure has been coded as a closed link between Euston Road and Bidborough Street. This restricts vehicles from going into or out of Judd Street from or into Euston Road.
- The Brunswick Square scheme has been coded as a road closure between Brunswick Square and Lansdowne Terrace.

2. COMPARISON OF OPTIONS

2.1 Impact of implementing the Brunswick Square scheme

2.1.1 This chapter provides information regarding the impact of the Brunswick Scheme. It compares the model including West End Project (WEP) and Brunswick Square against the model containing the WEP. As can be seen in Figure 1 and Figure 2, traffic which has used Brunswick Square gets distributed throughout the network when closing the link. No major traffic increase can be seen on any links meaning it can be said that the scheme has a negligible impact on the nearby network. Therefore, it has been kept in all subsequent options and comparisons.

Figure 1. Impact of Brunswick Square (AM)

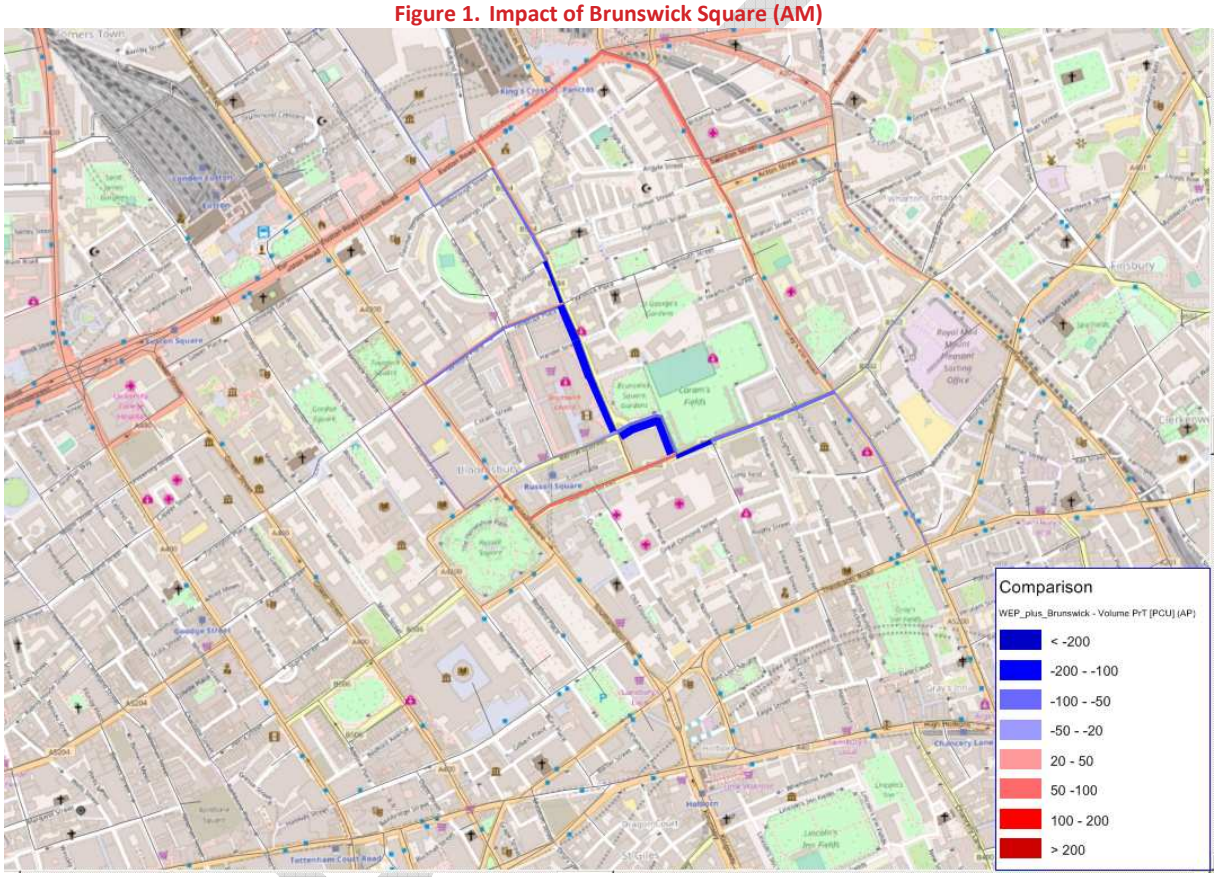
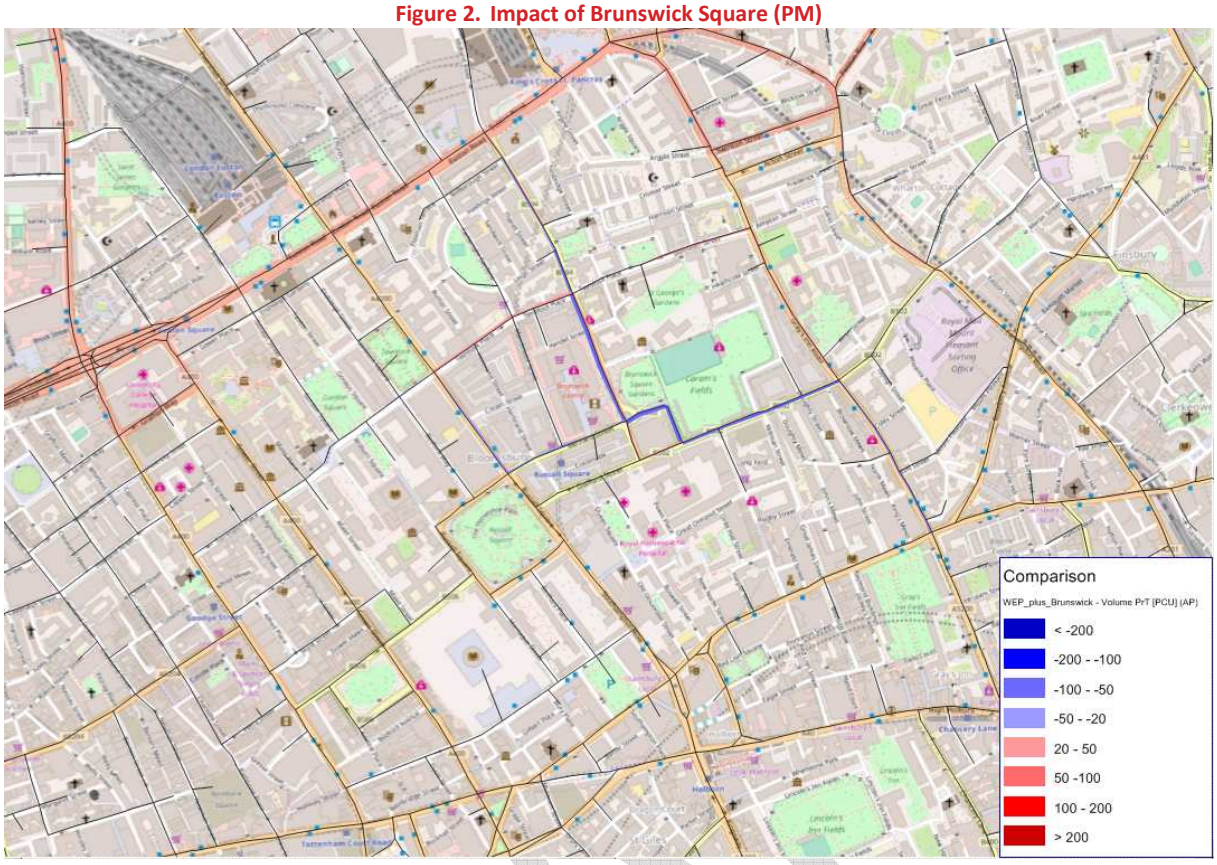


Figure 2. Impact of Brunswick Square (PM)



2.2 Impact of implementing the Trial with Brunswick Square scheme

2.2.1 The comparison of the model WEP with Brunswick Square and Trial against the model WEP with Brunswick Square shows the impact of the Trial on the surrounding area. Figure 3 and Figure 4 show that the traffic which was previously on Sidmouth Street, Tavistock Place, Gordon Square, Byng Place and Torrington Place is now rerouted to Grays Inn Road and Euston Road. Also, Tavistock Square northbound, Endsleigh Street northbound, Endsleigh Gardens westbound and Gower Place westbound are shown as alternative routes. Gower Street and Gordon Square (both southbound) show a decrease in traffic.

Figure 3. Impact of the Trial when Brunswick Square is in place (AM)

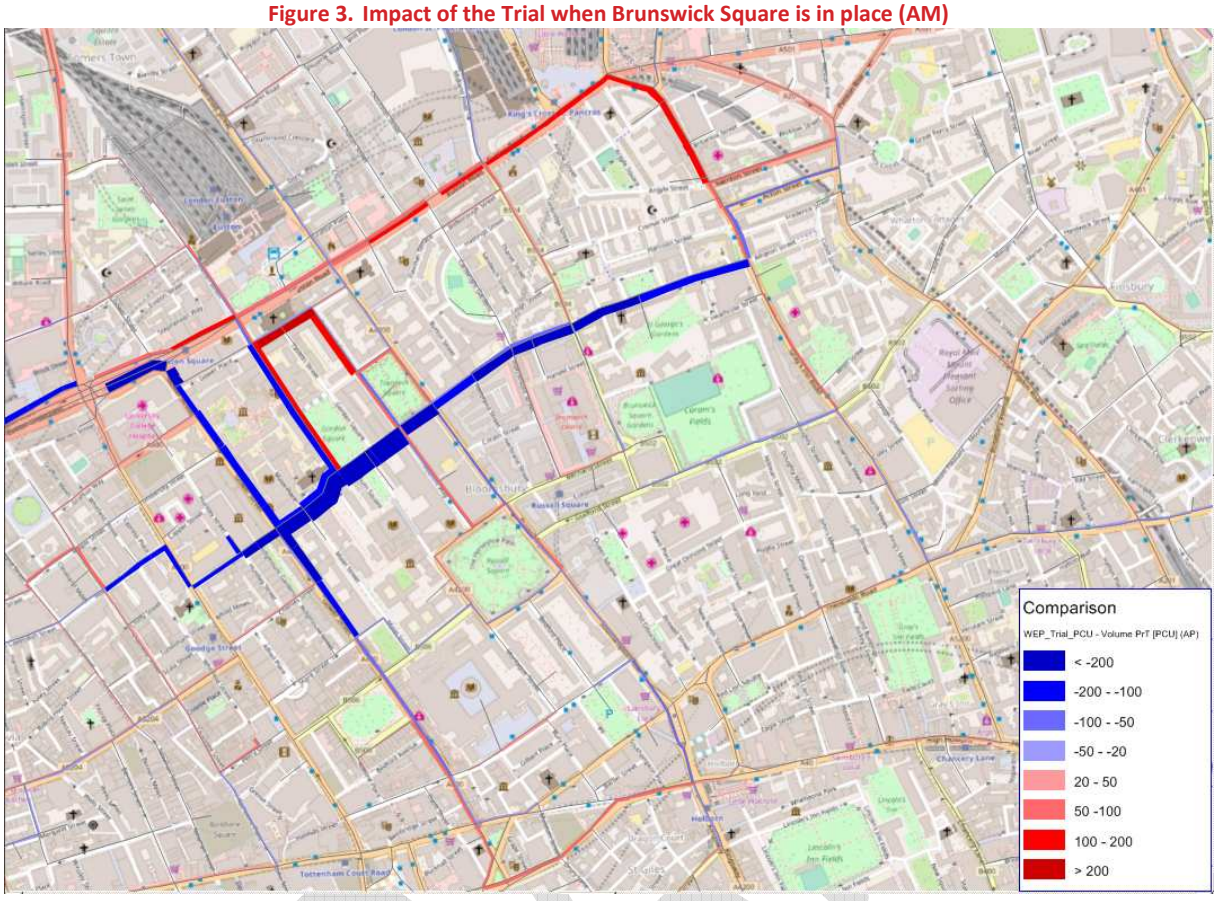
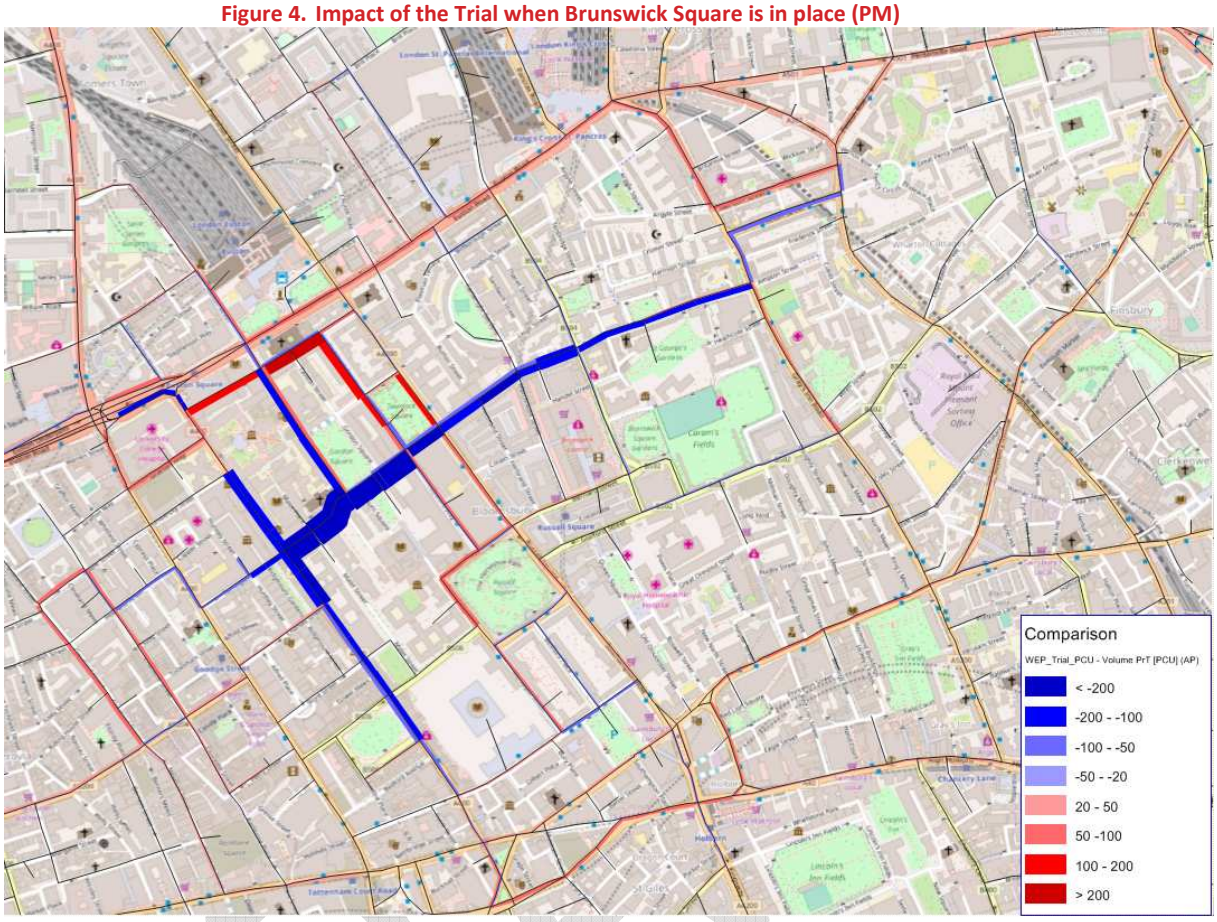


Figure 4. Impact of the Trial when Brunswick Square is in place (PM)



2.3 Impact of the Trial reversed with the Brunswick Square scheme in place

2.3.1 The following figures (Figure 5 and Figure 6) show the impact of the Trial in reversed direction through comparison of the WEP with Brunswick Square and reversed Trial model against the WEP with Brunswick Square model.

2.3.2 Instead of taking Tavistock Place, Gordon Square, Byng Place and Torrington Place in the eastbound direction, traffic distributes to the surrounding streets. A decrease can also be seen on Gower Street southbound. Increases can be found mainly on Endsleigh Gardens and Endsleigh Street as well as Woburn Place southbound, Montague Place, Russell Square and Bernard Street eastbound.

Figure 5. Impact of the reversed Trial when Brunswick Square is in place (AM)

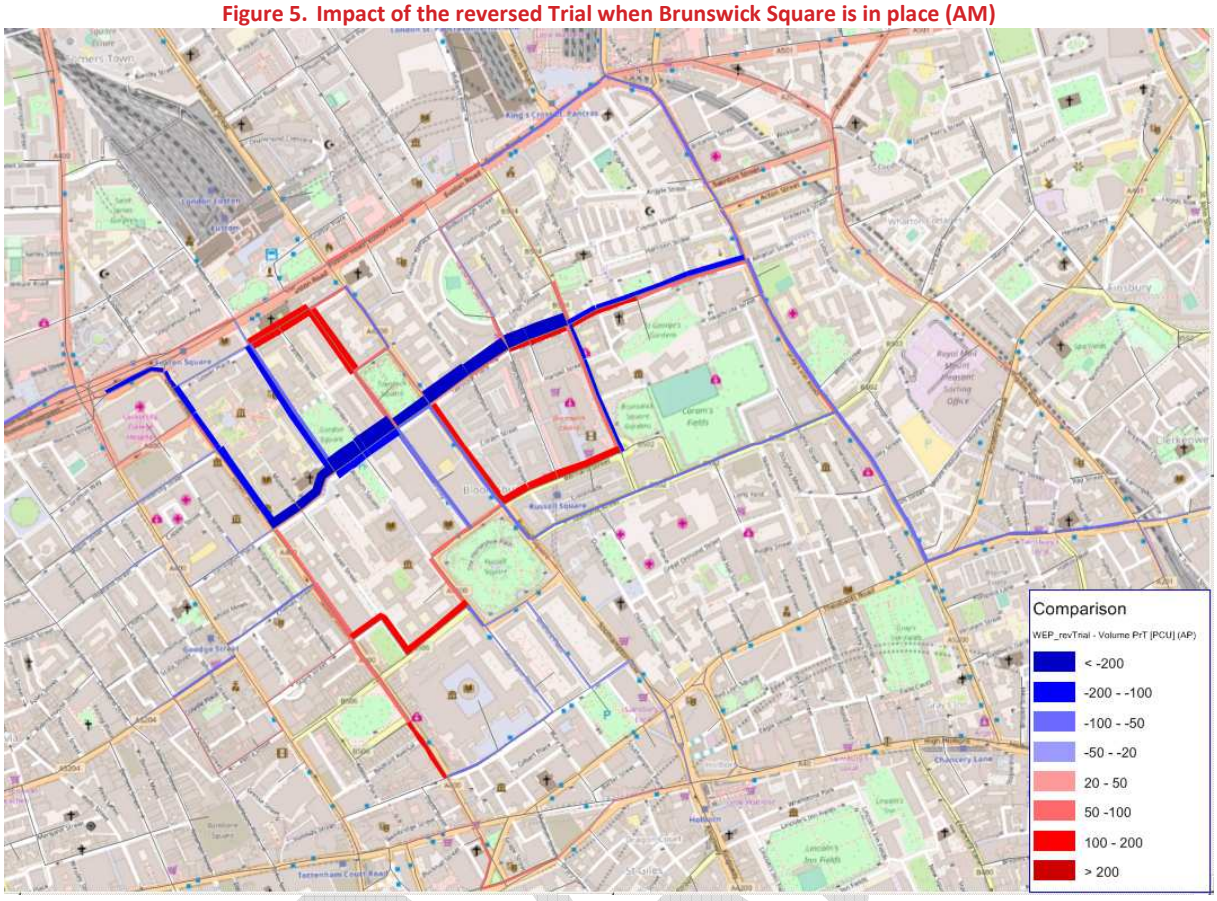
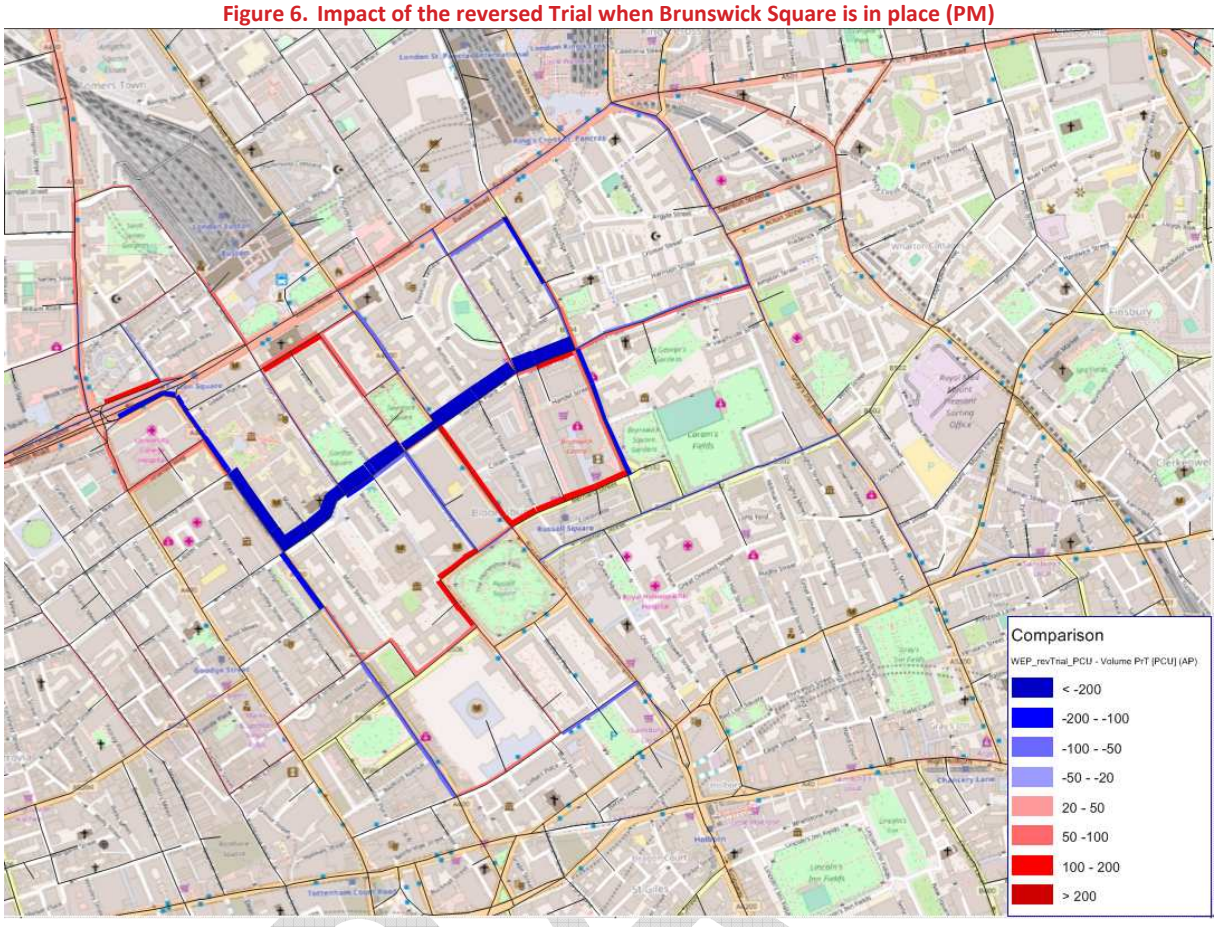


Figure 6. Impact of the reversed Trial when Brunswick Square is in place (PM)



2.4 Impact of Judd St closure with the Brunswick Square scheme in place

2.4.1 Here again, the model with WEP only is the base of the comparison. The only difference between the two models is that in the second model the Judd Street/Euston Road junction is closed for incoming and outgoing traffic. As expected, in both periods the decrease of traffic is limited to Judd Street, especially in southbound direction (Figure 7, Figure 8). The more northern the part of the road, the higher the decrease of traffic. The missing traffic has been rerouted on surrounding roads such as King's Cross Road.

Figure 7. Impact Of Judd Street closure when Brunswick Square is in place (AM)

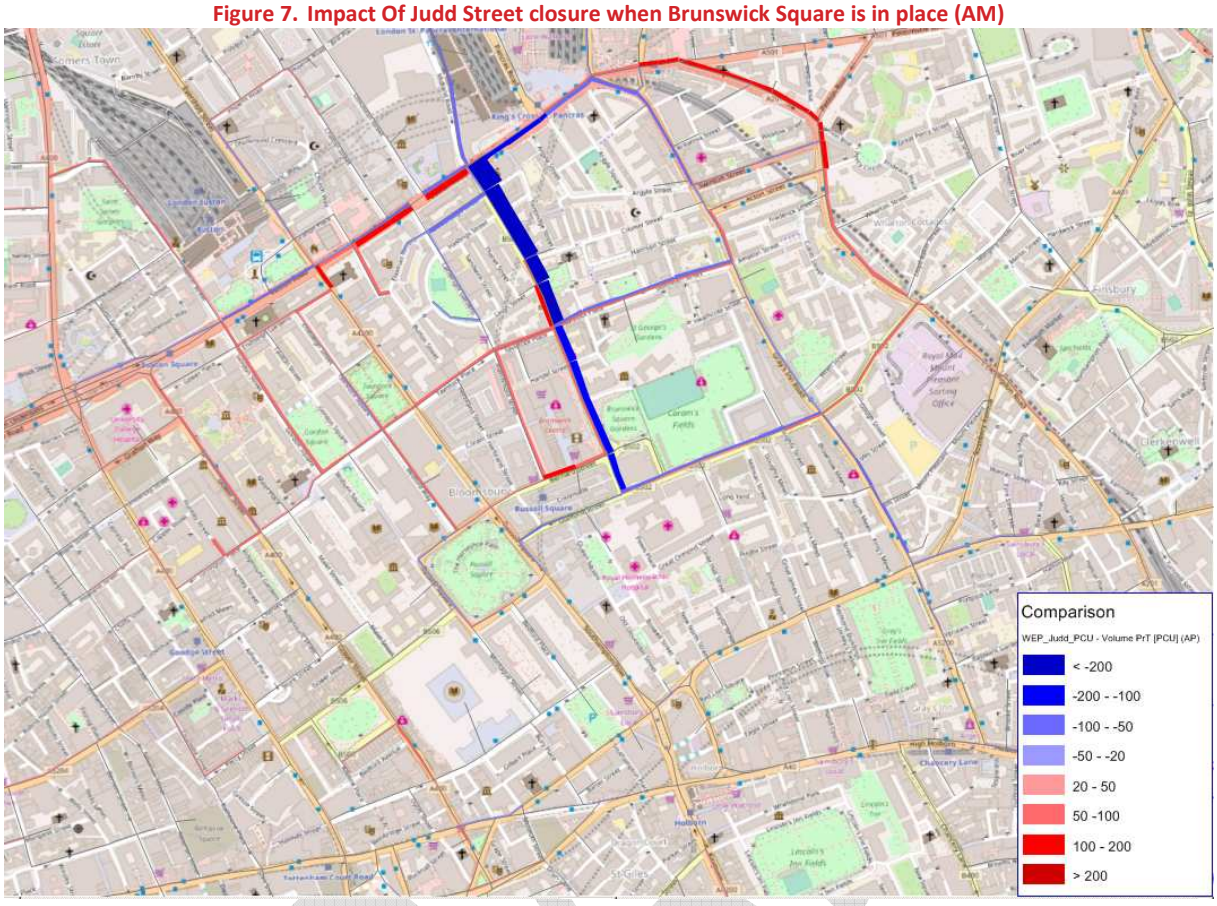
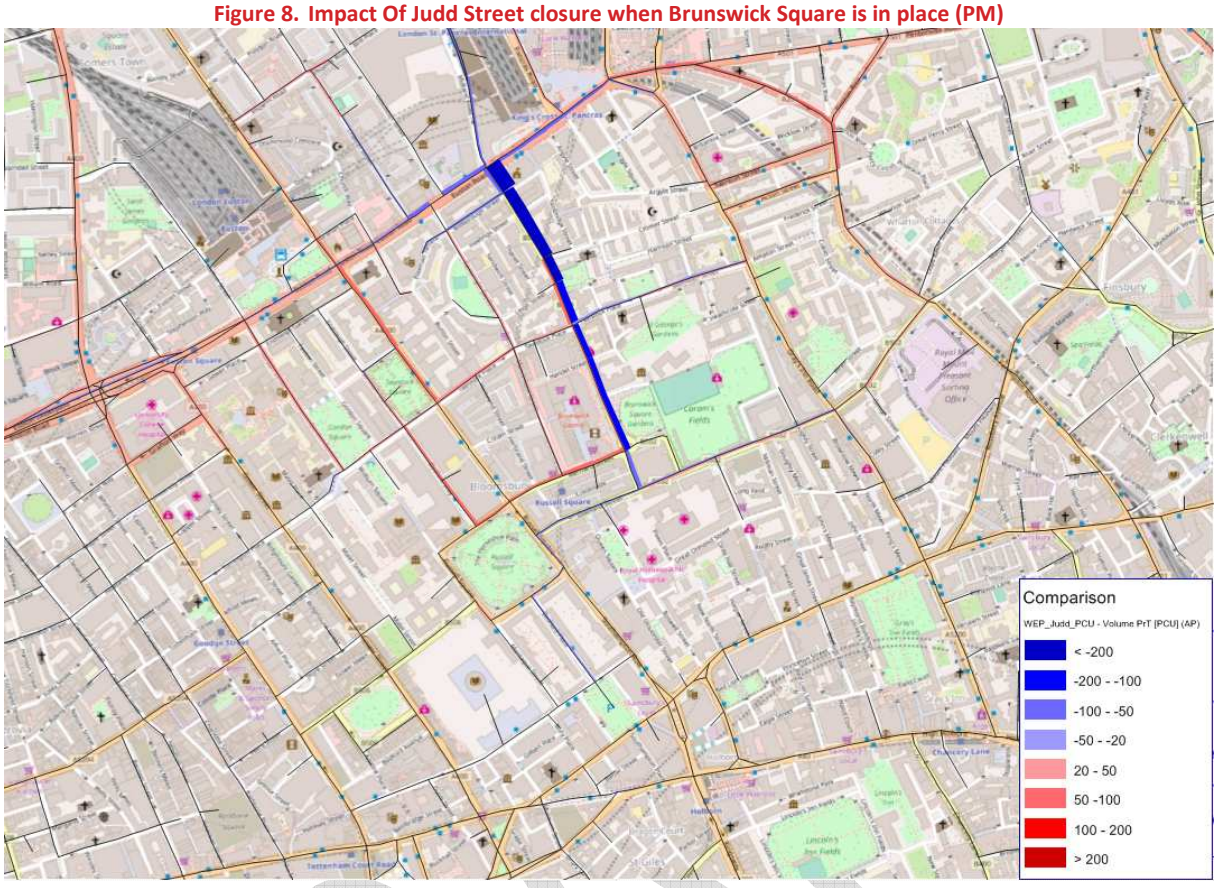


Figure 8. Impact Of Judd Street closure when Brunswick Square is in place (PM)



2.5 Impact of Judd St closure with the Trial and the Brunswick Square scheme in place

2.5.1 For this comparison the WEP with Brunswick Square and Trial model is used as the basis to assess how the Judd Street closure affects the performance of the network. On top of these results, the results from the section above apply.

2.5.2 As can be seen in Figure 9 and Figure 10, the changes in distribution of traffic are more significant than when the WEP with Brunswick Square, Trial and Judd Street option has been compared against the WEP with Brunswick Square option. In the AM, traffic mainly increases on the route Euston Road westbound, Upper Woburn Place southbound, Endsleigh Place westbound, Tavistock Square southbound, Tavistock Place eastbound, Marchmont Street southbound and Bernard Street eastbound. In the PM, this effect is not as significant.

Figure 9. Impact of Judd Street closure with Brunswick Square and Trial in place (AM)

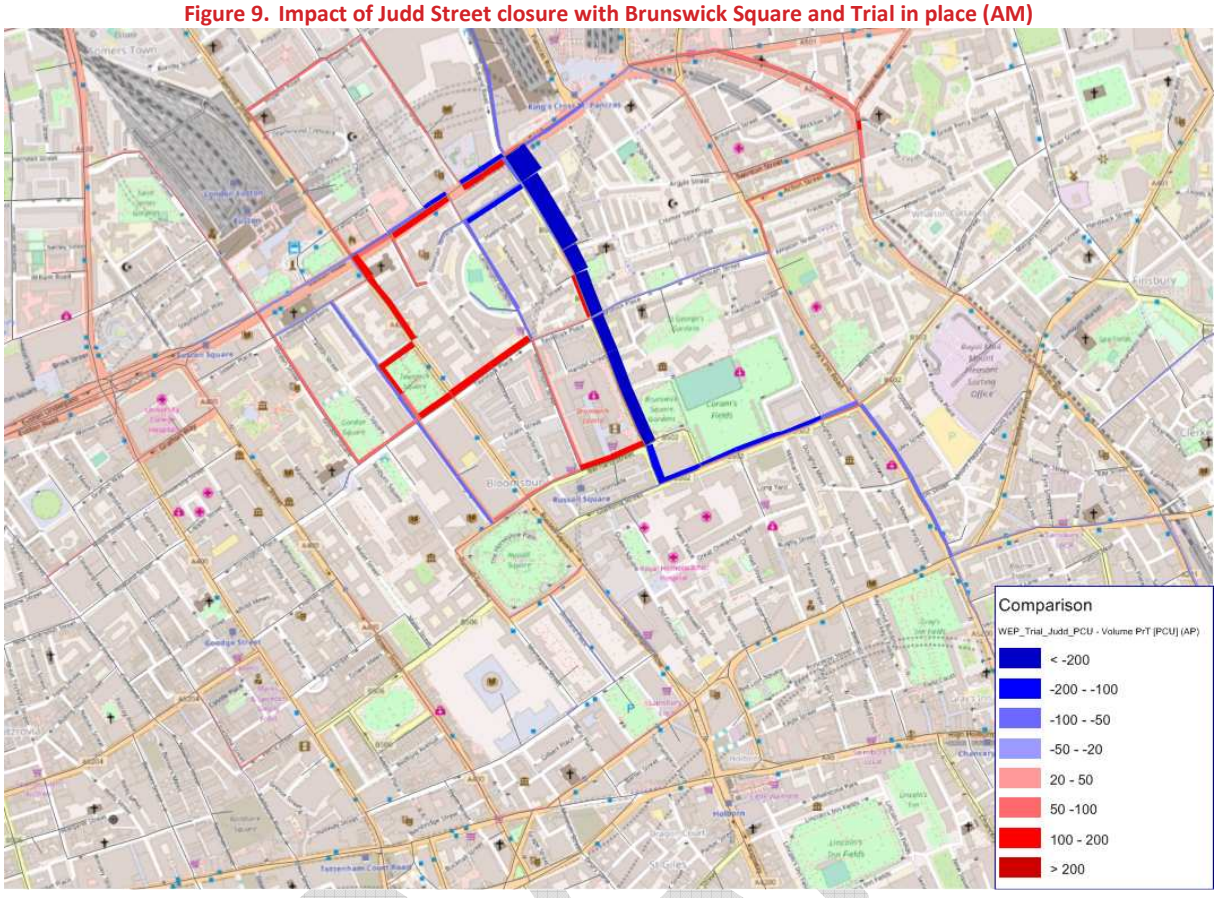
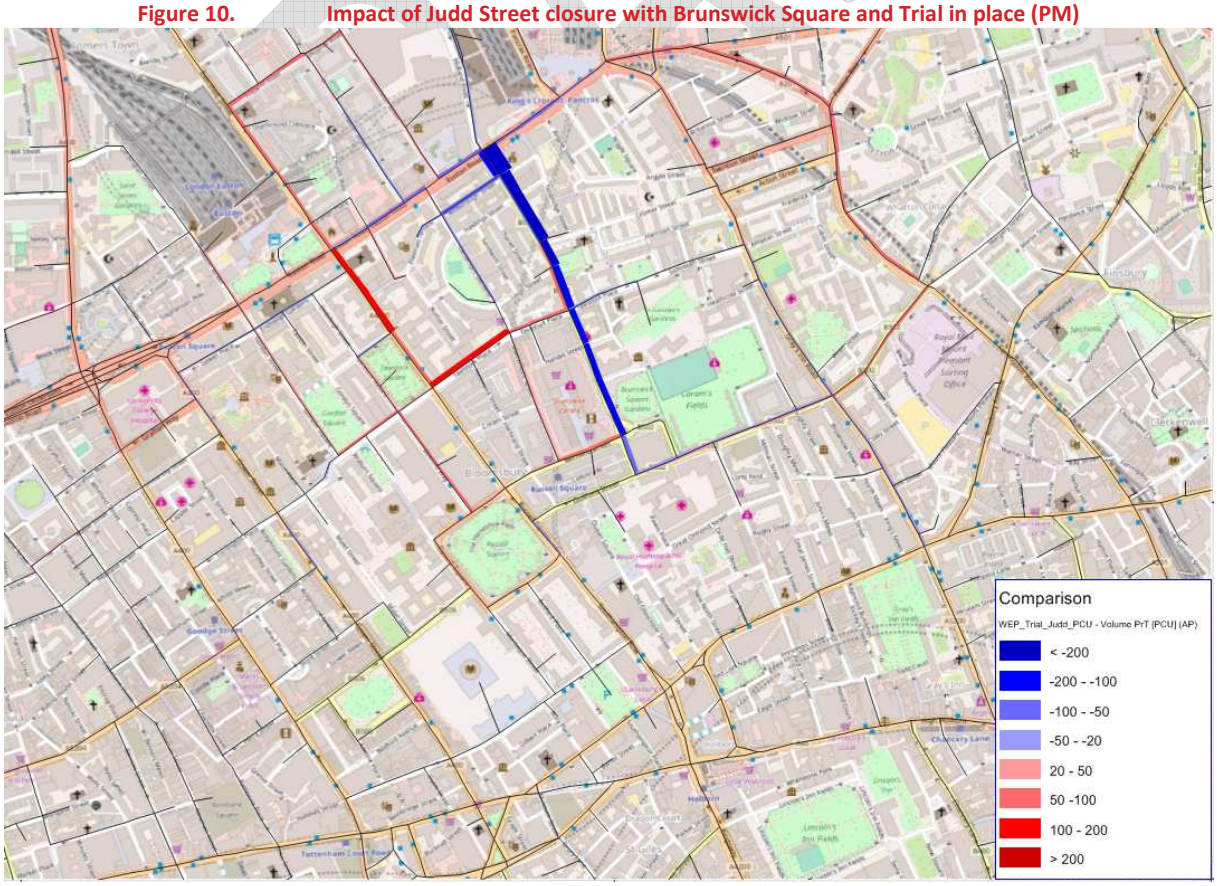


Figure 10. Impact of Judd Street closure with Brunswick Square and Trial in place (PM)



2.6 Impact of adding 2-way section to the Trial with the Brunswick Square scheme in place

2.6.1 As can be seen in Figure 11 and Figure 12, the short 2-way section has almost no measurable impact on traffic distribution. A small decrease in traffic can be seen on Bedford Way in the AM.

Figure 11. Impact of the 2-way sections with Brunswick Square and Trial in place (AM)

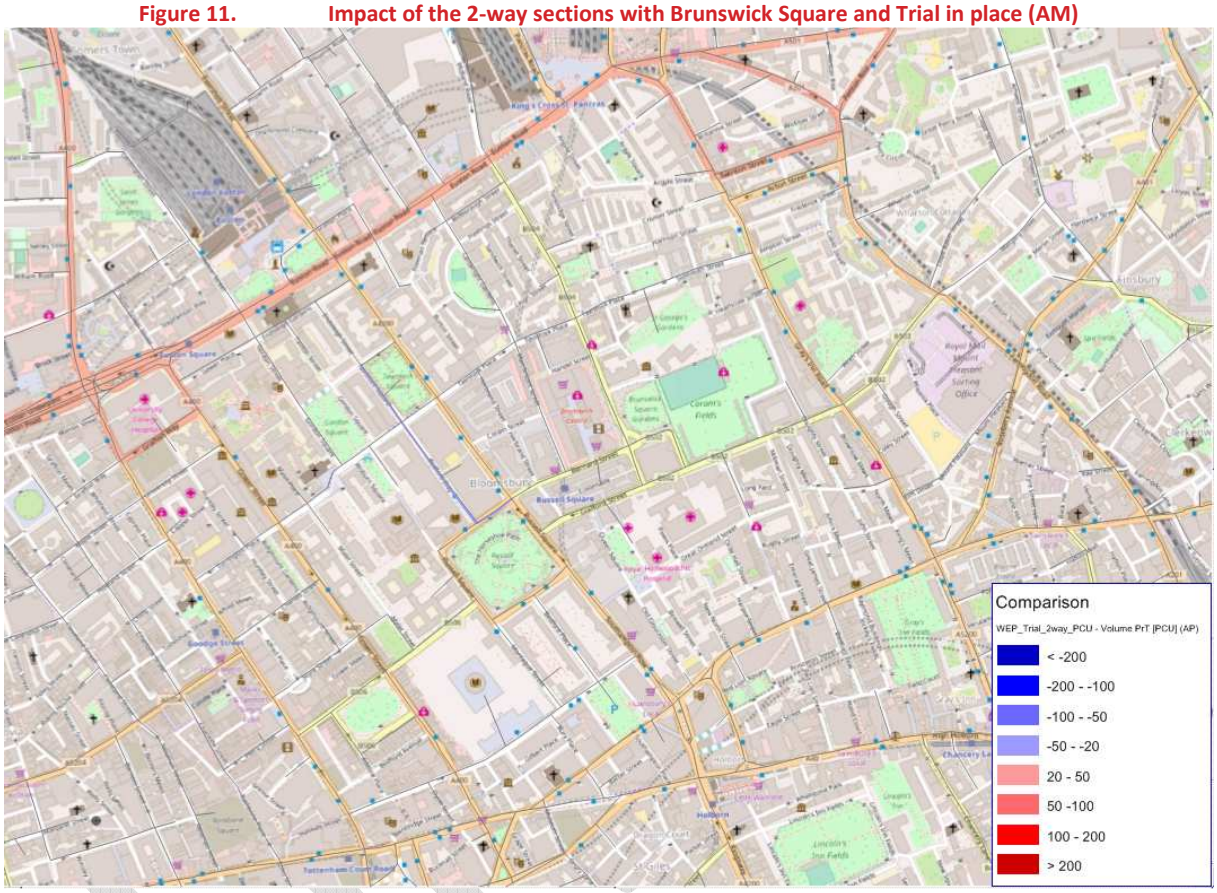
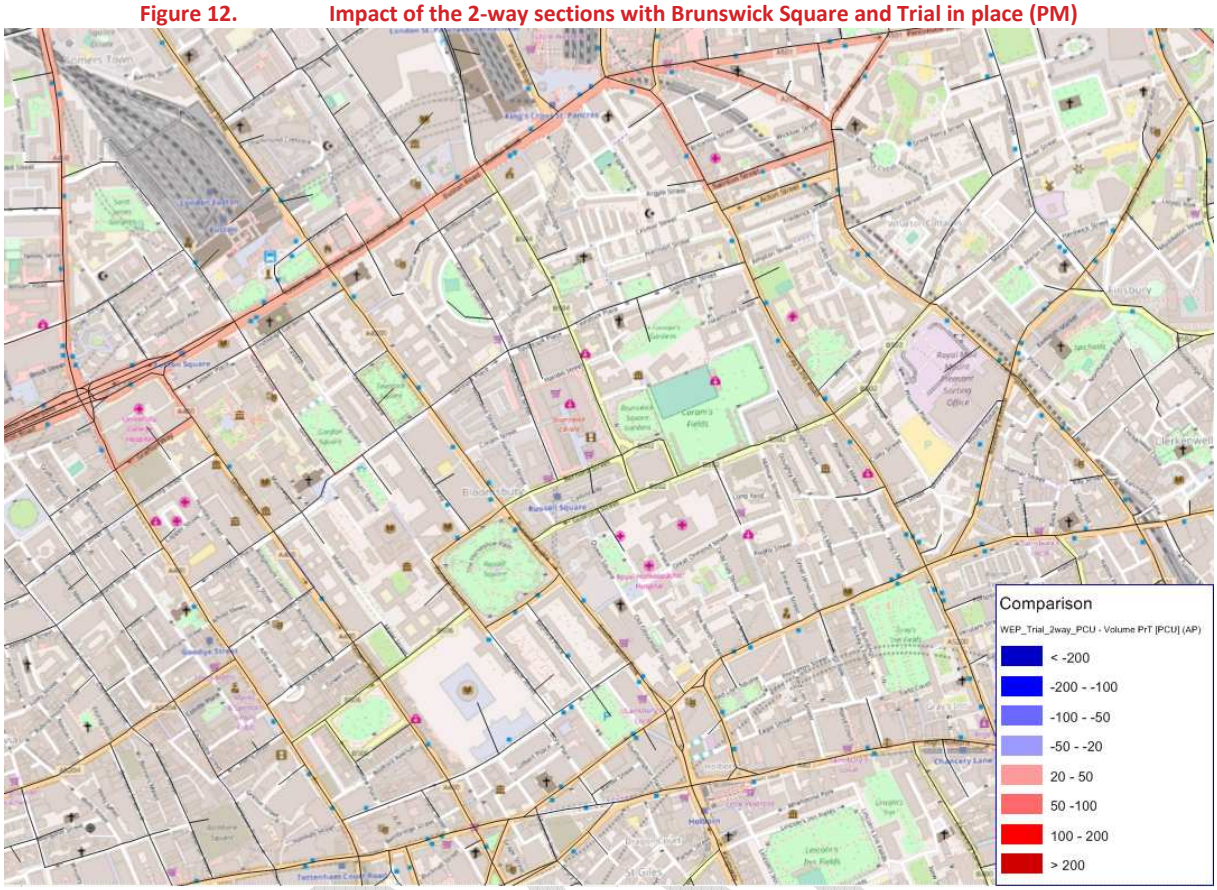


Figure 12. Impact of the 2-way sections with Brunswick Square and Trial in place (PM)



2.7 Impact of Judd St closure with the Brunswick Square scheme and the Trial reversed in place

2.7.1 This comparison involves WEP with Brunswick Square, Reversed Trial and the Judd Street closure against the WEP with Brunswick Square and Reversed Trial. In the PM, the changes in traffic distribution look similar to the other comparisons involving Judd Street closures described above (Figure 14). In the AM, the decrease can already be seen on Midland Road near St. Pancras Station. Also, Guilford Street and Grays Inn Road show clear decreases of traffic (Figure 13). In both periods the increases are distributed among several roads.

Figure 13. Impact of Judd Street closure with Brunswick Square and Reversed Trial in place (AM)

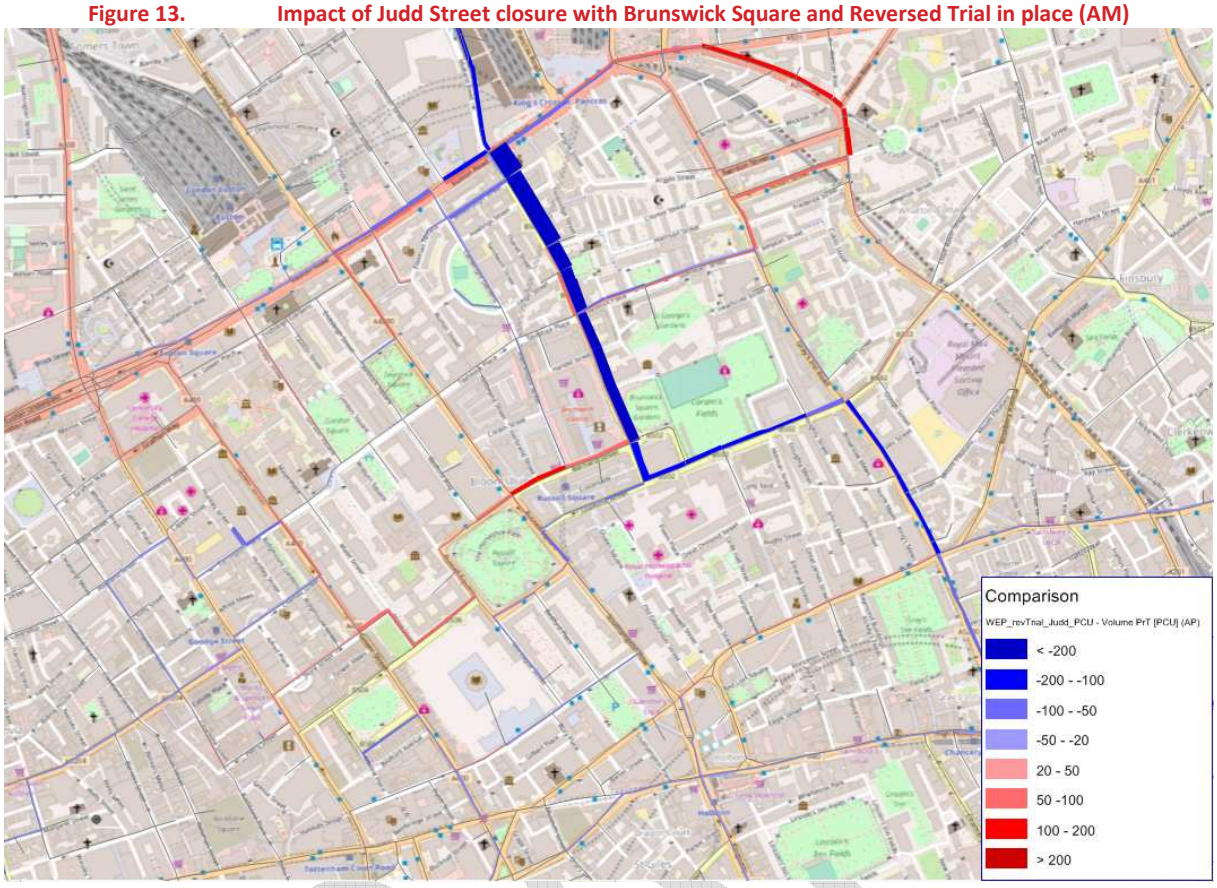
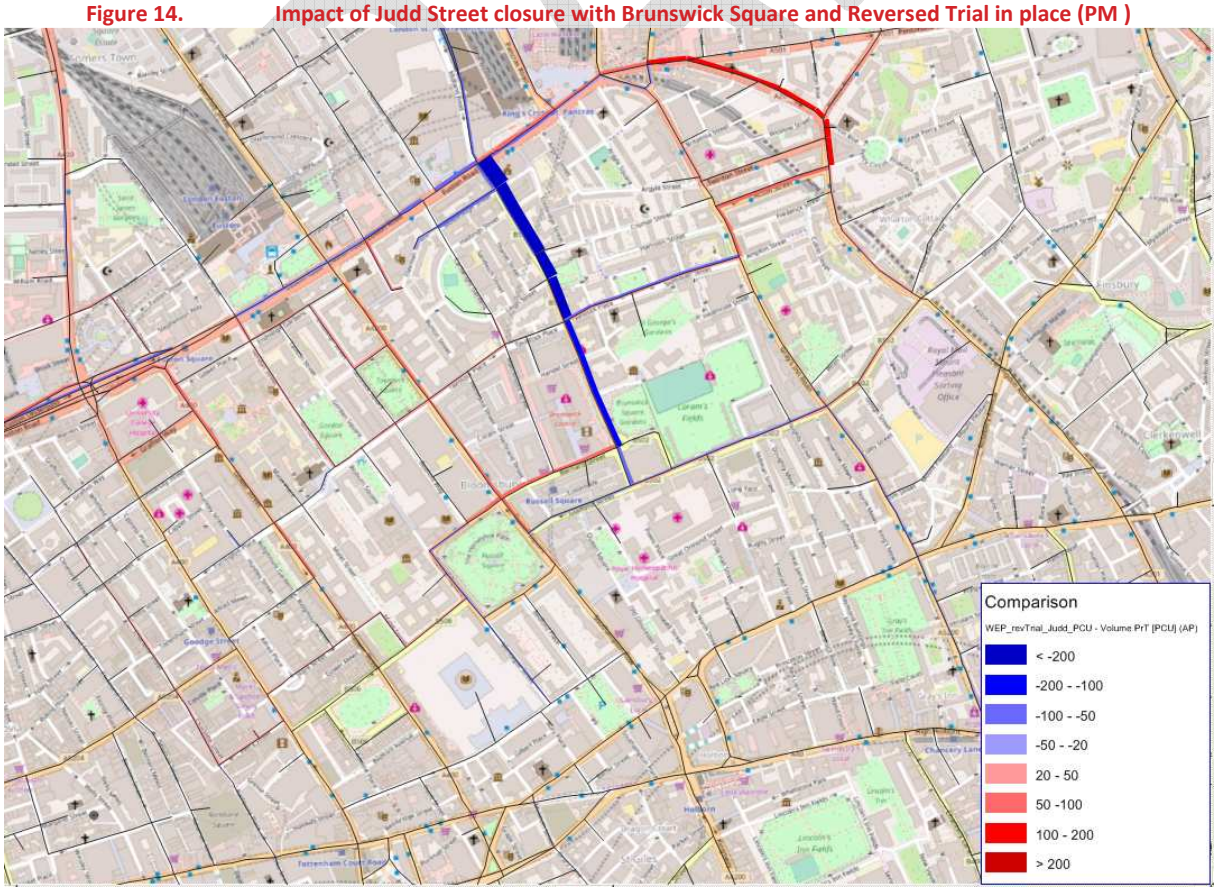


Figure 14. Impact of Judd Street closure with Brunswick Square and Reversed Trial in place (PM)



2.8 Impact of Judd St closure with the Brunswick Square scheme and the Trial with 2-way section in place

2.8.1 Again, similarly to the other comparisons including Judd Street Closure, the impact in the AM is higher than in the PM (Figure 15, Figure 16). In the AM period, traffic increases southbound on Upper Woburn Place, taking Tavistock Square west of Tavistock Square Gardens to continue on Tavistock Place going eastbound. In the PM period however, traffic do not take the detour west of Tavistock Gardens, but seems to go straight south instead. Other increases of traffic can be found on Euston Road and Bernard Street between Marchmont Street and Brunswick Square.

Figure 15. Impact of Judd Street closure with Brunswick Square, Trial and 2-way sections in place (AM)

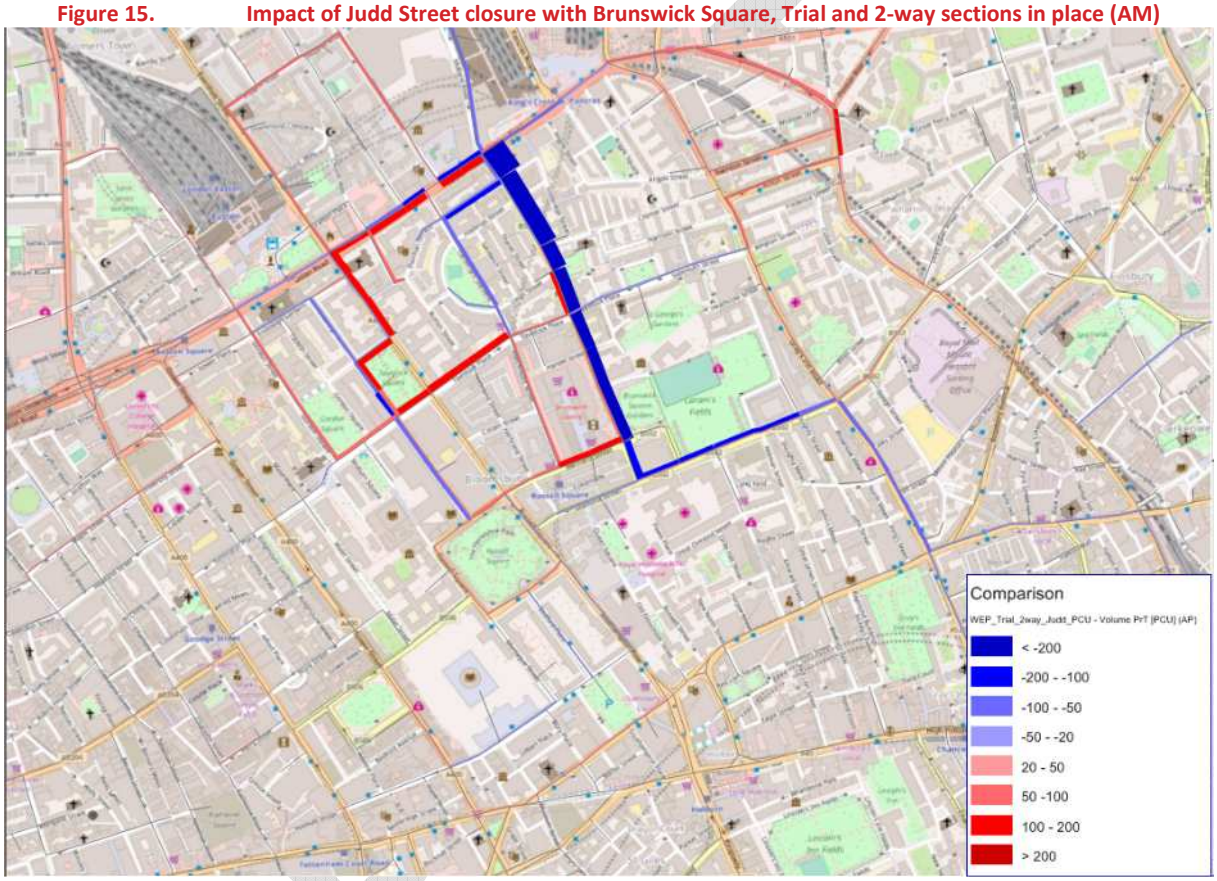
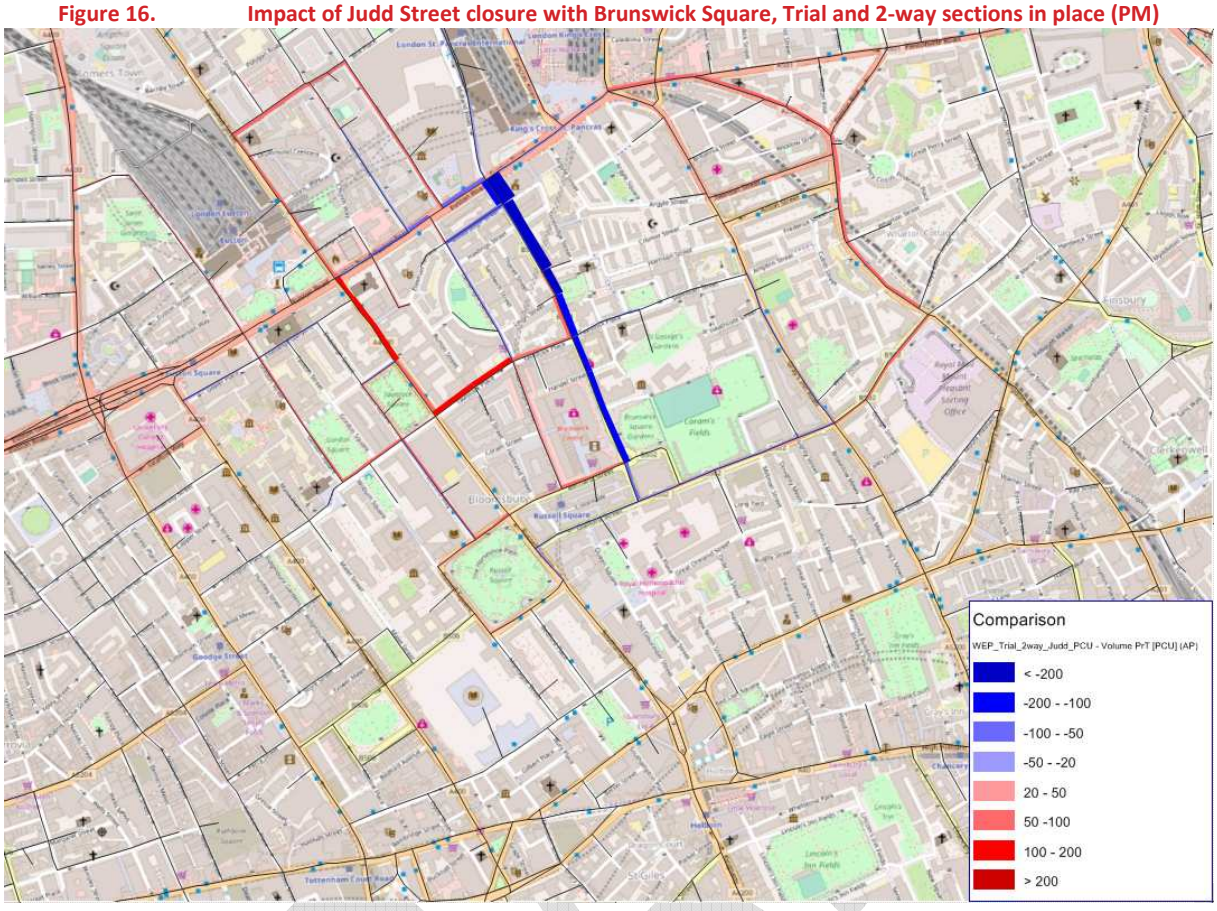


Figure 16. Impact of Judd Street closure with Brunswick Square, Trial and 2-way sections in place (PM)



2.9 Combined impact of the Brunswick Square scheme, the Trial and Judd St closure

2.9.1 To show the total impact of a combination of schemes, the following figures have been produced. Figure 17 and Figure 18 do not show new findings but summarise the impacts of the schemes implemented together. It can be seen that traffic which used to go through Tavistock Square and Torrington Place in the westbound direction, especially in the AM period, gets reassigned on Grays Inn Road and Euston Road. Also, Upper Woburn Place, Endsleigh Place, Endsleigh Street, Endsleigh Gardens and Gordon Street show a heavy increase in traffic.

Figure 17. Combined impact of Brunswick Square, Trial and Judd St closure (AM)

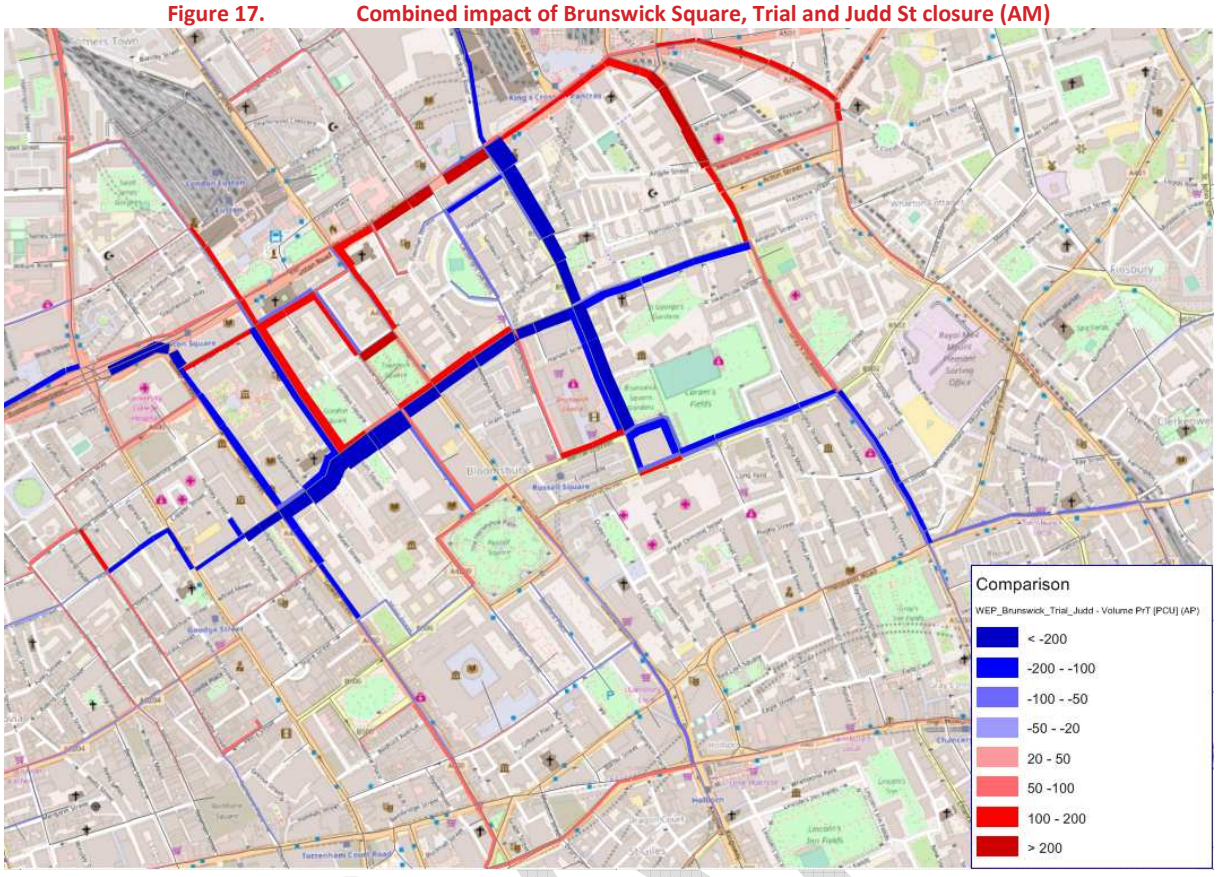
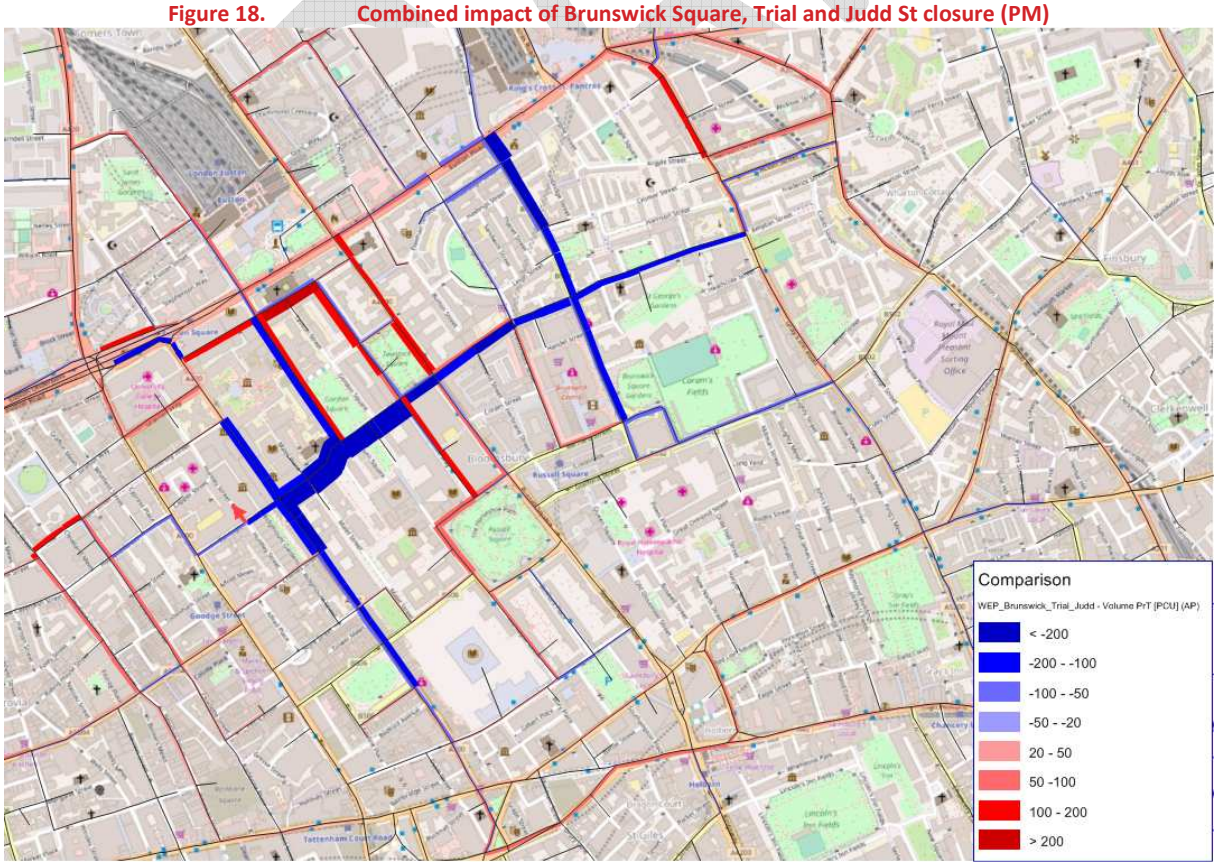


Figure 18. Combined impact of Brunswick Square, Trial and Judd St closure (PM)



2.10 Combined impact of the Brunswick Square scheme, the Trial reversed and Judd St closure

2.10.1 Similarly to 2.11, Figure 19 and Figure 20 show the total impact of a combination of schemes. Unlike when introducing the Trial in the eastbound direction, the reversed trial does not impact Euston Road negatively. However, there is an increase of traffic on King's Cross Road. Other increases in eastbound directions can be found on Gower Street, Keppel Street, Malet Street, Montague Place, Russel Square and Bernard Street. Also, Woburn Place southbound, Endsleigh Gardens and Endsleigh Street in both directions show traffic increases.

Figure 19. Combined Impact of Brunswick Square, Reversed Trial and Judd St closure (AM)

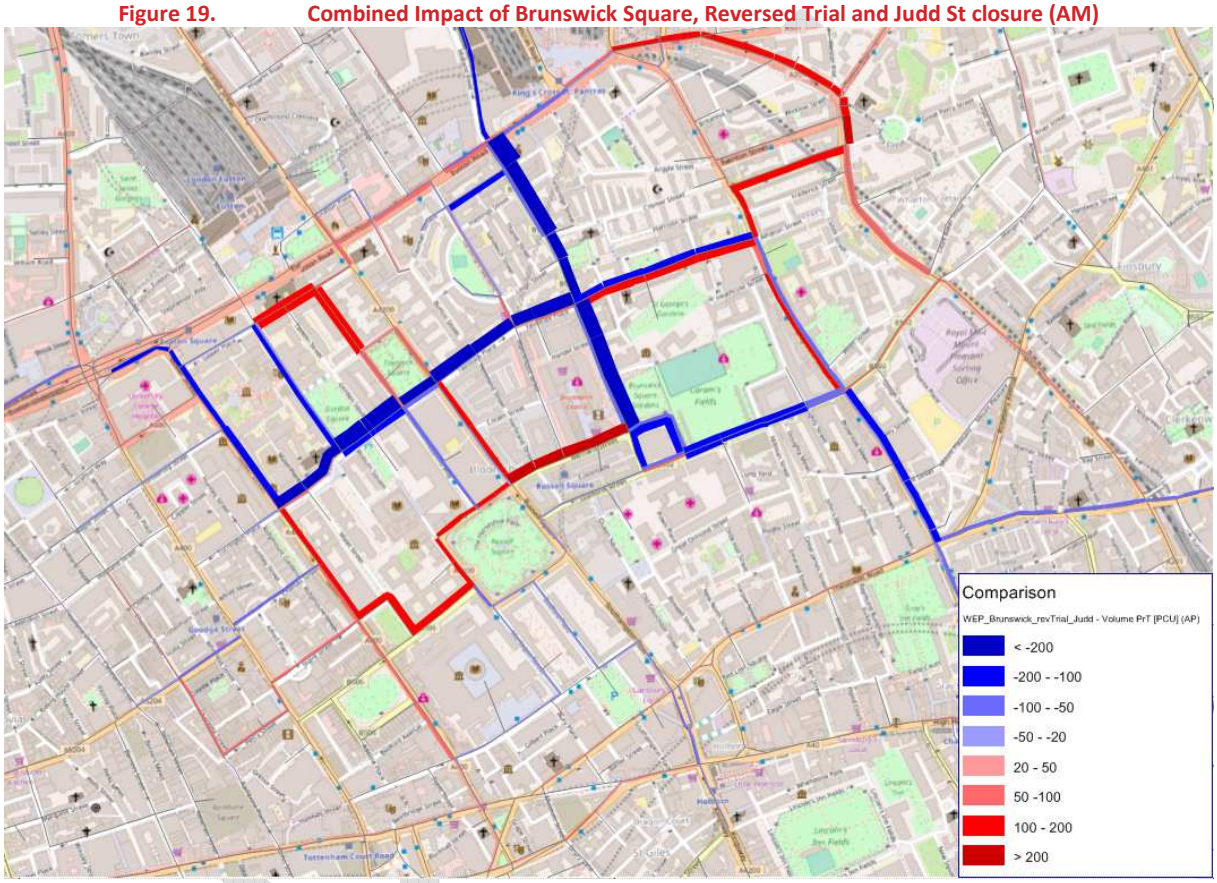
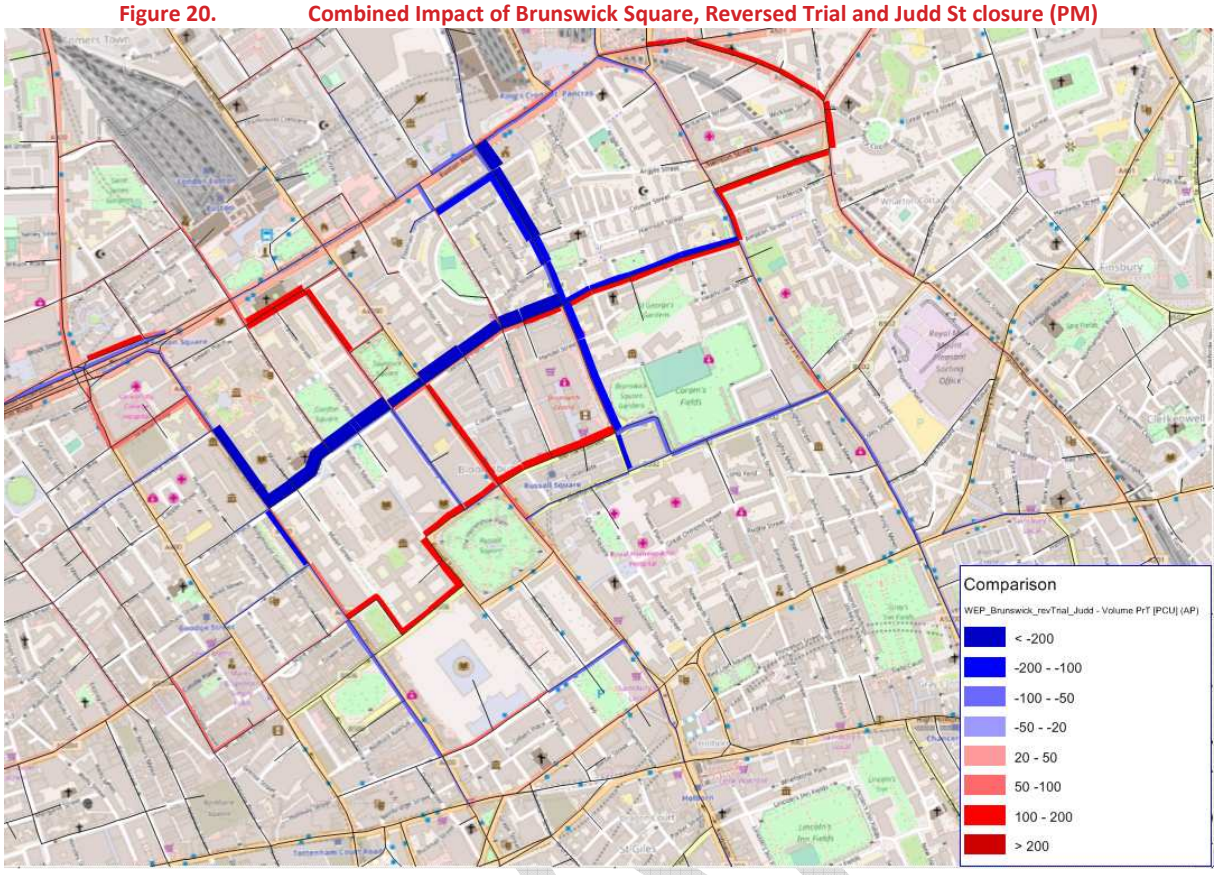


Figure 20. Combined Impact of Brunswick Square, Reversed Trial and Judd St closure (PM)



2.11 Impact of the Brunswick Square scheme with the Trial in place

2.11.1 As can be seen in Figure 21 and Figure 22, traffic via Brunswick Square going north and coming from the East, and vice-versa, is distributed throughout the network. It can also be seen that the AM is much more affected, especially in northbound direction.

Figure 21. Impact of Brunswick Square with Trial in place (AM)

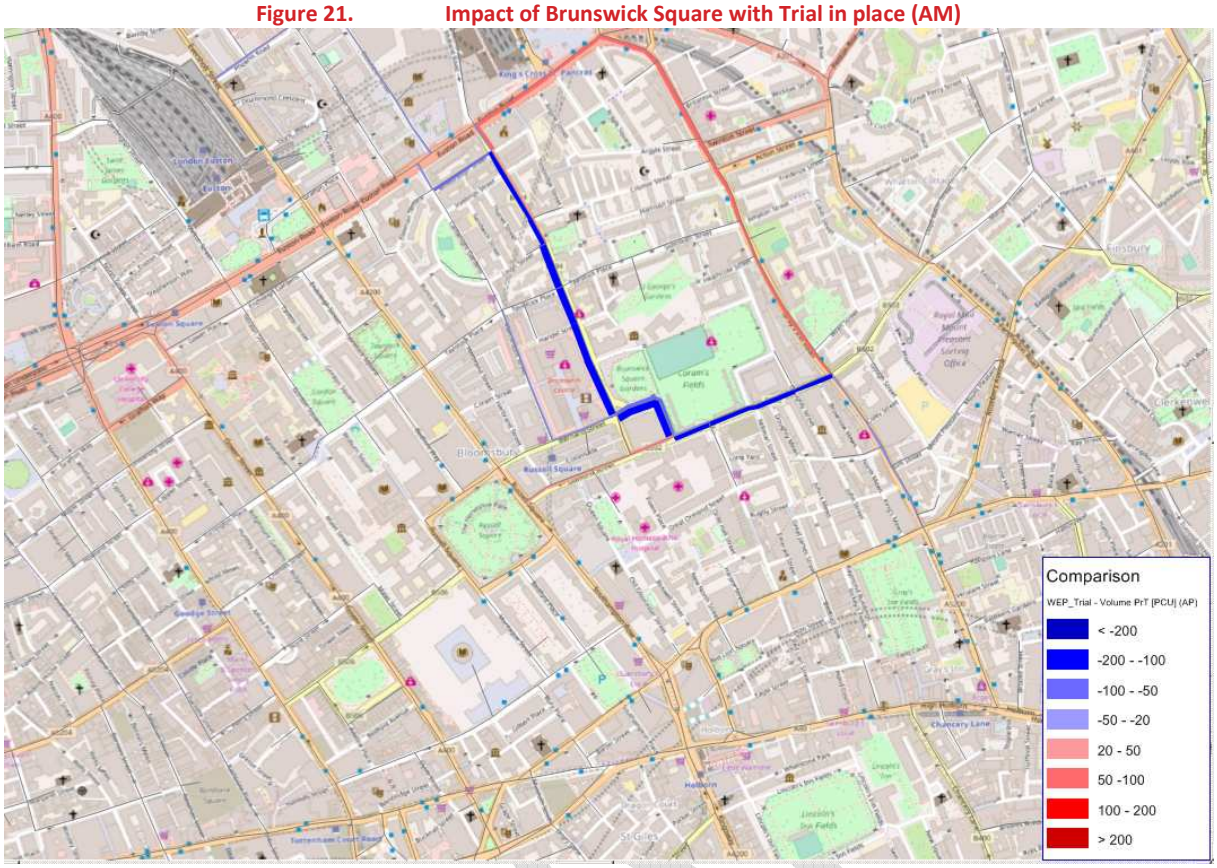
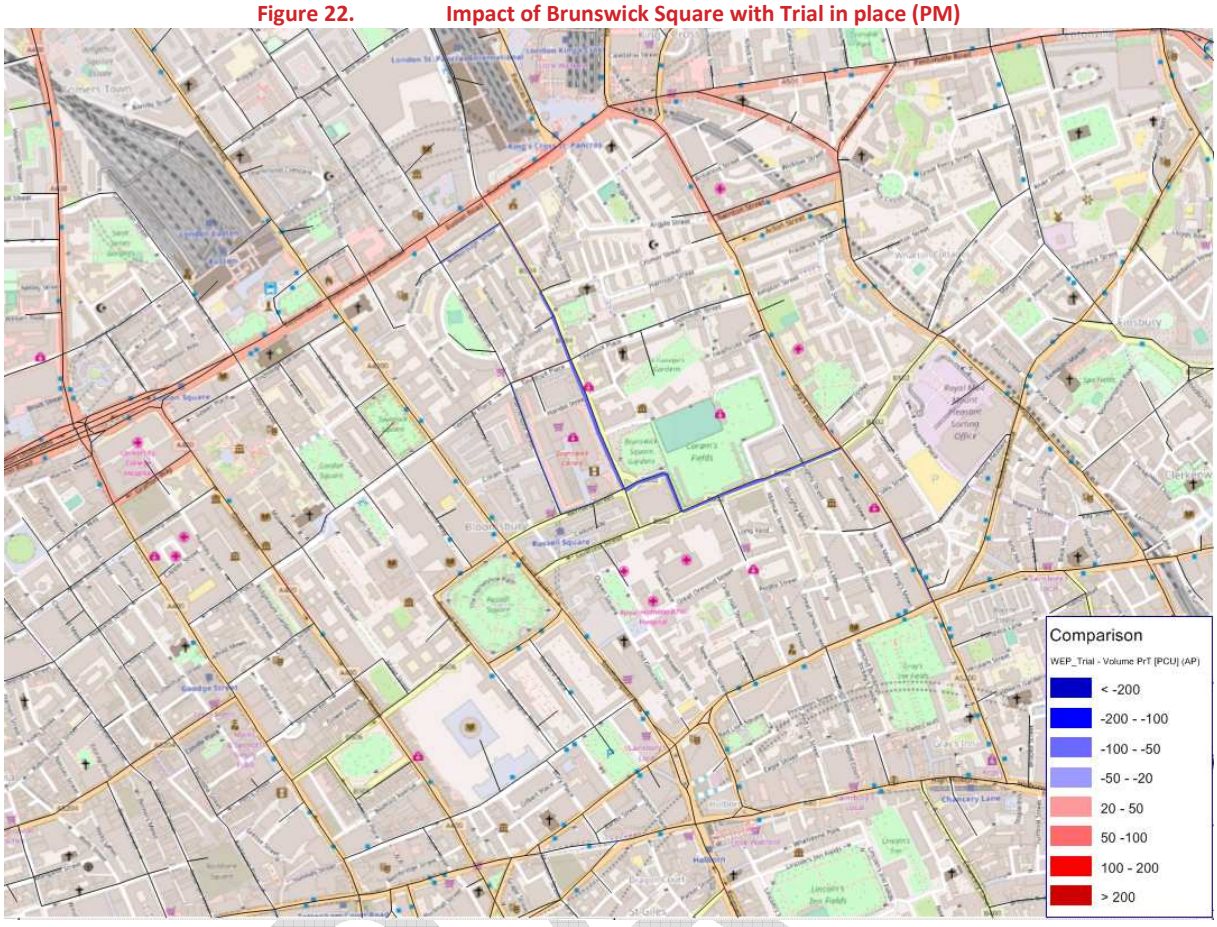


Figure 22. Impact of Brunswick Square with Trial in place (PM)



2.11.2 As the distribution of traffic cannot be seen clearly in the figure above, flow bundles have been produced to illustrate the changes of traffic flows. Flow bundles show the paths traversed by vehicles which go through a selected link. It should be noted that flow bundles may not only show traffic using the highlighted link, but also all the traffic from and to zones which may potentially use the link.

2.11.3 Figure 23 shows the flow bundle for the AM using Brunswick Square southbound if the Brunswick Square scheme is not in place. Here it can be seen that a majority of traffic does not use Brunswick Square. Figure 24 shows were the traffic goes if Brunswick Square is closed. The figure indicates that the traffic near Brunswick Square now just joins the major flow.

Figure 23. Flow Bundle on Brunswick Square Southbound when Trial is in place (AM)

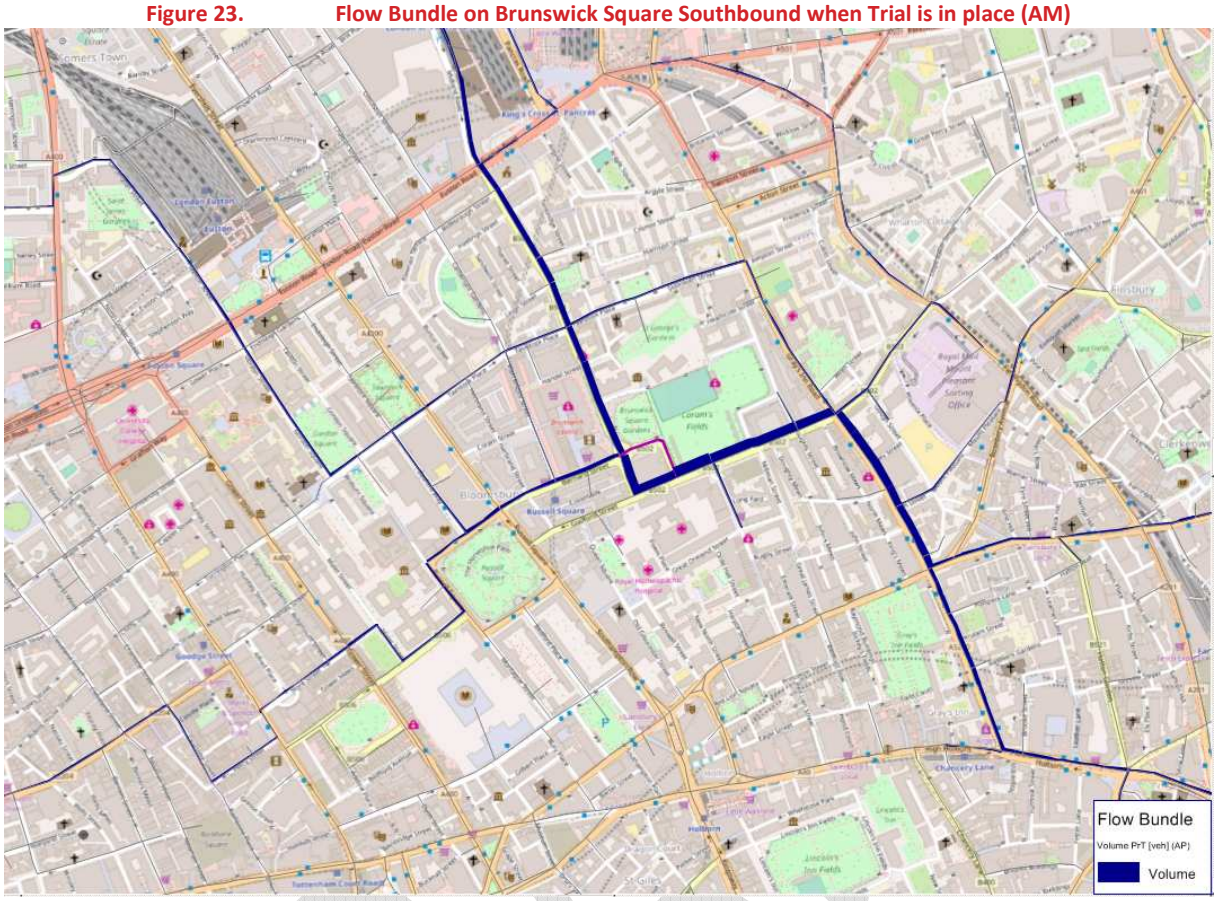
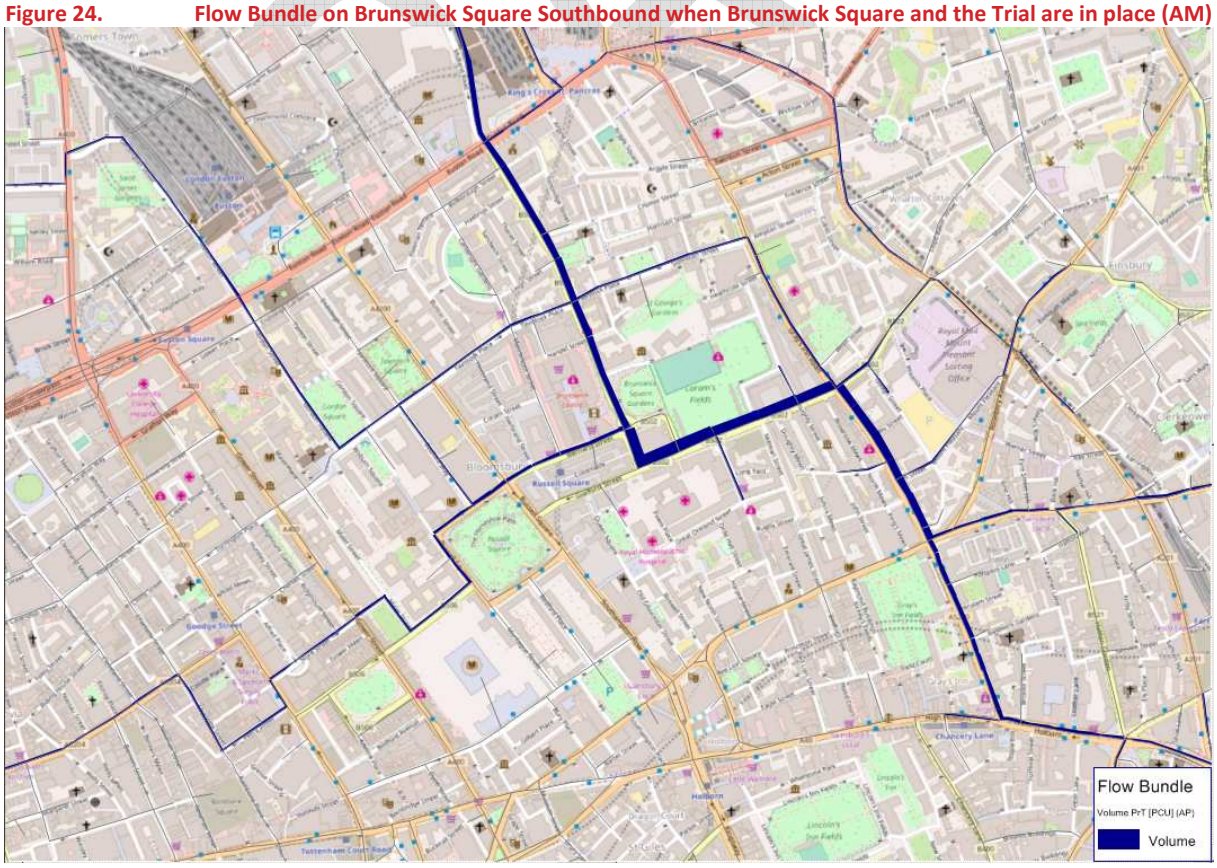


Figure 24. Flow Bundle on Brunswick Square Southbound when Brunswick Square and the Trial are in place (AM)



2.11.4 As shown in Figure 25 and previously seen in Figure 21, the northbound traffic via Brunswick Square in the AM is much higher. It can be seen that all traffic going north near the Brunswick Scheme uses the link which will be closed off in the scheme. When closing the link, traffic gets distributed to Grays Inn Road and Woburn Place/Tavistock Square. (Figure 26)

2.11.5 As the flows on this link are much lower in the PM and the traffic distribution very similar, it has been decided not to show these figures at this point.

Figure 25. Flow Bundle on Brunswick Square Northbound when Trial is in place (AM)

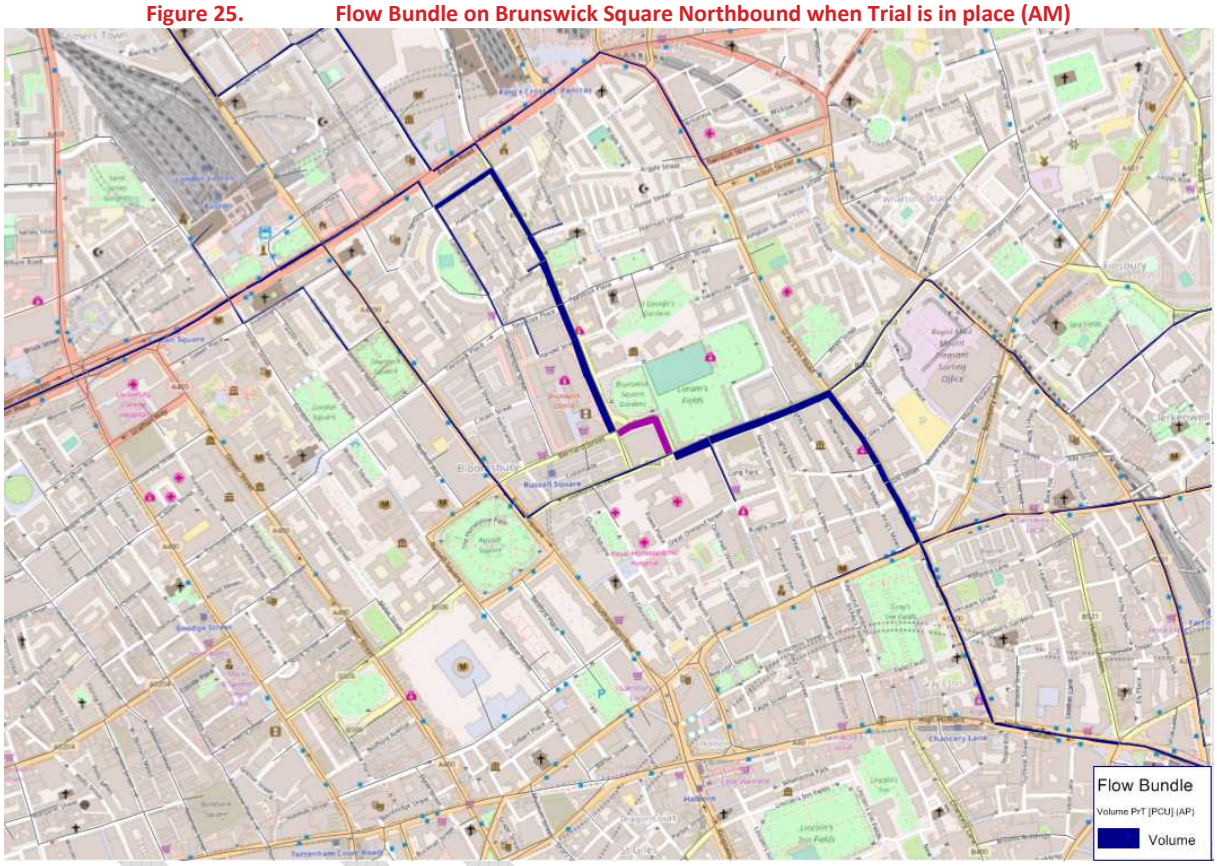
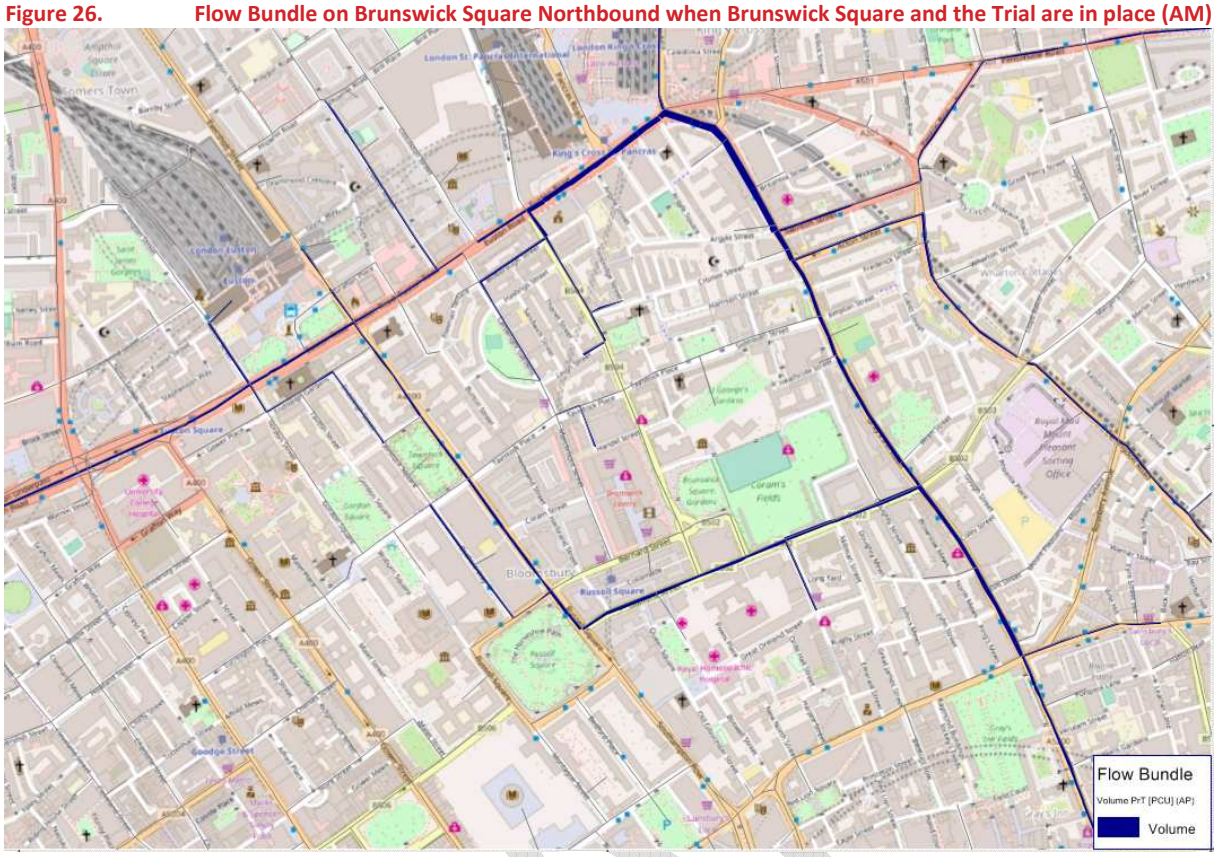


Figure 26. Flow Bundle on Brunswick Square Northbound when Brunswick Square and the Trial are in place (AM)



2.12 Impact of Judd St closure with the Trial

2.12.1 Figure 27 shows the impact of Judd Street Closure on AM traffic flows while the WEP and Trial schemes are in place. When comparing this with Figure 9, it can be seen that Brunswick Square scheme has little influence on the traffic re-distribution. The same applies for the PM (Figure 28, Figure 10).

Figure 27. Impact of Judd St Closure when Trial is in place (AM)

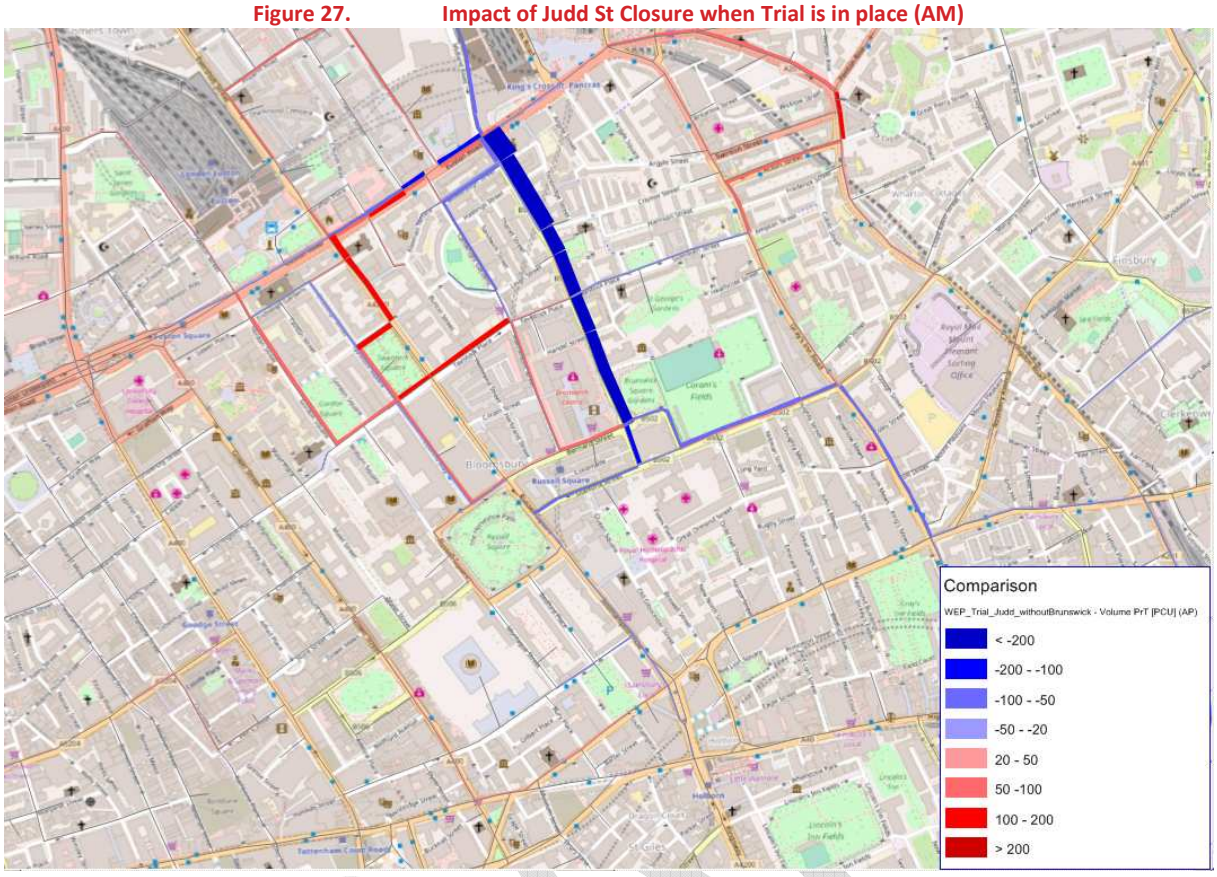
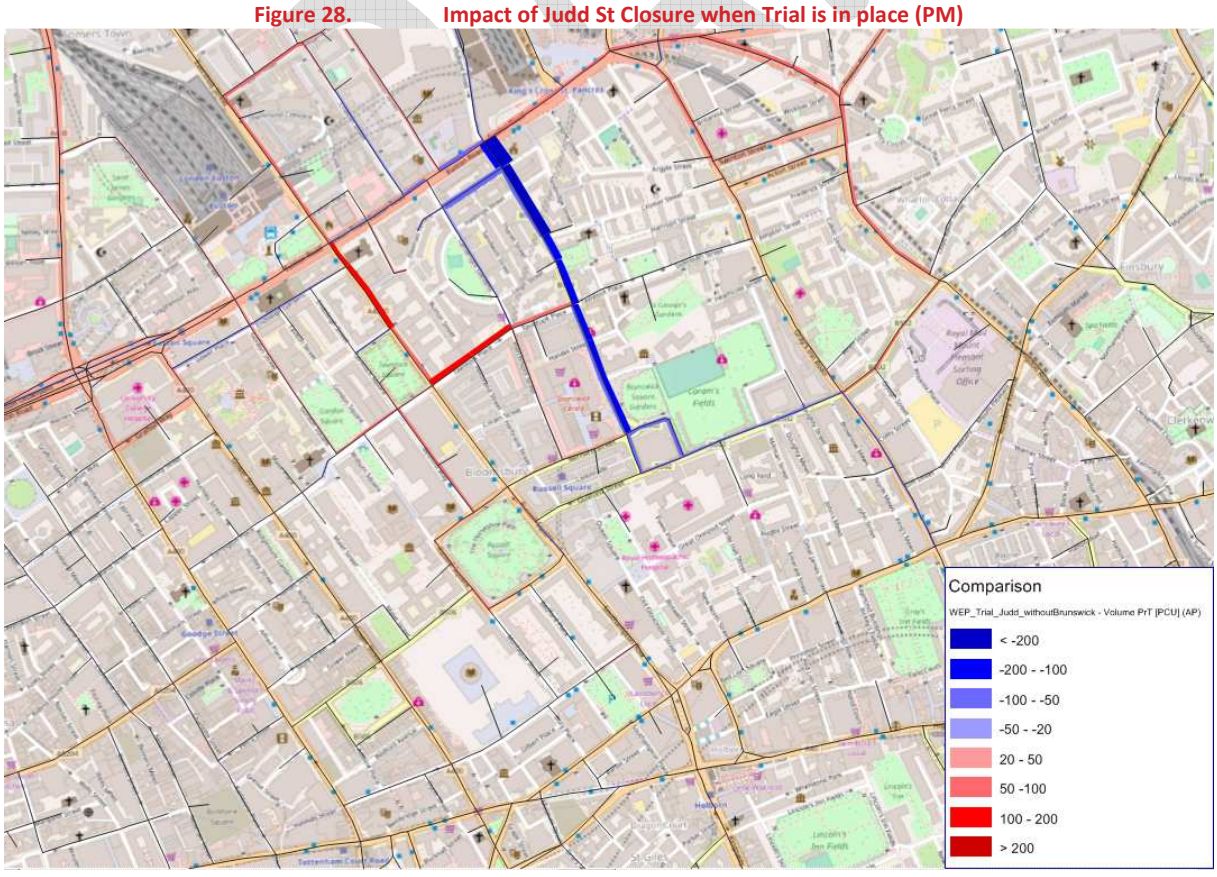


Figure 28. Impact of Judd St Closure when Trial is in place (PM)



2.12.2 To illustrate the re-distribution of traffic, flow bundles were produced. Figure 29 shows the flows from and to zones using Judd Street at the junction with Euston Road. Flow bundles are defined as in para 2.11.2. It can be seen that nearly no traffic uses Brunswick Square. Figure 30 shows no significant changes on Brunswick Square once Judd Street is closed. As the PM results do not diverge from the findings in the AM, the results are not included.

Figure 29. Flow Bundle on Judd Street Southbound when Trial is in place (AM)

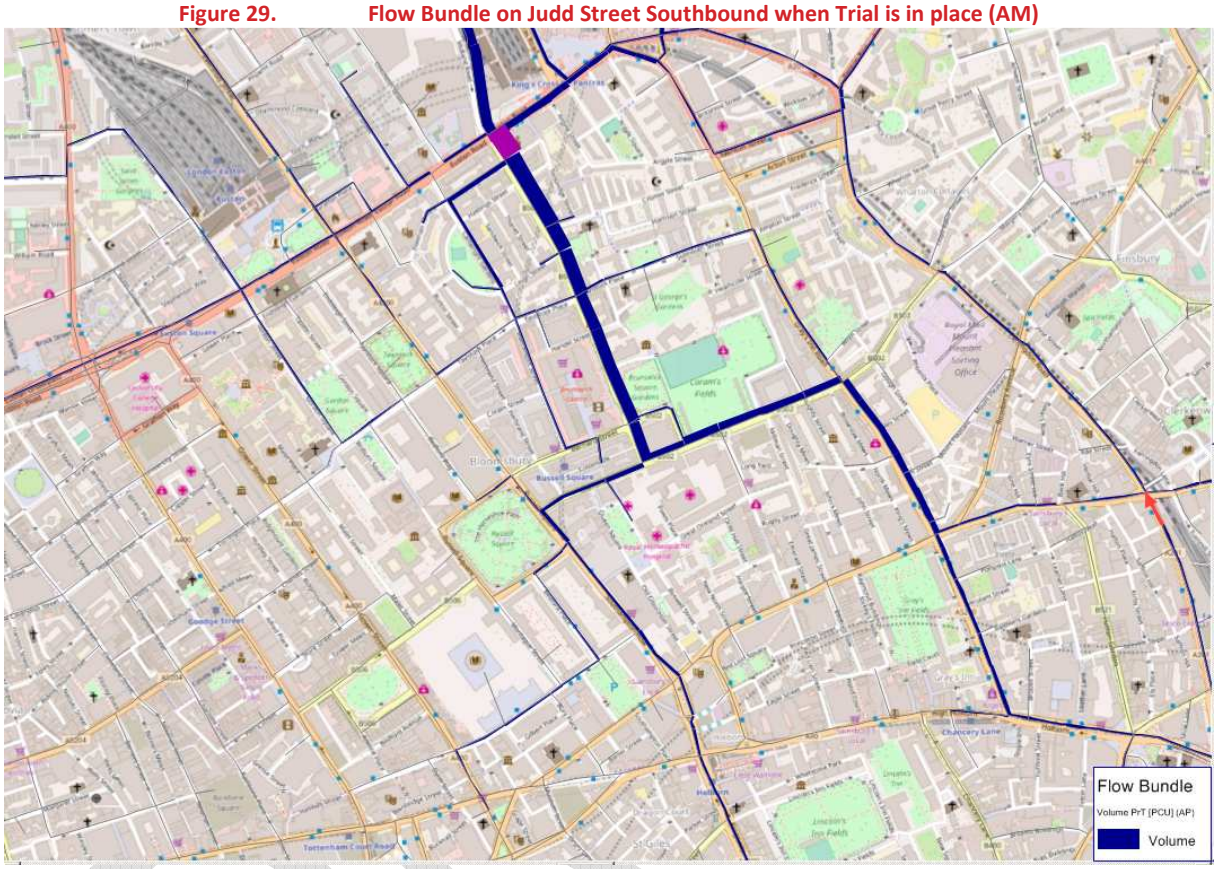
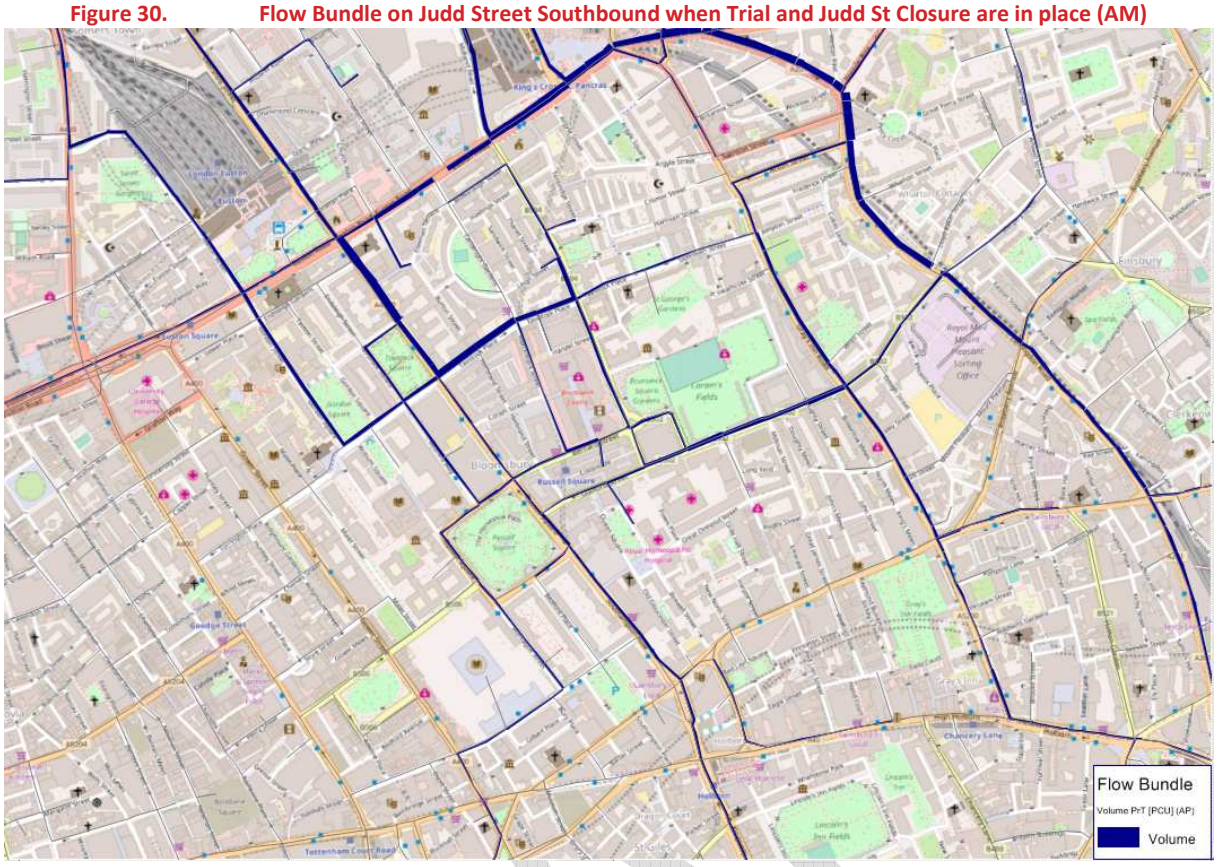


Figure 30. Flow Bundle on Judd Street Southbound when Trial and Judd St Closure are in place (AM)



3. SUMMARY

3.1.1 The initial stage of this investigation amended the base ONE model network to reflect the traffic management arrangements on site during the 2016 surveys. The existing ONE model matrix was then assigned onto this network. This initial assignment resulted in approximately one third of calibration sites having a GEH of 5 or lower when compared with modelled flows.

3.1.2 Therefore, a matrix estimation exercise (TFlowFuzzy) has been undertaken. This raised the satisfying sites (GEH <5 and/or DMRB criteria met) up to 87% in the AM and 76% in the PM. Given the short timescale, this level of calibration has been agreed to be acceptable by LB Camden and TfL.

3.1.3 The model has subsequently been used to compare the impacts of a series traffic management options. It is noted that the impacts of the West End Project (WEP) overshadowed all other potential changes and thus all options were tested with the WEP as a base. Given the potential number of comparisons available, the assessment has focused on comparing the differences between options, such that their relative benefits can be ascertained. As Brunswick Square did not show a negative impact on the surrounding network, it has been included in all option comparisons apart from the final comparison.

3.1.4 The smallest effect in traffic distribution comes with the introduction of the short 2-way section between Woburn Place and Gordon Square west. The closure of Judd Street causes a significant decrease in traffic in the southbound direction on Judd Street, but

only moderate increases on other roads as vehicles redistribute to several routes. When introducing the Trial, traffic mainly diverts onto Euston Road.

3.1.5 Additional tests regarding the effect of Brunswick Square Scheme showed that it usually only has minor impacts. An exception is the northbound traffic if the WEP and Trial scheme are in place. When closing Brunswick Square, traffic gets distributed to Grays Inn Road and Woburn Place/Tavistock Square.

Appendix A – Option Definitions

A series of options were identified for testing and were coded into the updated ONE model. These options were then utilised to develop a set of comparisons to facilitate analysis of the impact of a combination of scheme proposals. The options tested were:

- West End Project only (Option 0);
- West End Project and Brunswick Square (Option A);
- West End Project, Brunswick Square and Trial (Option B);
- West End Project, Brunswick Square and Judd Street Closure (Option C);
- West End Project, Brunswick Square, Trial and Judd Street Closure (Option D);
- West End Project, Brunswick Square and Trial in reversed direction (Reversed Trial) (Options E);
- West End Project, Brunswick Square, Reversed Trial and Judd Street Closure (Option F);
- West End Project, Brunswick Square, Trial and 2-way sections (Option G);
- West End Project, Brunswick Square, Trial, 2-way sections and Judd Street Closure (Option H);
- West End Project and Trial (Option I); and
- West End Project, Trial and Judd Street Closure (Option J).

The table below summarises the contents of the various options:

OPTION	WEP	BRUNSWICK SQUARE	TRIAL	REVERSED TRIAL	JUDD STREET CLOSURE	2-WAY SECTIONS
0	x					
A	x	x				
B	x	x	x			
C	x	x			x	
D	x	x	x		x	
E	x	x		x		
F	x	x		x	x	
G	x	x	x			x

OPTION	WEP	BRUNSWICK SQUARE	TRIAL	REVERSED TRIAL	JUDD STREET CLOSURE	2-WAY SECTIONS
H	x	x	x		x	x
I	x		x			
J	x		x		x	

The various option comparisons presented in this report are formulated through comparing two of the above options . The list below shows which options have been compared for each impact assessment comparison in Section 2 of the report.

- **Impact of implementing the Brunswick Square scheme**

  Option A – Option 0: Impact of Brunswick Square | (WEP + Brunswick) - WEP

- **Impact of implementing the Trial plus the Brunswick Square scheme**

  Option B – Option A: Impact of the Trial when WEP and Brunswick Square are in place | (WEP + Brunswick + Trial) – (WEP + Brunswick)

- **Impact of the Trial reversed with the Brunswick Square scheme in place**

  Option E – Option A: Impact of reversed Trial if WEP and Brunswick Square are in place | (WEP + Brunswick + Reversed Trial) – (WEP + Brunswick)

- **Impact of Judd St closure with the Brunswick Square scheme in place**

  Option C – Option A: Impact of Judd Street closure if WEP and Brunswick Square are in place | (WEP + Brunswick + Judd St Closure) – (WEP + Brunswick)

- **Impact of Judd St closure with the Trial and the Brunswick Square scheme in place**

  Option D – Option B: Impact of Judd Street closure if WEP, Brunswick Square and Trial are in place | (WEP + Trial + Brunswick + Judd St Closure) (WEP + Brunswick + Trial)

- **Impact of adding 2-way section to the Trial with the Brunswick Square scheme in place**

  Option G – Option B: Impact of 2-way sections if WEP with Brunswick Square and Trial are in place | (WEP + Brunswick + Trial + 2-way Sections) – (WEP + Brunswick + Trial)

- **Impact of Judd St closure with the Brunswick Square scheme and the Trial reversed are in place**

Option F – Option E: Impact of Judd Street closure if WEP with Brunswick Square and Reversed Trial are in place | (WEP + Brunswick + Reversed Trial + Judd St Closure) – (WEP + Brunswick + Reversed Trial)

- **Impact of Judd St closure with the Brunswick Square scheme and the Trial with 2-way section in place**

  Option H – Option G: Impact of Judd Street closure if WEP with Brunswick Square, Trial and 2-way section are in place | (WEP + Brunswick + Trial + 2-way Sections + Judd St Closure) – (WEP + Brunswick + Trial + 2-way Sections)

- **Combined impact of the Brunswick Square scheme, the Trial and Judd St closure**

  Option D – Option O: Impact of Brunswick, Trial and Judd Street closure | (WEP + Brunswick + Trial + Judd St Closure) – (WEP)

- **Combined impact of the Brunswick Square scheme, the Trial reversed and Judd St closure**

  Option D – Option O: Impact of Brunswick Square, Reversed Trial and Judd St Closure| (WEP + Brunswick + Reversed Trial + Judd St Closure) – (WEP)

- **Impact of the Brunswick Square scheme with the Trial**

  Option B – Option I: Impact of Brunswick Square closure if WEP and Trial are in place | (WEP + Brunswick + Trial) – (WEP + Trial)

  Impact of Judd St closure with the Trial

  Option J – Option I: Impact of Judd Street closure if WEP and Trial are in place | (WEP + Trial + Judd St Closure) – (WEP + Trial)

APPROVAL

Version	Name		Position	Date	Modifications
1	Author	Torsten Schneider	Transport Planner	23/12/2016	
	Checked by	Mohsin Munshi	Associate	23/12/2016	
	Approved by	Phil Marshall	Associate Director	23/12/2016	
2	Author	Torsten Schneider	Transport Planner	06/01/2017	Updated Figures for PM in chapter 3.1 and 3.2
	Checked by	Mohsin Munshi	Associate	06/01/2017	
	Approved by	Phil Marshall	Associate Director	06/01/2017	
3	Author	Torsten Schneider	Transport Planner	19/01/2017	Updated figure and inclusion of additional option tests
	Checked by	Mohsin Munshi	Associate	19/01/2017	
	Approved by	Phil Marshall	Associate Director	19/01/2017	
4	Author	Torsten Schneider	Transport Planner	30/01/2017	Inclusion of additional option tests
	Checked by	Mohsin Munshi	Associate	30/01/2017	
	Approved by	Phil Marshall	Associate Director	30/01/2017	
5	Author	Torsten Schneider	Transport Planner	08/02/2017	Internal Working Draft
	Checked by				
	Approved by				
6	Author	Torsten Schneider	Transport Planner	27/06/2017	Rephrasing of technical elements
	Checked by	Mohsin Munshi	Associate	27/06/2017	
	Approved by	Phil Marshall	Associate Director	27/06/2017	