# Temporary Crystal Palace and South Norwood Low Traffic Neighbourhood

## Study Report

**December 2020**

PJA

CROYDON
www.croydon.gov.uk

## Version Control and Approval

| Version | Date | Main Contributors | Issued by | Approved by |
|---|---|---|---|---|
| 1.0 | 12/11/2020 | JY | JMQ | JMQ |
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| 2.1 | 07/12/2020 | JY | - | - |
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| 2.3 | 11/12/2020 | JY | JMQ, BC | JMQ |
| 2.4 | 14/12/2020 | JY | JMQ | JMQ |
| 2.5 | 17/12/2020 | JY | JMQ | JMQ |
| 2.6 | 21/12/2020 | JY | - | - |

Prepared for

London Borough of Croydon

# 1

# INTRODUCTION

# 1 INTRODUCTION

## Background

London Borough of Croydon (LB Croydon) has introduced a series of Temporary Low Traffic Neighbourhood (LTN) measures in the Crystal Palace and South Norwood area. The temporary LTN measures are intended to to provide safe spaces for people to walk, cycle, exercise and socially distance, and have been developed in response to the Department for Transport's (DfT) Emergency Active Travel Fund (EATF) criteria. It is worth noting that there are historical issues regarding vehicle speeds and volumes on residential streets in the area which predate the introduction of the temporary LTN measures.

PJA has been commissioned by LB Croydon to complete a baseline analysis of the neighbourhood, and to undertake traffic analyses to review the effects of the temporary scheme.

## Temporary LTN measures

LB Croydon has introduced seven temporary LTN measures in the area in stages through Temporary Traffic Management Orders. The extents of the temporary LTN are shown opposite. Whilst there is no formal boundary to the temporary LTN, the notional 'neighbourhood' spans across the boundary with the London Borough of Bromley (LB Bromley). The temporary LTN covers a large area bounded by main A Roads and the railway line.

Six of these measures are 'modal filters' which prohibit motor vehicle access, but maintain through access for pedestrians and cyclists. The seventh location uses a bus gate which has the same operation as the other modal filters however through access is provided for bus services. The location of the measures is indicated on the plan opposite. A short timeline also explains the development of the temporary LTN and when the different measures were installed. Photos of the temporary LTN measures and more information on the rationale of the scheme are provided overleaf.

While we have made every effort to undertake an extensive review on the traffic effects associated with the temporary LTN, there are limitations. The general reduction in traffic due to COVID-19, coupled with a series of road works conducted in a close proximity to the temporary LTN, has posed difficulties in measuring and deducing effects arising directly from the scheme. We have also taken these factors into consideration when undertaking the analyses.

## Temporary LTN Timeline

1 **2 May 2020**

Modal filters placed on (TMO PN874):

- Junction of Lancaster Road/ Southern Avenue
- Junction of Woodvale Avenue/ Avenue Road

2 **9 May 2020**

Modal filter placed at (TMO PN878):

- Junction of Lancaster Road/ Warminster Road

3 **7 June 2020**

Modal filter placed on Auckland Road by Cypress Road (This was upgraded to a Bus Gate on 15/07/20 (TMO PN912), and with camera enforcement on 31/07/20 July (TMO PN928).

The road was closed by Southern Gas Network for emergency gas works since 11 March 2020.

4 **3 August 2020**

Modal filters placed on (TMO PN999):

- Stambourne Way
- Sylvan Hill
- Fox Hill


Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2*

Borough Boundary

LB Bromley

LB Lambeth

School Street scheme on Cypress Road (since Feb 2020)

## LTN Measures

Modal filter

Bus Gate

## Schools

Primary

Secondary

Independent/ Other

College and University

*Out of scope for Baseline analysis; analysed in regards to traffic impact in the latter part of this study



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TEMPORARY LTN SCHEME OVERVIEW

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,000 | JY | JMQ | 20/11/2020 |

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## Rationale for Low Traffic Neighbourhoods

Low Traffic Neighbourhoods (LTN) aim to reduce the impact of through vehicular traffic upon streets. Although coined as Low Traffic 'Neighbourhoods' which implies a residential focus, the approach can be applied to any area where through traffic has an adverse effect on other users. The main output of LTNs is reduced through traffic volumes, however the approach and its benefits are significantly wider ranging than traffic management. The additional benefits include improved air and noise quality, improved access to open spaces and parks, and improved road safety.

Low Traffic Neighbourhood is an increasingly popular method for encouraging increased levels of walking and cycling through the creation of low traffic environments. The Department for Transport's recently published 'Cycle Infrastructure Design - Local Transport Note 1/20' also makes specific reference to the use of low-traffic environments.

## Rationale for EATF Streetspace Programme

At the start of the first Lockdown in Spring 2020, LB Croydon introduced a series of temporary LTN measures to stop through traffic using certain streets.

Temporary LTNs have been installed by many London Boroughs as part of their EATF responses, including Brent, Camden, Enfield, Lambeth, Hackney, and Southwark. As with LB Croydon, these authorities are now monitoring the effects of the temporary measures and reviewing the next steps, which include removal or options for more permanent arrangements.

Auckland Road


Pedestrian andf Cycle Zone as part of the existing Cypress Road school street scheme


Stambourne Way modal filter


Advanced warning sign provided regarding bus gate on Auckland Road


Advanced warning sign provided regarding road closure on Sylvan Hill

Auckland Road bus gate

# 2

# BASELINE ANALYSIS

# 2.1 TRIP ATTRACTORS

This chapter presents our desk-based review of the baseline conditions of the neighbourhood, which covers the following topics:

- Trip attractors
- Public transport and walking
- Cycle network
- Car ownership
- Pedestrian and cyclist casualties
- Schools within the temporary LTN and pupils' home location
- Air quality

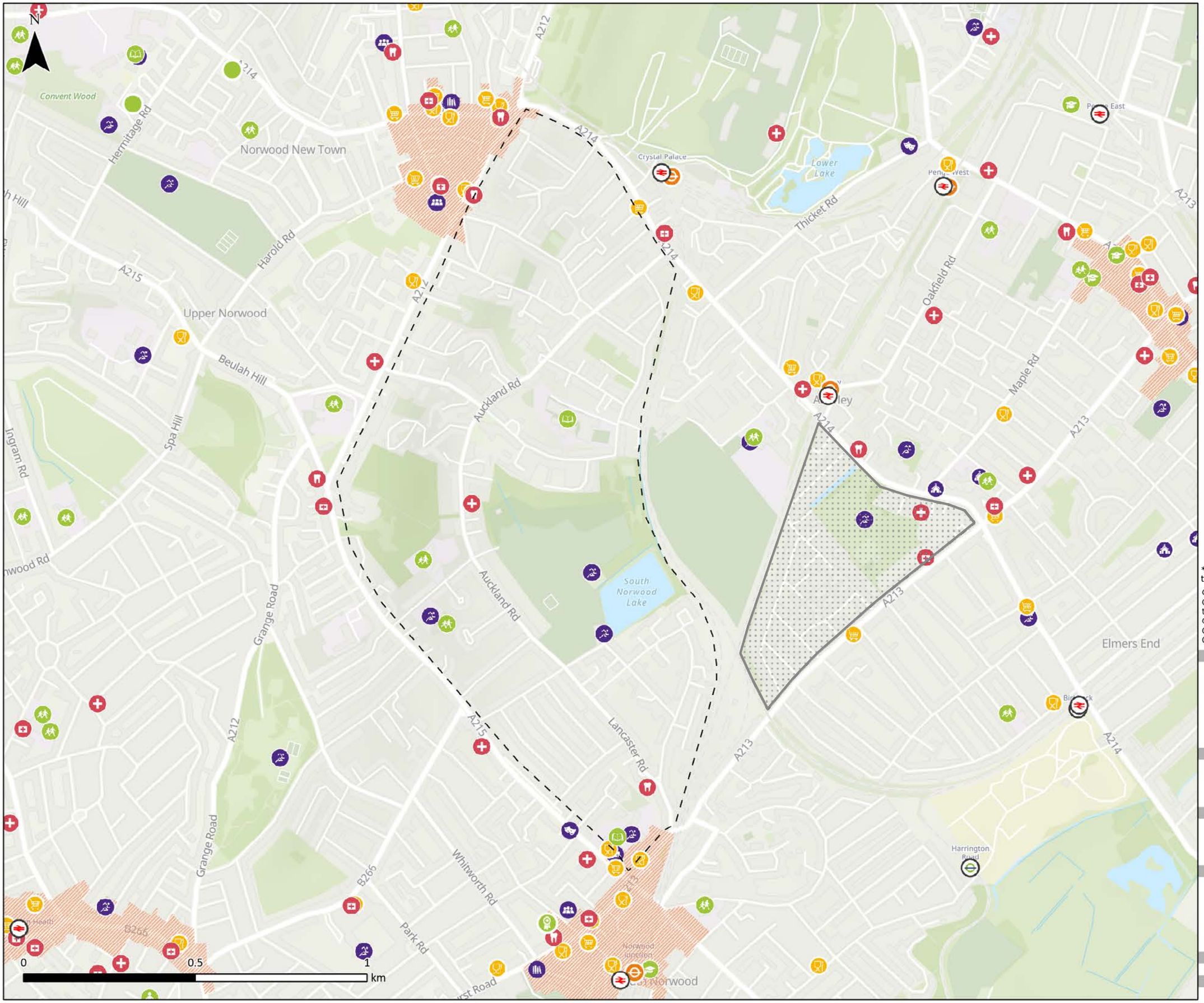
## TRIP ATTRACTORS

The plan opposite summarises the key trip attractors in the vicinity of the Temporary Crystal Palace and South Norwood LTN. It is important to review the distribution of these attractors to help understand movement patterns within the LTN.

There is a high density of trip attractors located at both the northern and southern edges of the LTN. Both of these areas, Upper Norwood and South Norwood, are recognised as District Centres in the London Plan.

There are restaurants, retail points, pharmacies, dentists, community centres and libraries at both locations.

Within the area of the temporary LTN, there is a GP surgery, a dentist, three sport facilities, three schools and two large open spaces. With a well-connected residential street network, there is convenient access to amenities, schools and other facilities in and around the temporary LTN.




Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2*

National Rail

Overground

Tramlink

**Healthcare Facilities**

Hospital

General Practice

Pharmacy

Dentist

**Schools**

Nursery

Primary

Secondary

Sixth Form

Independent/ Other

College and University

**Amenities**

Supermarket

Pub

Library

Community Centre

Sport Facility

Theatre

Place of Worship

District Centre (London Plan)

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# TRIP GENERATORS

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| FIGURE NUMBER | REVISION |
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# 2.2 SCHOOLS

The opposite plan identifies both the location of schools in the temporary LTN as well as the home locations of most of their pupils. This helps to understand the impact of the schools in the wider area and the key routes that pupils are likely to use to access the schools. There are three schools in the temporary LTN:

- Cypress Primary School (747 pupils) (with two sites on Cypress Road)
- Harris Academy South Norwood (1572 pupils)
- Harris City Academy Crystal Palace (1209 pupils)

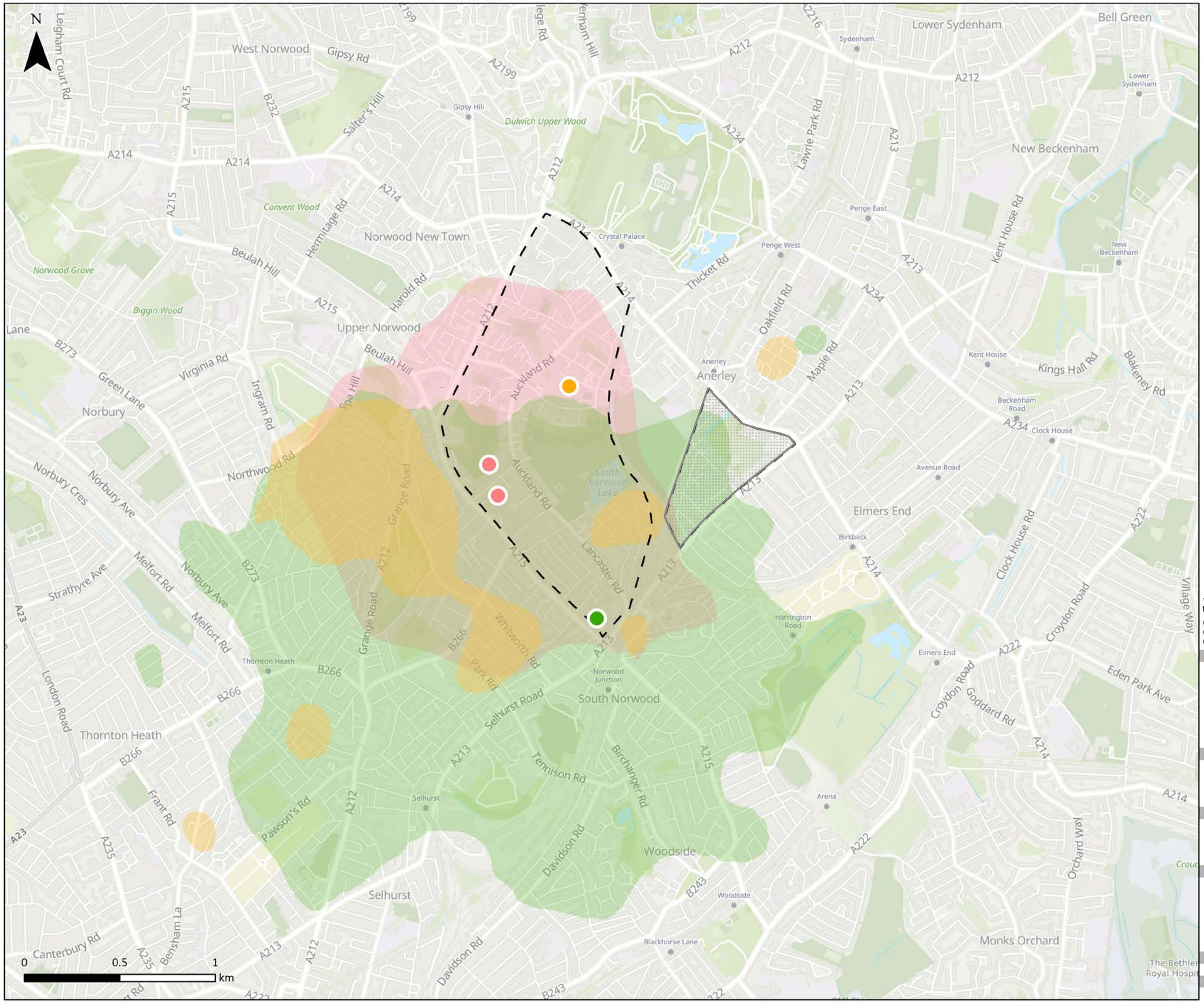
Despite Harris Academy South Norwood is located within the temporary LTN boundary, it is on a cul-de-sac that can only be accessed from South Norwood Hill.

The plan shows that over half of the home location catchment for Cypress Primary School is within the temporary LTN. A majority of pupils from Harris Academy South Norwood and Harris City Academy Crystal Palace live outside of the temporary LTN area.

Most pupils attending the local schools located in the temporary LTN live within 3.1km of their school. Based on TfL data, these distances would be considered comfortably cyclable and potentially walkable too [1] [2]. It would be expected to be beneficial to reduce road danger by reducing through traffic volumes in vicinity of the schools, with the aim of providing a safer routes for walking, cycling and scooting, etc. to schools for pupils.

1 - TfL's 'Analysis of Cycling Potential' defines a cycleable trip as less than 8km and the traveller is over 5 and under 64,

2- TfL's 'Analysis of Walking Potential' defines a walkable trip as less than 1.5km for those aged under 12 or over 69; and under 2km made by those aged 12-69.

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# SCHOOLS AND HOME LOCATION OF MOST PUPILS

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| A3 @ 1:18,000 | JY | JMQ | 20/11/2020 |

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| 9 | - |

# 2.3 PUBLIC TRANSPORT AND WALKING

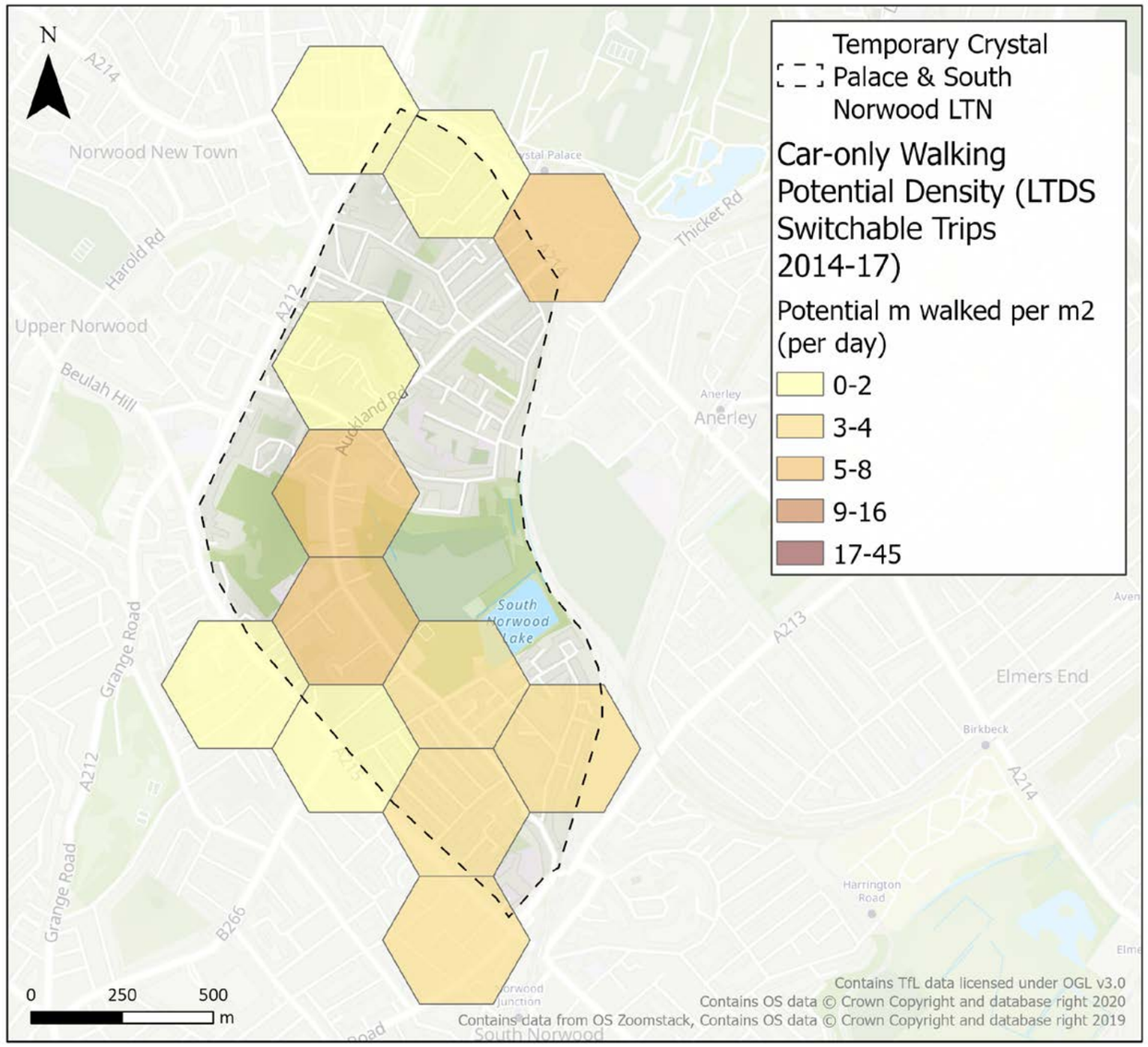
## PUBLIC TRANSPORT ACCESSIBILITY

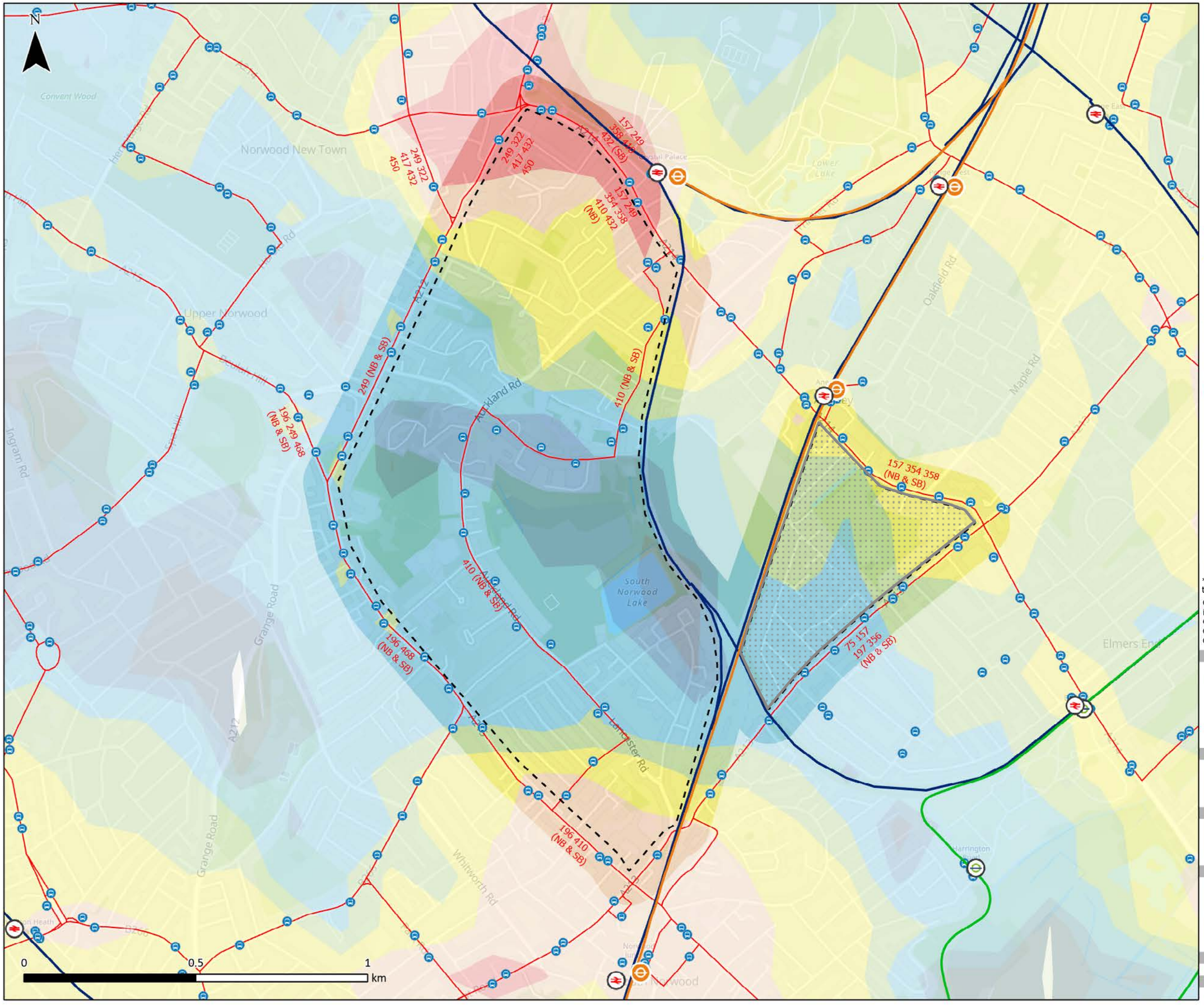
Public transport accessibility levels are analysed by TfL on a relative basis and are expressed as 'Public Transport Accessibility Levels' (PTAL). The PTAL scores range from 0 (worst) up to 6b (best). The PTAL scores for the study area are illustrated overleaf.

Over half of the temporary LTN area has a PTAL rating of 1 to 3. The northern and southern edges of the temporary LTN have PTAL scores of between 4 and 6a respectively. The temporary LTN area is bounded by bus routes and the 410 bus route runs through it. The difference in the distribution of PTAL rates is explained by the presence of rail stations at the northern and southern ends of the temporary LTN which increase the scores in neighbouring areas.

## WALKING POTENTIAL

Whilst PTAL scores vary across the temporary LTN, the TfL 'Car-Only Walking Potential Density' assessment (right) suggests that there is a moderate potential through the area for increased walking trips switchable from car driving. The data represents the density of walking trips that could be made by residents living within each of the hexagons, if they switched from driving a car. The assessment captures 'potential trips' by measuring the impact of switching suitable existing short private car trips to foot.



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# PUBLIC TRANSPORT CONNECTIONS

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| FIGURE NUMBER | REVISION |
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| 6 | - |

# 2.4 CYCLE NETWORK

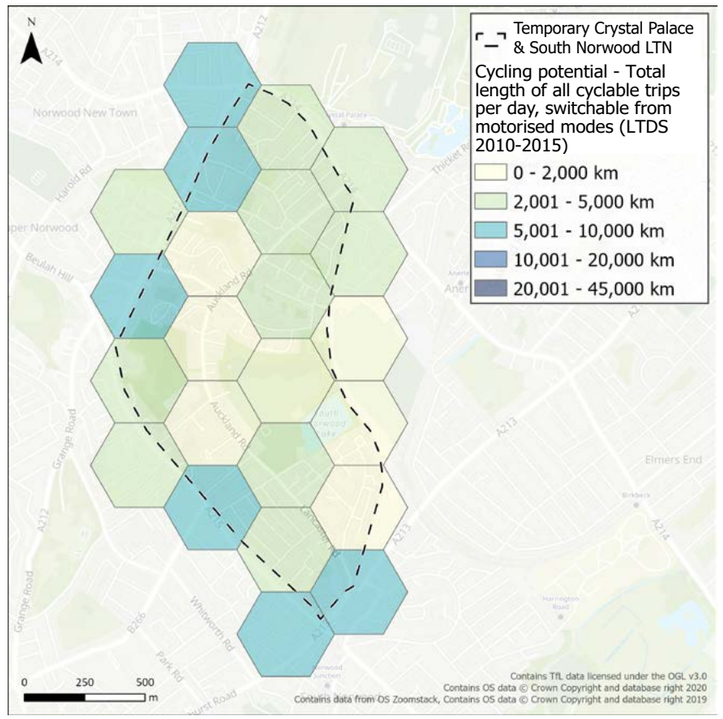
The plan overleaf summarises the existing cycle network in the vicinity of the temporary LTN area. The plan also includes cycling isochrones to illustrate the distance that could be cycled in five minutes and ten minutes using the existing road network. It shows that Thornton Heath to the southwest, as well as Crystal Palace, Anerley and South Norwood rail stations are located within a ten-minute cycle journey from the centre point of the temporary LTN area.

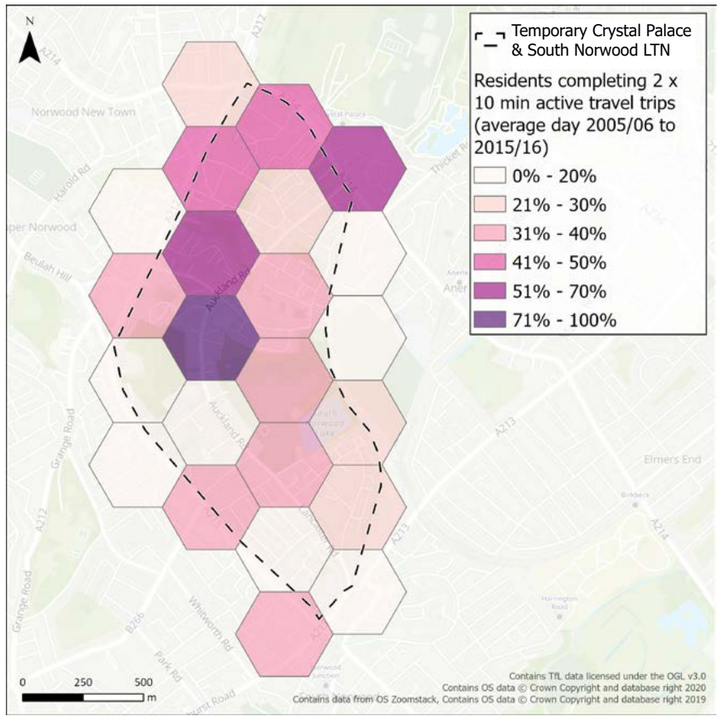
The combined outputs highlights that there are currently a number of route options in the area and that a majority of the temporary LTN is within a five minute cycle ride.

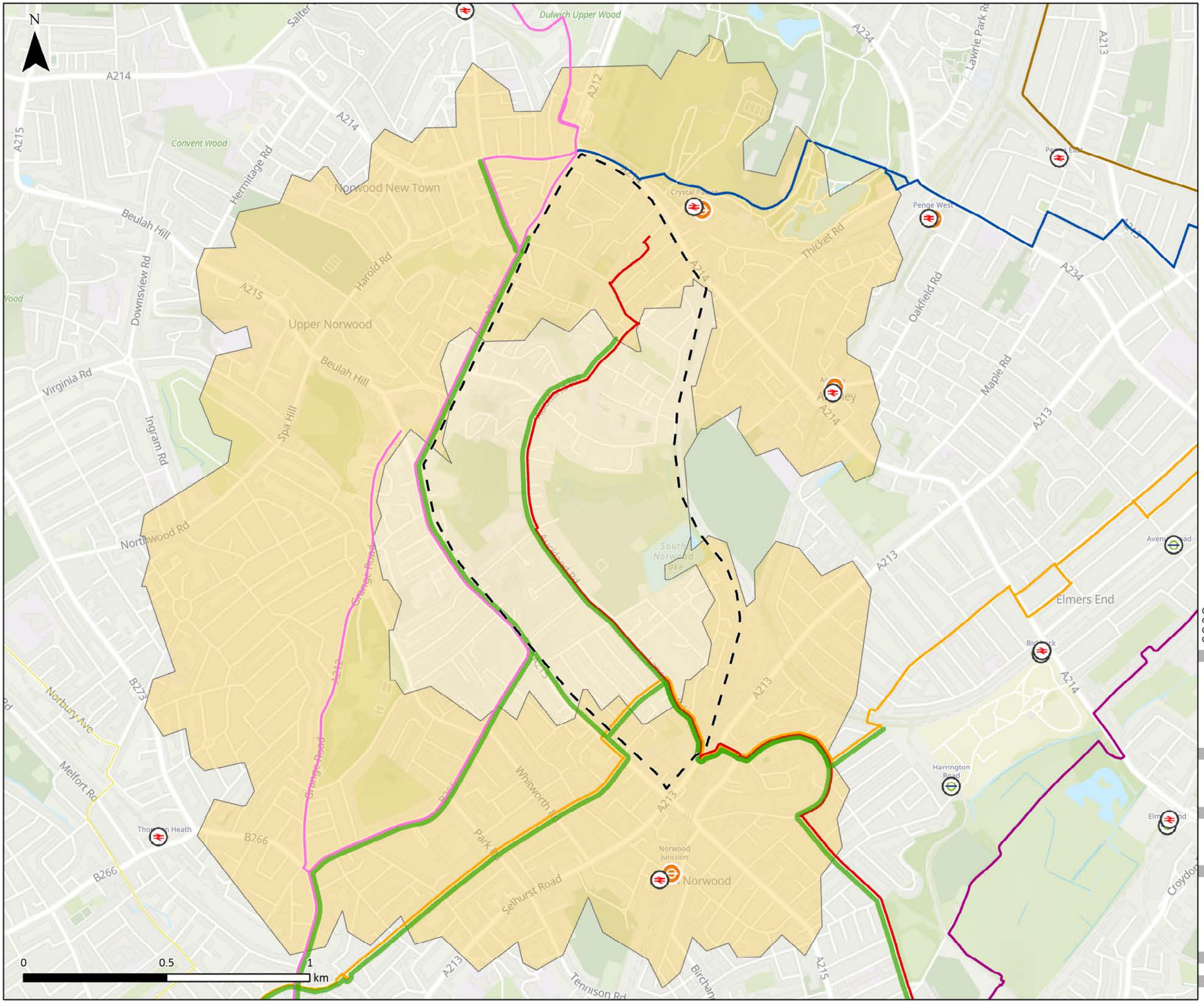
The two figures on this page compare the potential for increased cycling activity using outputs from TfL's City Planner Tool.

- The left figure shows TfL's assessment of the total length of all cyclable trips that could be made per day by residents living within each of the hexagons, if they switched from motorised modes.

- The figure to the right shows TfL's assessment of the proportion of residents who complete at least two 10-minute active travel trip on an average day.






Temporary Crystal Palace & South Norwood LTN

National Rail

Overground

Tramlink

## Cycle Time from LTN centroid

≤ 5 mins

≤ 10 mins

## Existing Cycle Routes

Existing Croydon Secondary Cycle Routes (LIP3)

LCN 23

LCN 27

LCN 29

LCN 5

LCN 62

LCN 77

NCN 21



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# CYCLE NETWORK

| SCALE | DRAWN | REVIEWED | DATE |
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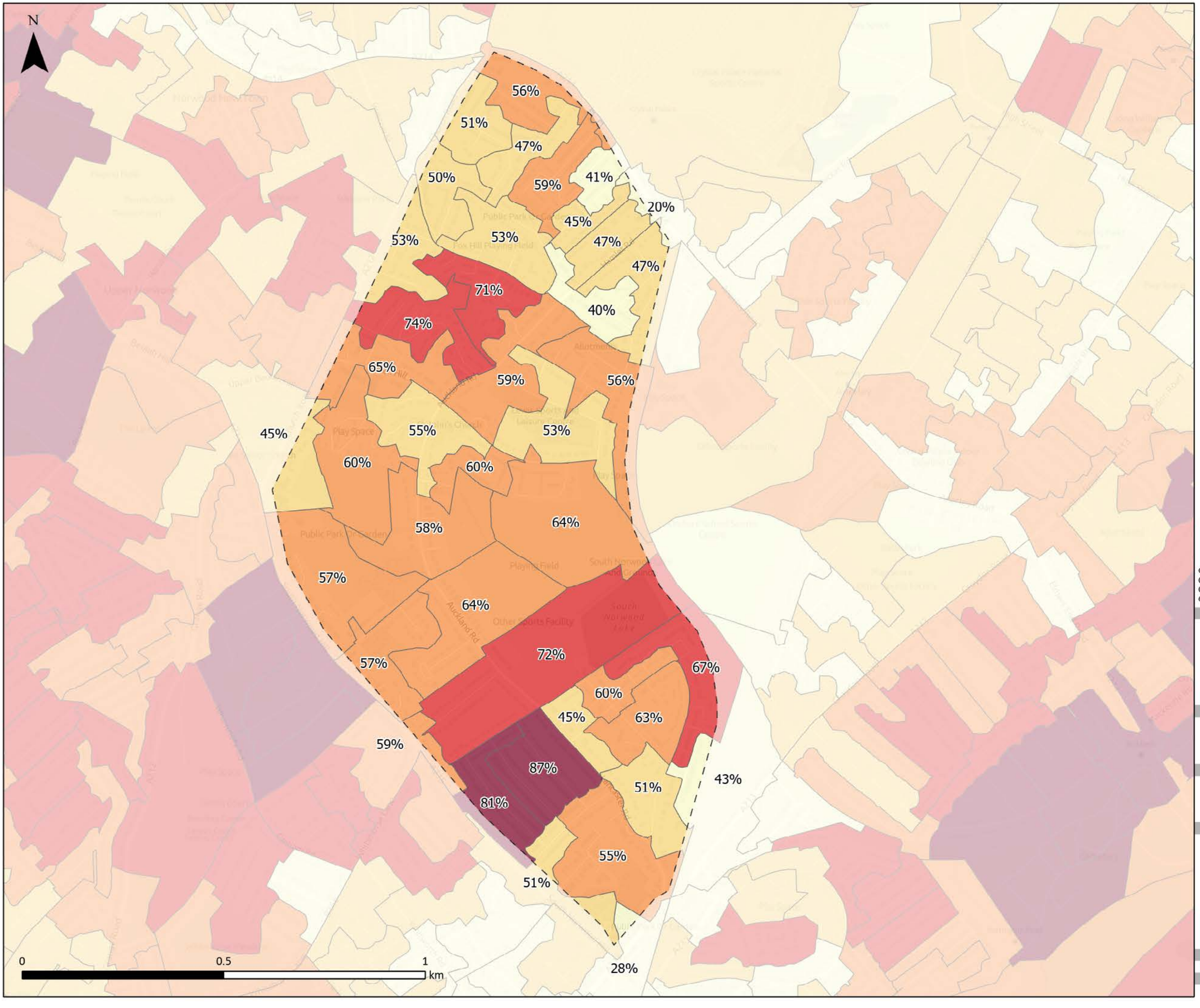
| FIGURE NUMBER | REVISION |
|---|---|
| 7 | A |

# 2.5 CAR OWNERSHIP

This plan to the right summarises the percentage of households that have access to at least one car or van based on 2011 Census data.

About 55% of the households in the temporary LTN area have access to one or more cars or vans. Areas with higher car ownership percentage are generally located around the centre of the temporary LTN area, with a relationship with accessibility to public transport.

The 2021 census will provide a more accurate picture.




Temporary Crystal Palace & South Norwood LTN

Percentage of household with access to car or van (2011 Census)

- ≤43%
- ≤55%
- ≤65%
- ≤77%
- ≤98%



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# CAR OR VAN AVAILABILITY BY HOUSEHOLD

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| A3 @ 1:8,500 | JY | - | 09/12/2020 |

| FIGURE NUMBER | REVISION |
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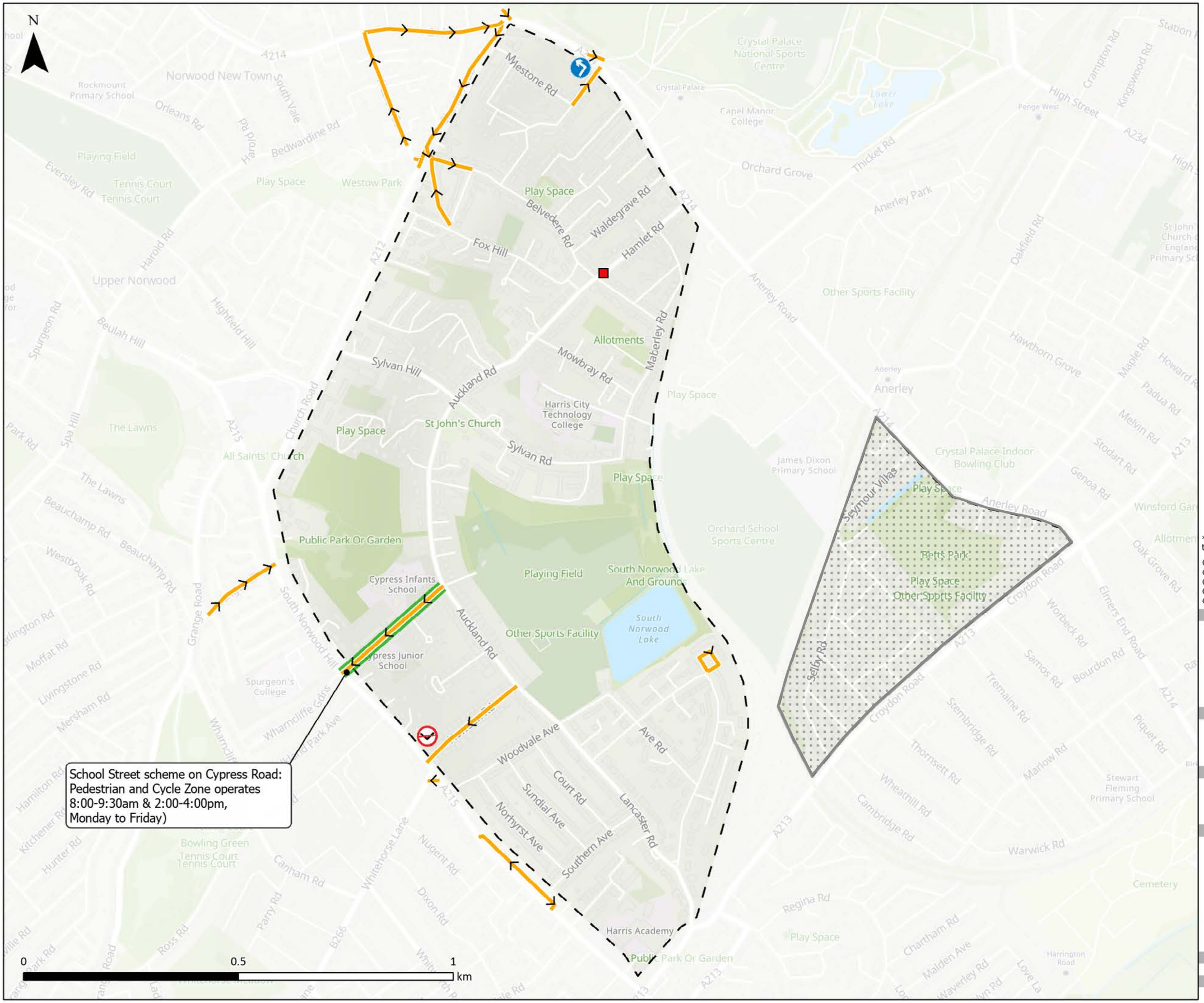
# 2.6 TRAFFIC MANAGEMENT (BEFORE LTN)

This plan summarises the traffic management measures within the area before the temporary LTN measures were introduced since May 2020. This provides an understanding on its baseline permeability level of vehicular traffic and action taken in the past to address traffic issues.

There are several traffic management measures that are currently in place in or around the LTN. These measures are listed below:

- A mandatory left turn is in place at Cintra Park junction with Anerley Hill.
- A right turn ban is in place at Howden Road junction with South Norwood Hill.
- Within the temporary LTN area, one-way operations are in place on:
  - Cintra Park
  - Landsdowne Place
  - Belvedere Road (western section)
  - Cyress Road
  - Howden Road
  - Warminster Square
- A width restriction where Auckland Road joins Hamlet Road
- A gyratory system is in place along the northern section of Church Road, Westow Street and the eastern section of Westow Hill.
- A school street scheme has been introduced on Cypress Road since February 2020, not long before the first Lockdown in March. It is a pedestrian and cycle zone arrangement enforced from Monday to Friday, during 8-9:30am and 2-4pm.




Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2*

School Street scheme on Cypress Road (since Feb 2020)

One Way Road

Turn Restriction

Mandatory Left Turn

Banned Right Turn

Width Restriction

*Out of scope for Baseline analysis; analysed in regards to traffic impact in the latter part of this study



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Auckland Road LTN

TITLE

# TRAFFIC MANAGEMENT MEASURES (BEFORE LTN IMPLEMENTATION)

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| FIGURE NUMBER | REVISION |
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| 11 | - |

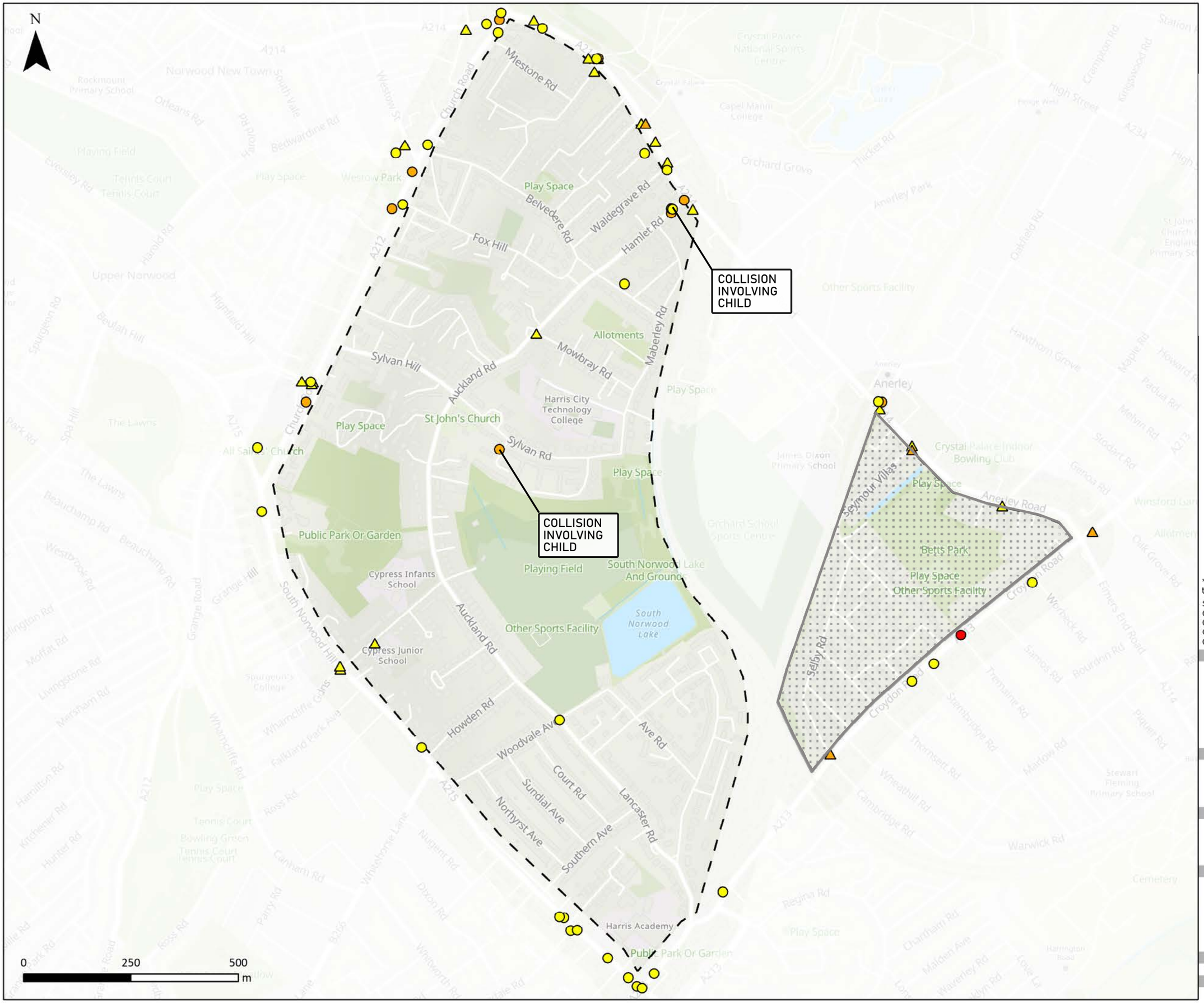
# 2.7 PEDESTRIAN AND CYCLIST CASUALTIES

This plan summarises collisions resulting in pedestrians and/or cyclist casualties between April 2017 and April 2020. This is the latest collision data available to date, provided by Transport for London.

There were nine collisions involving pedestrians or cyclists within the LTN area. Two of which were serious injuries. Notably, two of these collisions (22%) within the temporary LTN (as annotated on the plan) involved children walking.

These figures are neither a true reflection of road danger (due to under reporting of injured casualties to the police[1]) or road risk (due to people lowering risk by not walking or cycling where they see streets as dangerous, and not allowing their children to do so).

1 - DfT (2017), Reported Road Casualties in Great Britain: notes, definitions, symbols and conventions




Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2*

## Pedestrian and Cyclist Collision (Apr 2017-Apr 2020)

Pedestrian

- Fatal
- Serious
- Slight

Cyclist

- Serious
- Slight

*Out of scope for Baseline analysis; analysed in regards to traffic impact in the latter part of this study

School pupils statistics obtained from GLA's London School Atlas



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PEDESTRIAN AND CYCLIST COLLISIONS

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,000 | JY | JMQ | 26/11/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 10 | - |

# 2.8 AIR QUALITY

Three plans have been presented in the following pages (27-29), showing the annual mean concentrations of PM10, PM2.5 and NO2 in 2016.

## PM10

Although the temporary LTN area have shown PM10 concentrations that are within the UK legal limit (40 µg/m3), most parts of it are still higher than the WHO guideline limit of 20 µg/m3.

Concentrations around the boundary roads ranges from between 22 to 34 µg/m3. Auckland Road, which runs north-south across the temporary LTN, has shown concentrations between 21 to 23 µg/m3, which are figures within the range shown on main roads.

## PM2.5

Similar to PM10, the PM2.5 concentrations in and around the temporary LTN are within the UK legal limit (25 µg/m3), ranges from 12 to 17 µg/m3. However these figures are still higher than the WHO guideline limit of 10 µg/m3. Concentrations within the temporary LTN ranges around 12-13 µg/m3.

## NO2

Unlike PM10 and PM2.5, the UK's NO2 legal limit is the same as the WHO's guideline limit (40 µg/m3). Despite most parts of the temporary LTN are showing concentrations that are within the legal limit, most boundary roads have exceeded the limit, showing a range from around 40 to 70 µg/m3.

Notably, Sylvan Hill has shown considerably higher concentrations (36-37 µg/m3) than the surrounding areas. The surrounding areas show figures between 32 and 35 µg/m3.


Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2*

Annual Mean PM10 Concentrations 2016

µg/m3

- ≤ 17.94
- ≤ 18.5
- ≤ 18.9
- ≤ 19.17
- ≤ 19.37
- ≤ 19.51
- ≤ 19.7
- ≤ 19.98
- WHO guideline limit (20 µg/m3)
- ≤ 20.38
- ≤ 20.94
- ≤ 21.74
- ≤ 22.87
- ≤ 24.47
- ≤ 26.75
- ≤ 29.98
- ≤ 34.57
- UK legal limit (40 µg/m3)
- ≤ 41.09
- ≤ 50.34
- ≤ 63.47
- ≤ 82.11

Data from London Atmospheric Emission Inventory, showing modelled 2016 ground level concentrations



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# AIR QUALITY - PM10 CONCENTRATIONS

| SCALE | DRAWN | REVIEWED | DATE |
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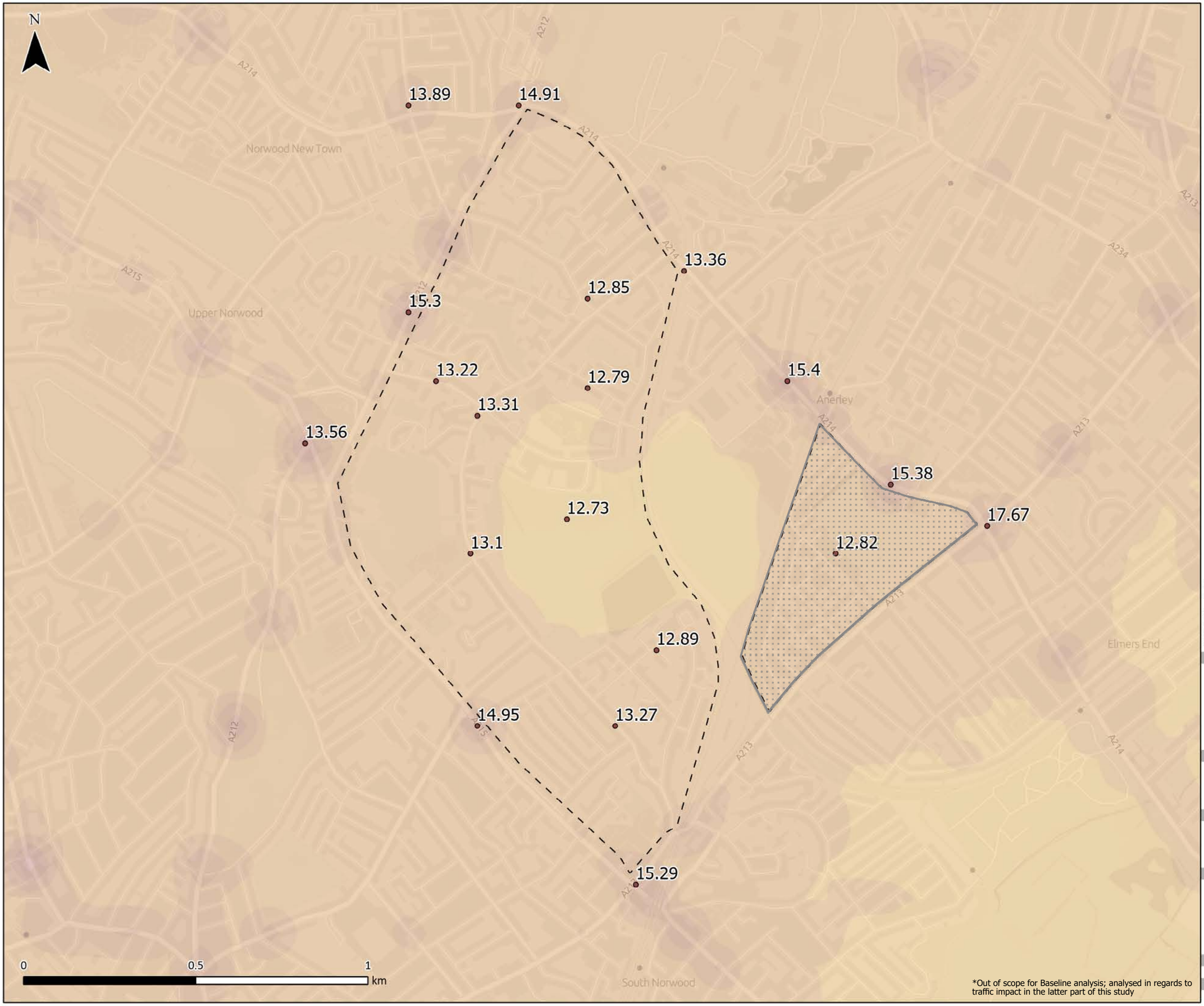


Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2*

Annual Mean PM2.5 Concentrations 2016

µg/m3

WHO guideline limit (10 µg/m3)

- ≤ 11.25
- ≤ 11.48
- ≤ 11.63
- ≤ 11.75
- ≤ 11.83
- ≤ 11.88
- ≤ 11.96
- ≤ 12.07
- ≤ 12.23
- ≤ 12.46
- ≤ 12.78
- ≤ 13.23
- ≤ 13.88
- ≤ 14.8
- ≤ 16.1
- ≤ 17.95
- ≤ 20.57
- ≤ 24.29

UK legal limit (25 µg/m3)

- ≤ 29.58
- ≤ 37.09

Data from London Atmospheric Emission Inventory, showing modelled 2016 ground level concentrations



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# AIR QUALITY - PM2.5 CONCENTRATIONS

| SCALE | DRAWN | REVIEWED | DATE |
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| A3 @ 1:10,000 | JY | JMQ | 10/11/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
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Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2*

Annual Mean NO2 Concentrations 2016

µg/m3

- ≤ 31.28
- ≤ 33.45
- ≤ 36.52
- UK legal & WHO guideline limit (40 µg/m3)
- ≤ 40.89
- ≤ 47.08
- ≤ 55.87
- ≤ 68.35

Data from London Atmospheric Emission Inventory, showing modelled 2016 ground level concentrations



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# AIR QUALITY - NO2 CONCENTRATIONS

| SCALE | DRAWN | REVIEWED | DATE |
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| A3 @ 1:10,000 | JY | JMQ | 10/11/2020 |

| FIGURE NUMBER | REVISION |
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3

# TRAFFIC ANALYSIS

# 3 TRAFFIC ANALYSIS

This chapter presents analysis on traffic effects in relation to the introduction of the temporary LTN. It includes analyses in the following three areas:

1. Estimated through traffic levels
2. Estimated traffic flows
3. Journey time difference

Comparisons have been drawn using data collected before and during the temporary LTN implementation.

This chapter begins with understanding the current traffic management measures, followed by an overview of road works that took place near the temporary LTN between March and October 2020, which may have affected traffic conditions aside of the temporary LTN measures.

### Widened scope for traffic analysis

LB Croydon has received feedback from LB Bromley regarding potential traffic displacement onto Selby Road and Seymour Villas.

For the purpose of this traffic analysis, we have incorporated this neighbourhood extent into our scope of study (it is referred as 'Neighbourhood 2').

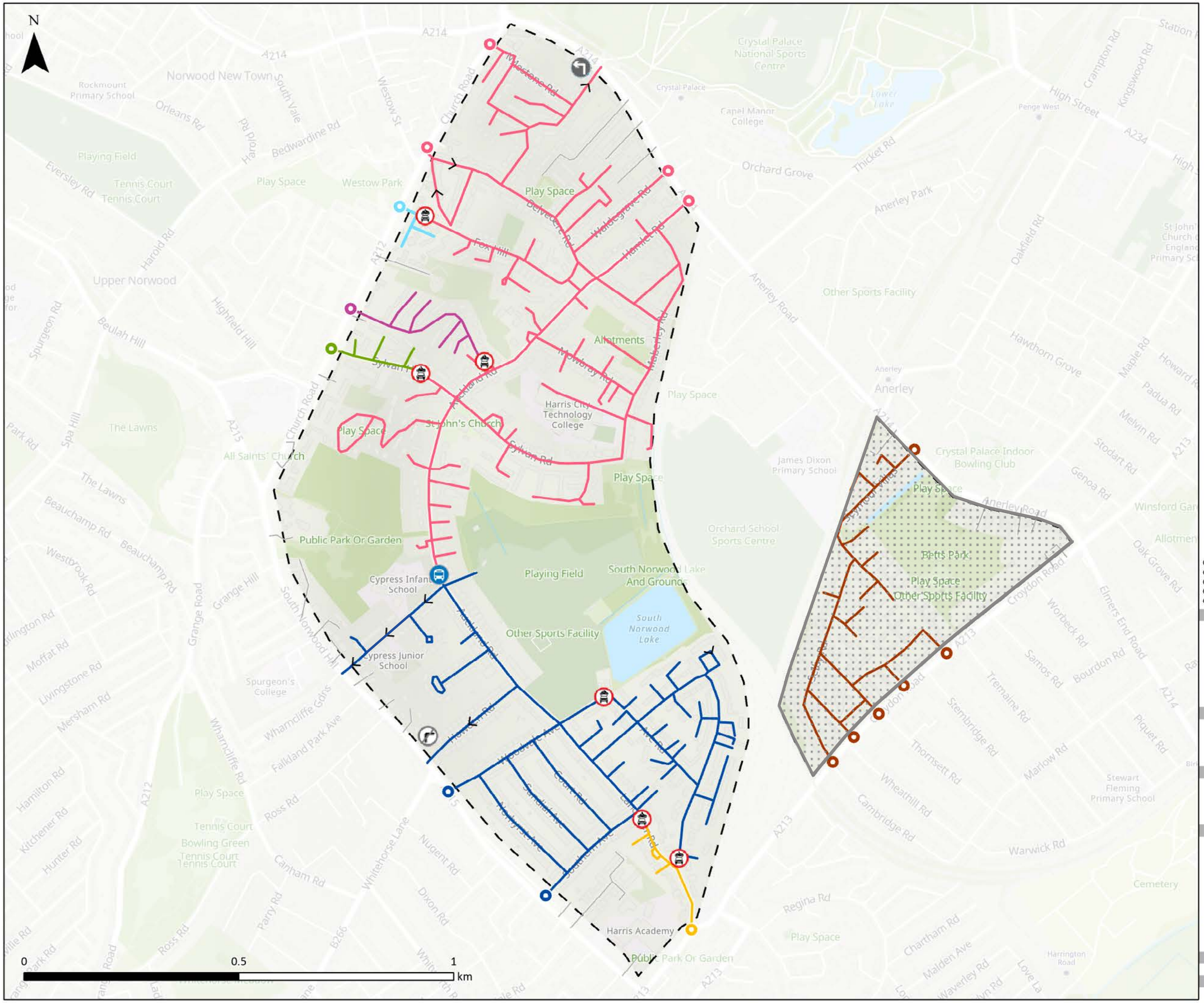
### TRAFFIC MANAGEMENT MEASURES (DURING LTN)

Chapter 1 presented an overview of the temporary LTN measures that were introduced between May and August 2020.

To understand how these measures affect vehicle access, the plan overleaf shows that the measures have divided the temporary LTN into seven sub zones. The vehicle entry points for each zone are also presented.

It is noted that the number of entry points to most sub zones is proportionate to their size. For instance, there are four entry points from two boundary roads (Church Road and Anerley Road) for sub zone A (shown in pink colour), which is the largest of all sub zones. The second largest in the temporary LTN, sub zone B (shown in blue colour), has two entry points along South Norwood Hill.

All streets within the LTN areas remain accessible by motor vehicles.



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Auckland Road LTN

TITLE

# DURING LTN IMPLEMENTATION - SUB ZONE AND ENTRY POINTS

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,000 | JY | - | 27/11/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 13 | - |

## ROAD WORKS AND TEMPORARY LTN MEASURES TIMELINE

A series of road works were conducted in close proximity to the temporary LTN, which has posed difficulties in measuring and deducing the direct effects caused by the temporary LTN. In consideration we have compiled the list of road works in chronological order, and plotted alongside the temporary LTN measures on the plan overleaf.

### Road works

**A** **11 March - 6 June 2020**

**Auckland Road**
Emergency gas works. One way working was introduced on Cypress Road, and on Auckland Road west-bound towards South Norwood Hill

**B** **22 March - 1 November 2020**

**Church Road**
A car crashed into a candle shop at 111 Church Road. The southbound lane located to the south of the junction with Westow Street was blocked by scaffolding for seven months. Temporary signals were in place.

**C** **29 April - 5 May 2020**

**Westow Hill**
Water works. A lane by 2 Westow Hill was closed.

**D** **13 - 16 May 2020**

**Church Road**
Water works. Entire road was closed, closure point by No. 49.

**E** **26 - 29 May 2020**

**Sylvan Road**
Urgent gas works. Traffic control with priority working in operation, by St Johns Church on Sylvan Road.

**F** **20 - 26 June 2020**

**Westow Hill**
Water works. Entire road was closed.

**G** **23 July 2020**

**Woodvale Avenue**
Carriageway resurfacing works. Entire road was closed.

**H** **28 August - 7 September 2020**

**South Norwood Hill**
Power works. Traffic control with two-way signals in operation, by 126 South Norwood Hill.

**I** **23 - 29 September 2020**

**Auckland Road**
Water works. Give-and-take traffic Control in operation, outside No. 98.

**J** **1 - 7 October 2020**

**Auckland Road**
Water works. Traffic control with multi-way signals in operation, at J/O Cypress Road with Auckland Road

**K** **13 - 19 October 2020**

**South Norwood Hill**
Water works. Traffic control with multi-way signals in operation, outside No. 153.

**L** **13 - 19 October 2020**

**Howden Road**
Water works. Entire road was closed, closure point by No. 16.

**M** **26 - 28 October 2020**

**Warminster Road**
Carriageway resurfacing works. Closure between J/W Warminster Square to J/W Lancaster Road.

**N** **28 - 30 October 2020**

**Auckland Road**
Water works. Traffic control with multi-way signals in operation, at J/O Cypress Road with Auckland Road.

## Temporary LTN Measures

**1 — 2 May 2020**

Modal filter placed at (TMO PN874):

- Junction of Lancaster Road/ Southern Avenue
- Junction of Woodvale Avenue/ Avenue Road

**2 — 9 May 2020**

Modal filter placed at (TMO PN878):

- Junction of Lancaster Road/ Warminster Road

**3 — 7 June 2020**

Modal filter placed on Auckland Road by Cypress Road, which was changed to a Bus Gate on 15 July (TMO PN912), and with camera enforcement starting 31 July (TMO PN928).

The road was closed by Southern Gas Network for emergency gas works since 11 March 2020 (A)

**4 — 3 August 2020**

Modal filter placed on (TMO PN999):

- Stambourne Way
- Sylvan Hill
- Fox Hill

Temporary Crystal Palace & South Norwood LTN

Borough Boundary

LB Bromley

LB Lambeth

School Street scheme on Cypress Road (since Feb 2020)

### LTN Measures

Modal filter

Bus Gate

### Schools

Primary

Secondary

Independent/ Other

College and University



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TITLE
LTN SCHEME OVERVIEW

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,000 | JY | JMQ | 20/11/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 8 | - |

# 3.1 ESTIMATED THROUGH TRAFFIC LEVELS

This section analyses which road segments within the temporary LTN were amongst the most affected by through traffic, and whether the situation has improved since the measures have been installed.

Two sets of through traffic data have been retrieved and collected, representing the time periods before and during the temporary LTN measures were introduced:

- 'Before LTN': February 2019 - March 2020
- 'During LTN': June 2020 - November 2020

It is worth noting that the period included as 'Before LTN' preceed the period when the temporary signals were in use on Church Road (the road work specified as B on page 34). The temporary signals were in use on Church Road for the entire period of 'During LTN'.

## Methodology

The through traffic data was supplied by The Floow, a telematics company, which collected the raw traffic data using telematics technology. Having applied a method called the Blend Analysis to identify through traffic levels, the company identified the origin and destination for each journey in terms of LSOA, a geospatial statistical unit for small area statistics.

The Floow repeated this process for several time periods, in this case, the daily average, AM and PM peak periods. The analysis classifies the trip travel under the following three categories:

- Exclusively internal to the cell ('In-In'), with both origin and destination located within the cell
- Exclusively external to the cell ('Out-Out'), with both origin and destination located out of the cell
- Involves either an origin ('In-Out') or destination ('Out-In') inside of the cell only. These are trips with a purpose related to the cell, i.e. by people who live, work, spend time in, or deliver to the cell.

Through traffic is defined as the 'Out-Out' trips, with trip purposes unrelated to the cell.

The occurrences of segments within journeys were then tallied in terms of the category of trip travel, and were stored as a percentage of all journeys.

An estimated general traffic flow per hour is also provided for each road segment by direction. This data is approximated by extrapolating the telematic data with traffic flow counts obtained from Department for Transport. Using this traffic flow estimate, we then multiply by the through traffic percentage to calculate an estimated through traffic flow for each road segment per hour, per direction.

## Limitations

Due to data sampling limitations, the dataset representing 'During LTN' includes data recorded starting from June 2020, when some measures have not yet been put in place. It might therefore present a view of the situation that is not the most up-to-date. We have taken this into account when interpreting the data.

In addition, telematics uses vehicle tracking (black box) and GPS location data to identify type of trip travel. It relies on engine activity to determine the start or end of trip. Therefore, separate trips but with the engine kept running in between would be considered as one single trip, e.g. a food delivery if the engine is left running. These characteristics might render potential, albeit small, inaccuracy to the through traffic percentage data.

Whilst a traffic flow estimate was generated for every road segment, it was modelled using counts from scattered locations across the road network. Hence, it is highlighted that they cannot be fully accurate to the actual flows and should be interpreted as an approximation.

In the following analyses, we have reviewed the before-and-during through traffic levels in terms of daily average, then by peak period.


Advanced warning sign for bus gate on Auckland Road


Advanced warning sign for bus gate and modal filters on Auckland Road


Fox Hill modal filter


Bus gate on Auckland Road


Public consultation notice for the temporary LTN scheme


Advanced warning sign for the camera enforcement of bus gate on Auckland Road

## AVERAGE WEEKDAY DAILY THROUGH TRAFFIC (BEFORE LTN)

The estimated flows of average daily (12-hour average, 7am-7pm) through traffic on weekdays, before the temporary LTN was introduced, is shown overleaf.

The Hamlet Road-Auckland Road-Lancaster Road route had been a popular through traffic route before the temporary LTN was introduced. Given it is a direct north-south route parallel to the boundary roads (Church Road and South Norwood Hill), it was heavily used by 70-170 through traffic vehicles per hour (vph) in both directions, across an average weekday.

Waldegrave Road northbound was also frequently used by through traffic (circa 60 vph), as an alternative way out of the north-south route.

A few more roads within the temporary LTN had been frequently used by through traffic as well:

- Stambourne Way (30-60 vph, both directions)
- Sylvan Hill (60-80 vph, both directions)
- Cypress Road (circa 80 vph westbound)
- Woodvale Avenue (circa 120 vph eastbound)
- Southern Avenue (90-105 vph, both directions)

These five roads were used as the connecting routes between the boundary roads and Auckland Road.

### Speeding issue on Auckland Road

Besides, according to Speedvisor data, collected in August 2019, the average speed on Auckland Road is 21.16 mph, exceeding the speed limit of 20mph. An average of 62.9% of vehicles speeded over the limit. The 85th percentile speed (the speed at which the data shows 85% of vehicles were travelling at or below) is 25 mph.


'Daily' means 12-hour average taken between 7am-7pm
Traffic data obtained from Floow


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TITLE
# AVERAGE WEEKDAY DAILY THROUGH TRAFFIC WITHIN LTN (BEFORE LTN)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,000 | JY | - | 05/12/2020 |
| FIGURE NUMBER | | REVISION | |
| 16 | | A | |

## AVERAGE WEEKDAY DAILY THROUGH TRAFFIC (DURING LTN)

The plan on the opposite page shows a clear reduction of through traffic within the temporary LTN, during the scheme was introduced.

Auckland Road (between Sylvan Hill and Southern Avenue), and Lancaster Road show a significant reduction in through traffic. Similar reductions have also been recorded on four of the connecting routes to Auckland Road, namely Stambourne Way, Cypress Road, Woodvale Avenue and Southern Avenue.

Notably, Cypress Road, where Cypress Primary School is located, has recorded about 75% decrease in through traffic volume. This might partly be attributed to the School Street scheme enforced since February 2020.

An anomaly can be spotted on these plans. While the data shows that through traffic has been halved on the northbound direction of Hamlet Road-Auckland Road (northern section)-Sylvan Hill, the southbound direction on these roads appears still being used heavily by through traffic. However, given that the modal filter on Sylvan Hill was installed in early August and has since been intact, the data shown may have reflected the trends from the period between June and August. In a case which the data is the most up-to-date, through traffic should not be shown at all along this route.

To explain further, as Auckland Road has been closed due to emergency gas works since March, Cypress Road, Woodvale Avenue and Southern Avenue became unattractive for through traffic since then. In contrast, Hamlet Road-Auckland Road (northern section)-Sylvan Hill continued to be an attractive through traffic route to avoid the Anerley Hill/ Church Road junction, up until Sylvan Hill was closed in August. This is a possible explanation for why the data only shows through traffic on one stretch but not the other ones.

Neverthless, we recommend LB Croydon to verify the actual situation along this section of roads using Automatic Traffic Counters (ATCs). We have included this recommdation in the conclusions.


'Daily' means 12-hour average taken between 7am-7pm
Traffic data obtained from Floow


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# AVERAGE WEEKDAY DAILY THROUGH TRAFFIC WITHIN LTN (DURING LTN)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,000 | JY | - | 05/12/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 16 | A |

## COMPARISON BETWEEN AM PEAK AND PM PEAK

The 'before' and 'during' plans, showing the average weekday through traffic for both AM peak (7-10am) and PM peak (4-7pm) periods, are presented in the next four pages:

- Before, AM peak (page 43)
- Before, PM peak (page 44)
- During, AM peak (page 45)
- During, PM peak (page 46)

A table showing comparison of through traffic volume before and during LTN is also presented by peak period, within the plan opposite.

### Before LTN

Similar patterns can be found for both AM and PM peaks before the temporary LTN. The Hamlet Road-Auckland Road-Lancaster Road route had been a popular through traffic route for both AM and PM peaks, with a through traffic volume of at least 150 vph. Stambourne Way, Sylvan Hill, Cypress Road, Woodvale Avenue and Southern Avenue, as well as Tudor Road-Cintra Park, also served as the main through traffic connections between Auckland Road and the boundary roads in both peak periods. These roads carried at least 50 vph of through traffic volumes.

Nevertheless, there are variations in through traffic volume between AM and PM peaks. AM peak generally recorded less through traffic than the PM peak on majority of the roads. One of the exceptions had been the loop of Woodvale Avenue-Auckland Road-Cypress Road. The circa 200 vehicles in the AM peak recorded on this route could be attributed to the 'school run traffic' associated with Cypress Primary School.

Another exception for a higher volume in the AM peak (150-200 vph) can also be spotted on Lancaster Road-Southern Avenue heading south, which could be contributed by traffic seeking to avoid the South Norwood Hill/ High Street junction. The prevailing direction of through traffic can be seen reversed to head north in the PM peak.

### During LTN

In line with the trends shown in the daily average, through traffic in the temporary LTN have generally been significantly reduced on both AM and PM peaks since the measures were installed.

Same as the daily average data, an anomaly appears on Hamlet Road, Auckland Road (northern section) and Sylvan Hill for both AM and PM peak periods.

Apart from the roads mentioned above, through traffic volume in AM peak reduced to less than or around 10 vph. PM peak saw slightly more through traffic remaining in the area, with the volume generally reduced to below or around 20 vph on most roads. More reductions was recorded in the PM peak, given the fact that it had more through volume before the temporary LTN havs been in place.

Auckland Road section between Sylvan Hill and Cypress Road is the only route connecting the northern and southern part of the temporary LTN. For the northbound, it shows a reduction of 88vph in the AM peak, and 112 vph for the PM peak. For the southbound, it shows a reduction of 46 vph in the AM peak and 118 vph in the PM peak.

The loop of Woodvale Avenue-Auckland Road-Cypress Road, located by Cypress Primary School, saw only about 10 vph of through traffic in the AM peak. However, the figures jumped up to around 40 vph for the PM peak, possibly due to the school street restriction only being enforced until 4pm.

| Roads commonly used by through traffic within LTN (excluding roads with anomaly) | | AM Peak | | PM Peak | |
|---|---|---|---|---|---|
| | | Before (vph) | During (vph) | Before (vph) | During (vph) |
| Waldegrave Road | NB | 105 | 8 | 96 | 15 |
| Cintra Park-Tudor Road | NB | 84 | 4 | 29 | 0 |
| Stambourne Way | WB | 37 | 12 | 99 | 33 |
| | EB | 90 | 0 | 20 | 12 |
| Auckland Road (Sylvan Hill-Cypress Road) | NB | 96 | 8 | 132 | 20 |
| | SB | 70 | 24 | 155 | 37 |
| Cypress Road | WB | 206 | 12 | 87 | 37 |
| Auckland Road (Cypress Road-Woodvale Avenue) | NB | 283 | 8 | 158 | 28 |
| | SB | 38 | 12 | 88 | 5 |
| Woodvale Avenue | EB | 250 | 4 | 201 | 6 |
| | WB | 20 | 8 | 96 | 30 |
| Southern Avenue | EB | 55 | 4 | 201 | 6 |
| | WB | 20 | 8 | 96 | 26 |
| Lancaster Road | NB | 263 | 4 | 182 | 9 |
| | SB | 111 | 4 | 364 | 7 |

BEFORE SCHOOL STREET SCHEME WAS INTRODUCED ON CYPRESS ROAD

0 0.5 1 km

Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2

Schools

- Primary
- Secondary
- Independent/ Other

Average Weekday AM Peak Through Traffic within LTN (Before)

Approx. no. of vehicle/ hour

- ≤10
- ≤30
- ≤50
- ≤100
- ≤150
- ≤200
- ≤300
- Data Unavailable

'AM peak' means 3-hour average taken between 7-10am
Traffic data obtained from Floow


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# AVERAGE WEEKDAY AM PEAK THROUGH TRAFFIC WITHIN LTN (BEFORE)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,000 | JY | - | 05/12/2020 |
| FIGURE NUMBER | | REVISION | |
| 29 | | - | |


'PM peak' means 3-hour average taken between 4-7pm
Traffic data obtained from Floow


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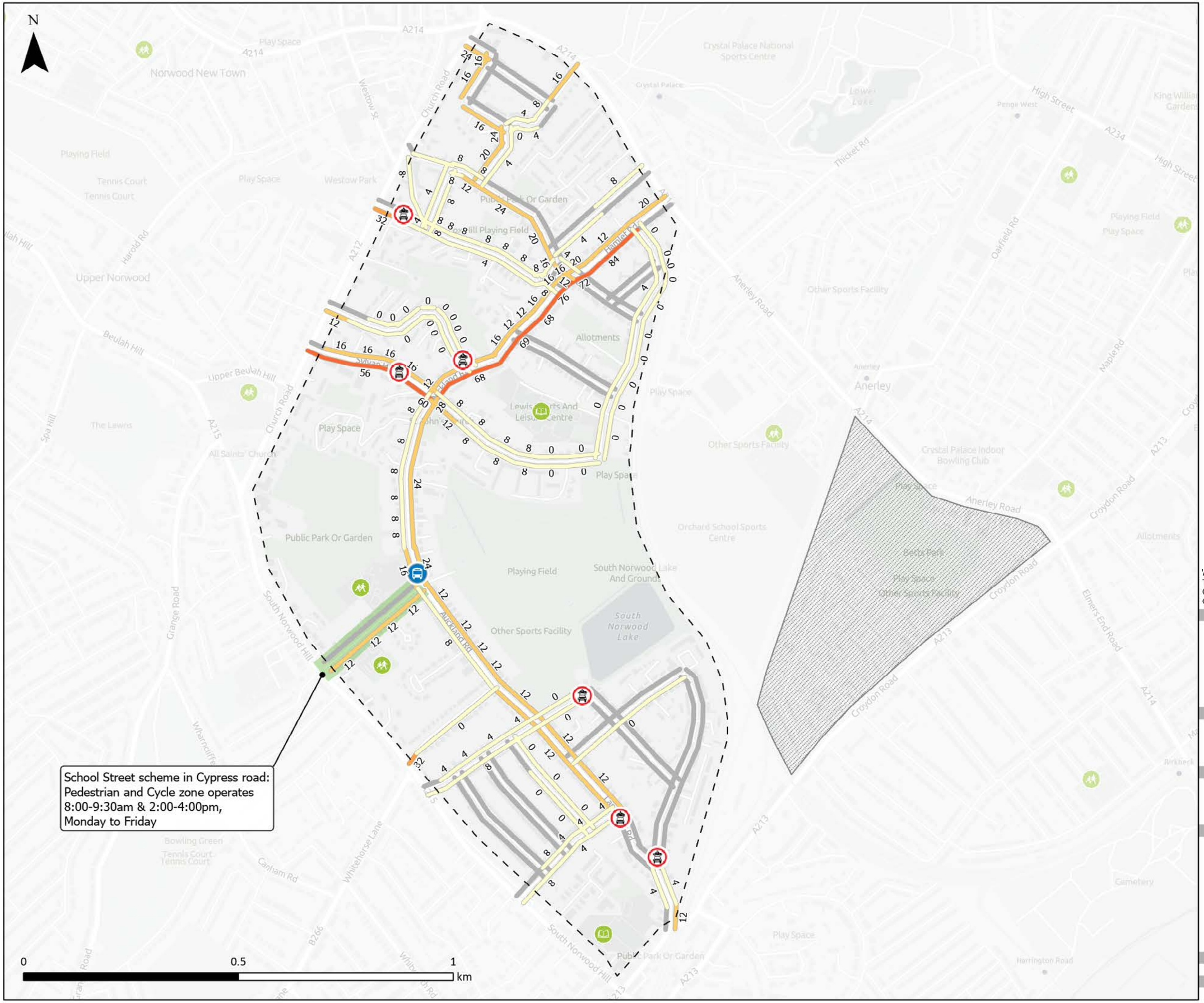
# AVERAGE WEEKDAY PM PEAK THROUGH TRAFFIC WITHIN LTN (BEFORE)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,000 | JY | - | 05/12/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 31 | - |

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# AVERAGE WEEKDAY AM PEAK THROUGH TRAFFIC WITHIN LTN (DURING)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,000 | JY | - | 05/12/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 30 | - |


'PM peak' means 3-hour average taken between 4-7pm
Traffic data obtained from Floow


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# AVERAGE WEEKDAY PM PEAK THROUGH TRAFFIC WITHIN LTN (DURING)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,000 | JY | - | 07/12/2020 |
| FIGURE NUMBER | | REVISION | |
| 32 | | - | |

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# 3.2 ESTIMATED TRAFFIC FLOWS

LB Croydon is keen to understand the degree to which traffic was displaced from within the temporary LTN and onto the nearby A Roads.

The four A Roads surrounding the temporary LTN are:

- Anerley Road (A214)
- High Street-Penge Road (A213)
- South Norwood Hill (A215)
- Church Road (A212)

Traffic concerns have also been raised for roads forming the Crystal Palace Triangle gyratory, namely Church Road (Anerley Hill-Westow Street), Westow Street and Westow Hill.

LB Bromley has also expressed concern about potential traffic displacement onto Selby Road and Seymour Villas.

This section examines the effects on a number of selected roads aforementioned, to understand how the surrounding road network is performing during the introduction of the scheme. The estimated traffic flows used in this analysis were supplied by The Floow, which gathered the flow estimates using telematics technology. Limitations on the data methodology was presented on page 36.

Traffic counts were also conducted between 26 November and 2 December 2020, after the temporary measures were installed, but during the second Lockdown. The results are presented in the Appendix.

## CHANGE BEFORE AND DURING LTN (AVERAGE WEEKDAY DAILY FLOWS)

The plan on the page after next (page 50) shows the percentage change in average weekday daily (12-hour average, 7am-7pm) traffic before and during the temporary LTN was introduced. The change in estimated number of vehicle is also shown in the plan, extracted from certain points representative of each road.

While figures within the temporary LTN are also shown on the plan, this part of analysis focuses on the change in traffic flows outside the temporary LTN.

Two plans showing the flow estimates 'before' and 'during' the scheme are also presented on page 51-52.

The change on the selected roads are summarised as follows.

### Boundary roads

- Anerley Road saw a reduction between -42 and -127 vph (-8% to -25%) northbound, and a reduction between -17 and -105 vph (-3% to -20%) southbound.
- High Street-Penge Road saw a change in vehicle flows ranging from +78 to -102 vph (+15% to -17%) eastbound; and from +10 to -142 vph (+3% to -27%) westbound.
- South Norwood Hill saw a change in vehicle flows ranging from +39 to -27 vph (+11 to -5%) northbound; and from +12 to -243 vph (+4 to -42%) westbound.
- Church Road (Westow Street-Beulah Hill) saw a reduction between -42 and -80 vph (-15% to -22%) northbound, and a reduction between -77 and -95 vph (-21% to -29%) southbound.

### Crystal Palace Triangle

- Church Road (Anerley Hill-Westow Street), one-way southbound, saw a reduction of -103 vph (-18%).
- Westow Street, one-way northbound, saw a reduction of -48 vph (-10%).
- Westow Hill, one-way eastbound, saw an increase of +33 vph (7%).

### Neighbourhood 2

- Selby Road and Seymour Villas saw an increase between +44 and +71 vph (+40% to +68%) northbound; and a change

ranging from +23 to -5 vph (+24% to -5%) southbound.

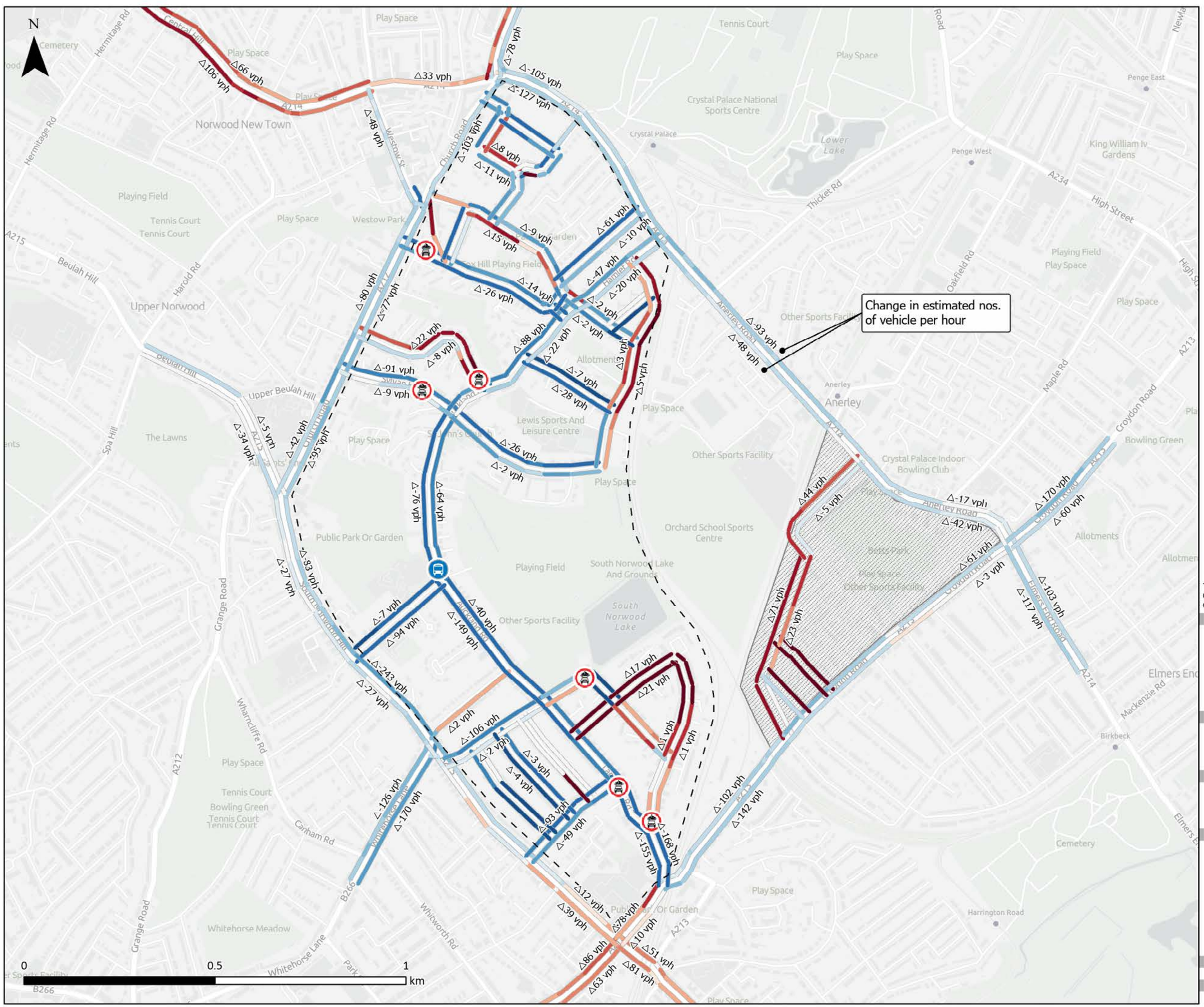
## Summary

Overall, the average weekday daily flow estimates show a general reduction of traffic on majority of the roads mentioned above, during the temporary LTN was introduced.

Some increase in traffic can also be noticed on several roads during the temporary LTN was introduced. These include around the High Street/ South Norwood Hill junction, Central Hill, Westow Hill and Selby Road-Seymour Villas within 'Neighbourhood 2'.

The estimated average weekday daily flows have given us a view that was averaged across 12 hours of a typical weekday. To examine the specific time periods when the network takes the most pressure, we have also undertaken analyses on the periods of peak traffic:

- AM peak (page 53)
- PM peak (page 57)




Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2

LTN Measures

Modal Filter

Bus Gate

% Change in Estimated Average Weekday Daily Traffic, Before and During LTN

- -71-100%
- -56-70%
- -41-55%
- -31-40%
- -21-30%
- -11-20%
- -6-10%
- -1-5%
- 0%
- +1-5%
- +6-10%
- +11-20%
- +21-30%
- +31-40%
- +41-50%
- +51-100%
- >+100%

'Daily' means 12-hour average taken between 7am-7pm

Traffic data obtained from Floow



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# CHANGE IN ESTIMATED AVERAGE WEEKDAY DAILY TRAFFIC (BEFORE AND DURING LTN)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:9,000 | JY | - | 06/12/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 20 | - |


'Daily' means 12-hour average taken between 7am-7pm
Traffic data obtained from Floow


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# AVERAGE WEEKDAY DAILY TRAFFIC OUTSIDE LTN (BEFORE)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,500 | JY | - | 05/12/2020 |
| FIGURE NUMBER | | REVISION | |
| 23 | | - | |


'Daily' means 12-hour average taken between 7am-7pm
Traffic data obtained from Floow


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# AVERAGE WEEKDAY DAILY TRAFFIC OUTSIDE LTN (DURING)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,500 | JY | - | 05/12/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 24 | - |

## CHANGE BEFORE AND DURING LTN (AVERAGE WEEKDAY AM PEAK)

As shown on the plan on the following page, the AM peak (7-10am) generally saw more increase in traffic amongst the selected roads than the daily average.

Two plans showing the flow estimates 'before' and 'during' the scheme are also presented on page 55-56. The change on each of the selected roads are summarised as follows.

### Boundary roads

- Anerley Road saw a reduction of -92 to -132 vph (-18% to -29%) northbound, and a reduction between -105 and -145 vph (-25% to -35%) southbound.
- High Street-Penge Road saw a reduction between -63 and -370 vph (-8% to -43%) eastbound; and a change in traffic flows ranging from +134 to -147 vph (+69% to -29%) westbound.
- South Norwood Hill saw an increase between +33 and +88 vph (+5% to +21%) northbound; and a change in traffic flows ranging from -458 to +22 vph (-72% to +14%) southbound.
- Church Road (Westow Street-Beulah Hill) saw a increase between +97 and +129 vph (+37% to +39%) northbound, but a reduction on southbound between -127 and -132 vph (-41% to -46%).

### Crystal Palace Triangle

- Church Road (Anerley Hill-Westow Street), one-way southbound, saw a reduction of -57 vph (-11%).
- Westow Street, one-way northbound, saw an increase of +260 vph (+49%).
- Westow Hill, one-way eastbound, saw an increase of +114 vph (7%).

### Neighbourhood 2

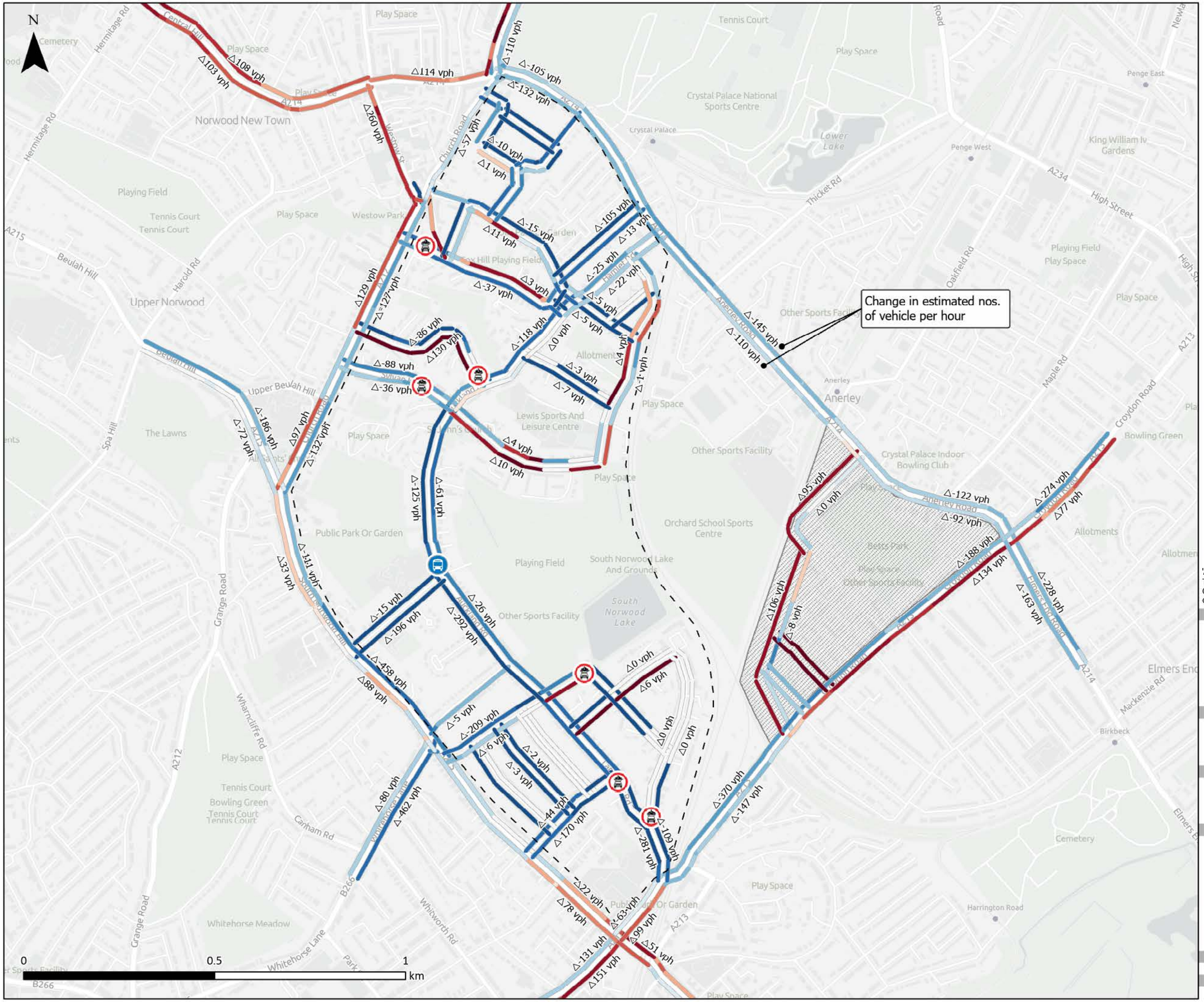
- Selby Road and Seymour Villas saw an increase between +95 and +106 vph (+76% to +87%) northbound; and a change ranging from 0 to -8 vph (0% to -25%) southbound.

### Summary

Apart from the locations seen in the daily average, traffic increase in the AM peak were also located along the northbound direction of South Norwood Hill, Church Road (Westow Street-Beulah Hill) and Westow Street. This shows an increased flow of traffic going northbound originated from the southern end of South Norwood Hill up to Crystal Palace Parade.

In addition, 'Neighbourhood 2' also saw an increase in traffic along the northbound direction of Selby Road and Seymour Villas during the temporary LTN was introduced.

A more detailed discussion on the effects, using journey time difference data, is conducted in the Discussion section at the end of this chapter.




Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2

LTN Measures

Modal Filter

Bus Gate

% Change in Estimated Average Weekday AM Peak Traffic, Before and During LTN

- -71-100%
- -56-70%
- -41-55%
- -31-40%
- -21-30%
- -11-20%
- -6-10%
- -1-5%
- 0%
- +1-5%
- +6-10%
- +11-20%
- +21-30%
- +31-40%
- +41-50%
- +51-100%
- >+100%

'AM peak' means 3-hour average taken between 7-10am
Traffic data obtained from Floow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PROJECT

Crystal Palace & South Norwood LTN

TITLE

# CHANGE IN ESTIMATED AVERAGE WEEKDAY AM PEAK TRAFFIC (BEFORE AND DURING LTN)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:9,000 | JY | - | 06/12/2020 |
| FIGURE NUMBER | | REVISION | |
| 33 | | - | |


'AM peak' means 3-hour average taken between 7-10am
Traffic data obtained from Floow


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PROJECT

Crystal Palace & South Norwood LTN

TITLE

# AVERAGE WEEKDAY AM PEAK TRAFFIC OUTSIDE LTN (BEFORE)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,500 | JY | - | 05/12/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 25 | - |


'AM peak' means 3-hour average taken between 7-10am
Traffic data obtained from Floow


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TITLE

# AVERAGE WEEKDAY AM PEAK TRAFFIC OUTSIDE LTN (DURING)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,500 | JY | - | 05/12/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 26 | - |

## CHANGE BEFORE AND DURING LTN (AVERAGE WEEKDAY PM PEAK)

The plan showing the change in traffic flow before and during the temporary LTN, for average weekday PM peak (4-7pm), is provided on the following page.

In comparison to the daily average and the AM peak, PM peak saw much more reduction than increase in traffic amongst the selected roads.

Two plans showing the flow estimates 'before' and 'during' the scheme are also presented on page 59-60.

The change on the selected roads are summarised as follows.

### Boundary roads

- Anerley Road saw a reduction between -61 and -150 vph (-7% to -21%) northbound, and a change in traffic flows ranging from +151 to -213 vph (+20% to -29%) southbound. The increase was detected in proximity to the junction with Croydon Road.
- High Street-Penge Road saw a change in traffic flows ranging from +18 to -104 vph (+3% to -14%) eastbound; and a reduction between -98 and -278 vph (-19% to -31%) westbound.
- South Norwood Hill saw a change in traffic flows ranging from +18 to -140 vph (+4% to -20%) northbound; and between +7 and -321 vph (+2% to -35%) southbound.
- Church Road (Westow Street-Beulah Hill) saw a reduction between -166 and -268 vph (-49% to -62%) northbound, and a reduction of -147 to -190 vph (-26% to -38%) southbound.

### Crystal Palace Triangle

- Church Road (Anerley Hill-Westow Street), one-way southbound, saw a reduction of -174 vph (-23%).
- Westow Street, one-way northbound, saw a reduction of -258 vph (-45%).
- Westow Hill, one-way eastbound, saw a reduction of -135 vph (-23%).

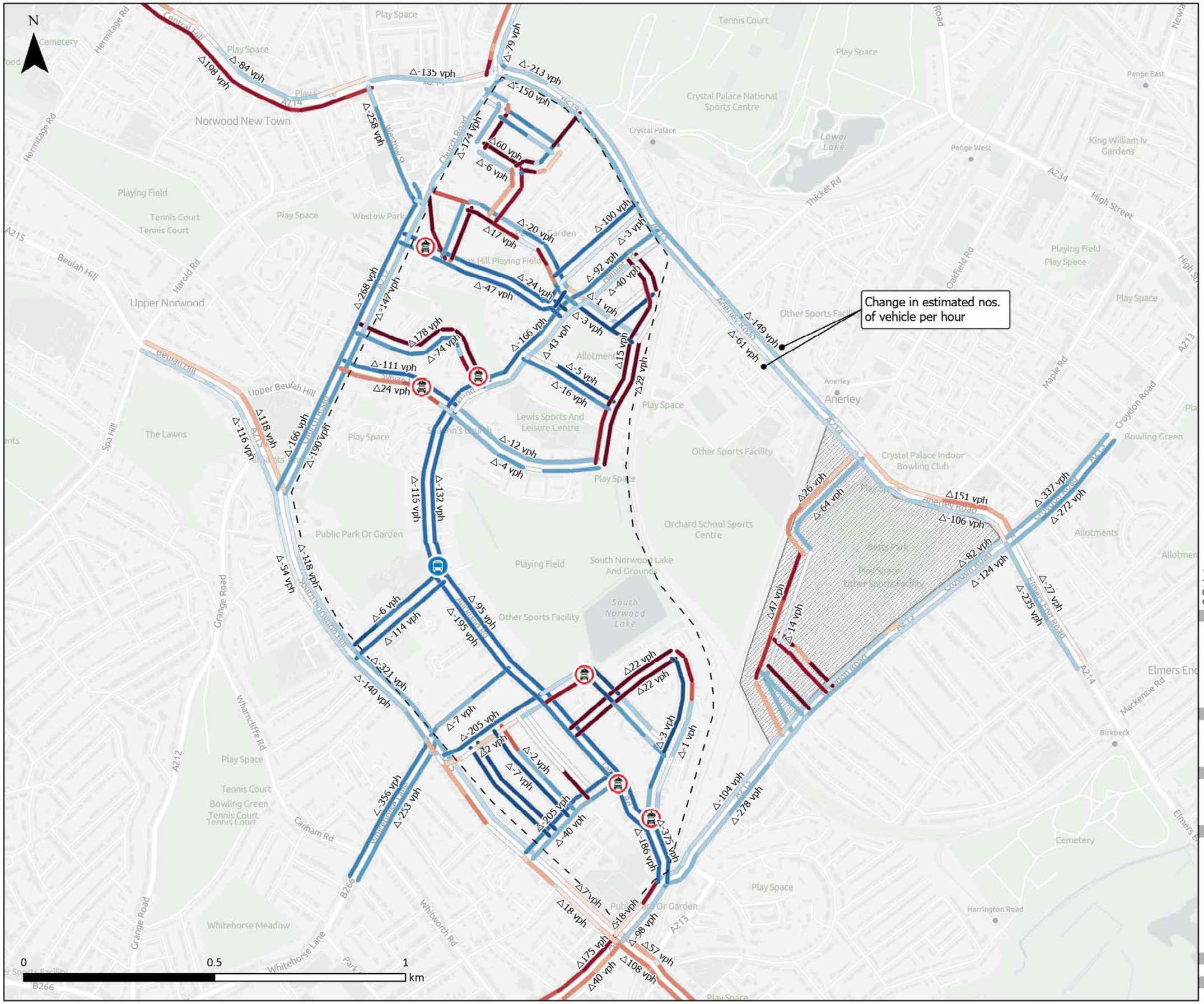
### Neighbourhood 2

- Selby Road and Seymour Villas saw an increase between +26 and +47 vph (+16% to +32%) northbound; but a reduction between of -14 to -64 vph (-8% to -35%) southbound.

### Summary

For the PM peak, while traffic mostly decreased on the roads nearby, Selby Road and Seymour Villas of 'Neighbourhood 2' still saw an increase in the northbound direction during the temporary LTN was introduced.

A more detailed discussion on the effects, using journey time difference data, is conducted in the Discussion section at the end of this chapter.




Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2

LTN Measures

Modal Filter

Bus Gate

% Change in Estimated Average Weekday PM Peak Traffic, Before and During LTN

- -71-100%
- -56-70%
- -41-55%
- -31-40%
- -21-30%
- -11-20%
- -6-10%
- -1-5%
- 0%
- +1-5%
- +6-10%
- +11-20%
- +21-30%
- +31-40%
- +41-50%
- +51-100%
- >+100%

'PM peak' means 3-hour average taken between 4-7pm
Traffic data obtained from Floow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TITLE

# CHANGE IN ESTIMATED AVERAGE WEEKDAY PM PEAK TRAFFIC (BEFORE AND DURING LTN)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:9,000 | JY | - | 06/12/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 34 | - |


'PM peak' means 3-hour average taken between 4-7pm
Traffic data obtained from Floow


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TITLE

# AVERAGE WEEKDAY PM PEAK TRAFFIC OUTSIDE LTN (BEFORE)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,500 | JY | - | 05/12/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 27 | - |


'PM peak' means 3-hour average taken between 4-7pm
Traffic data obtained from Floow


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PROJECT

Crystal Palace & South Norwood LTN

TITLE

# AVERAGE WEEKDAY PM PEAK TRAFFIC OUTSIDE LTN (DURING)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:8,500 | JY | - | 05/12/2020 |
| FIGURE NUMBER | | REVISION | |
| 28 | | - | |


Church Road section between Anerley Hill and Westow Street, taken during AM peak


The original exit arm on Belvedere Road, now converted to an outdoor dining space

Portland Road facing northbound

Church Road section between Anerley Hill and Westow Street, taken during PM peak


Church Road junction with Westow Street, taken during PM peak


Anerley Hill junction with Cintra Park

# 3.3 JOURNEY TIME DIFFERENCE (GENERAL TRAFFIC)

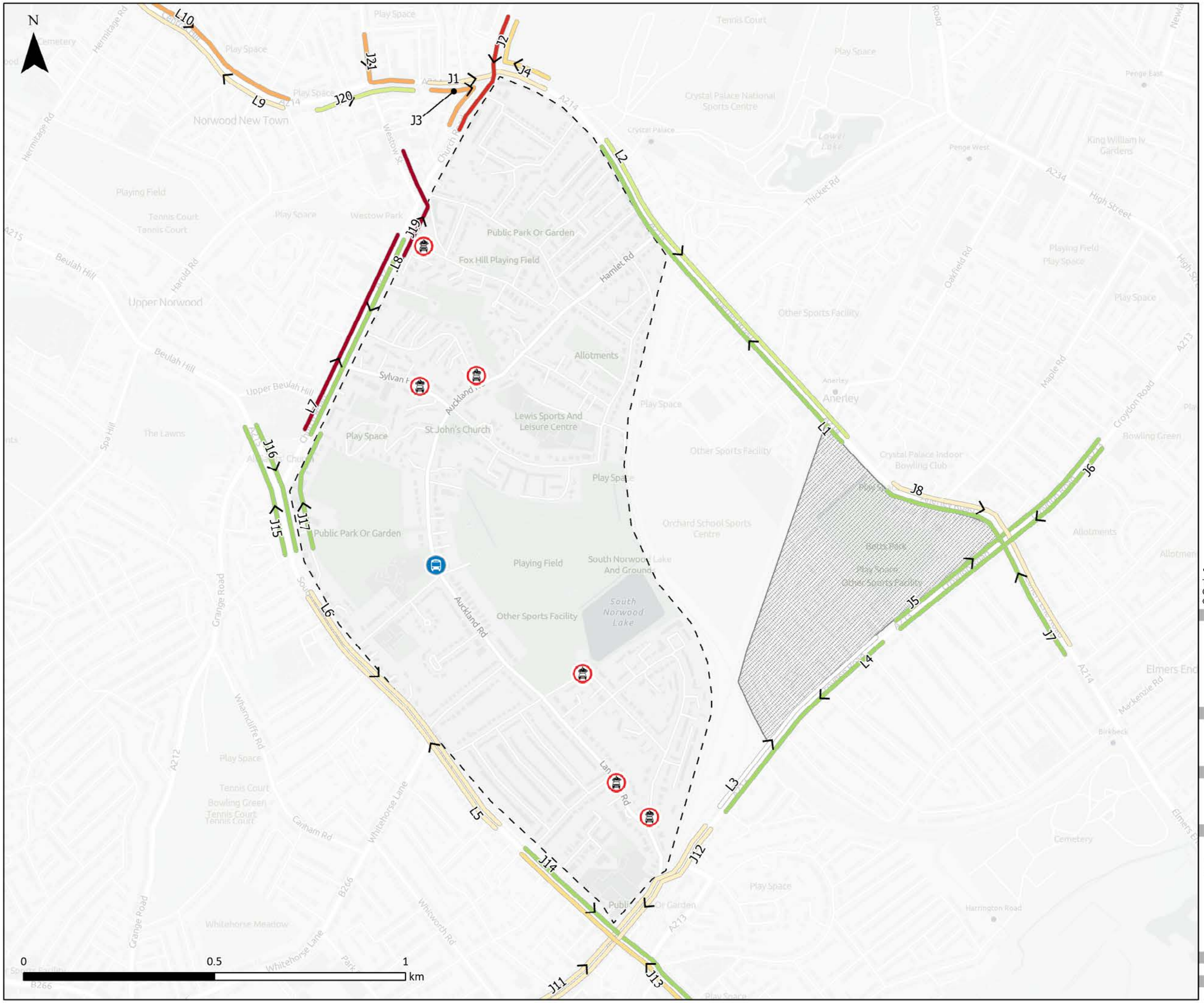
This section presents the before-and-during journey time comparison for general traffic, on roads and junctions in vicinity to the temporary LTN. Similarly to the previous sections, the data was provided for The Floow using telematics technology. The data is presented by peak periods. We have calcuated the jounrey time difference using median journey time in seconds.

## GENERAL TRAFFIC (AM PEAK)

A total of 31 routes was monitored, though three of the routes did not have enough data to generate robust results for the AM peak (7-10am). Results for the remaining 28 routes are shown in the table laid out on the right, with their location shown on the plan overleaf.

Roughly half of the routes have recorded a reduction or less than 1% increase in median journey time. Most routes (13 in total) with more than 1% increase are along Church Road northbound and the Crystal Palace Triangle. The median journey time increase ranges from 1 second to around 1.9 minutes.

| Route Label | Median AM Peak journey time, Before LTN | Median AM Peak journey time, During LTN | Journey time range for 80% of journeys in AM Peak, During LTN | Difference in median journey time in AM Peak | % Change in median journey time in AM Peak |
|---|---|---|---|---|---|
| J1 | 101 s | 102 s | 64s - 139s | +1 s | +1.0% |
| J2 | 58 s | 100.5 s | 50s - 189s | +42.5 s | +73.3% |
| J3 | 123 s | 143 s | 83s - 313s | +20 s | +16.3% |
| J4 | 128 s | 137.5 s | 84s - 211s | +9.5 s | +7.4% |
| J5 | 127 s | 110 s | 86s - 180s | -17 s | -13.4% |
| J6 | 91 s | 86 s | 73s - 117s | -5 s | -5.5% |
| J7 | 154 s | 146 s | 79s - 243s | -8 s | -5.2% |
| J8 | 82 s | 83 s | 66s - 116s | +1 s | +1.2% |
| J11 | 172 s | 176 s | 113s - 286s | +4 s | +2.3% |
| J12 | 145 s | 146 s | 100s - 212s | +1 s | +0.7% |
| J13 | 170 s | 185 s | 100s - 329s | +15 s | +8.8% |
| J14 | 131 s | 121 s | 91s - 241s | -10 s | -7.6% |
| J15 | 71 s | 61.5 s | 39s - 96s | -9.5 s | -13.4% |
| J16 | 55 s | 49 s | 36s - 67s | -6 s | -10.9% |
| J17 | 69 s | 62 s | 42s - 91s | -7 s | -10.1% |
| J19 | 91.5 s | 208 s | 79s - 267s | +116.5 s | +127.3% |
| J20 | 87 s | 86 s | 45s - 169s | -1 s | -1.1% |
| J21 | 41 s | 48.5 s | 39s - 83s | +7.5 s | +18.3% |
| L1 | 145 s | 131.5 s | 99s - 319s | -13.5 s | -9.3% |
| L2 | 129 s | 123 s | 98s - 175s | -6 s | -4.7% |
| L3 | 71 s | 71 s | 54s - 104s | 0 s | 0.0% |
| L4 | 78 s | 72 s | 57s - 119s | -6 s | -7.7% |
| L5 | 138 s | 141 s | 104s - 233s | +3 s | +2.2% |
| L6 | 96 s | 96.5 s | 77s - 120s | +0.5 s | +0.5% |
| L7 | 71.5 s | 146 s | 61s - 293s | +74.5 s | +104.2% |
| L8 | 64.5 s | 60 s | 49s - 76s | -4.5 s | -7.0% |
| L9 | 47 s | 48 s | 41s - 73s | +1 s | +2.1% |
| L10 | 140 s | 157 s | 131s - 216s | +17 s | +12.1% |




Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2

LTN Measures

Modal Filter

Bus Gate

% Change in AM Peak median journey time

- -10-14 %
- -5-9 %
- -1-4 %
- ≤0
- +1-5%
- +6-10%
- +11-25%
- +26-50%
- +51-100%
- +101-130%

'AM peak' means 3-hour average taken between 7-10am
Traffic data obtained from Floow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# JOURNEY TIME DIFFERENCE (AM PEAK) (BEFORE AND DURING LTN)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:9,000 | JY | - | 09/12/2020 |
| FIGURE NUMBER | | REVISION | |
| 21 | | - | |

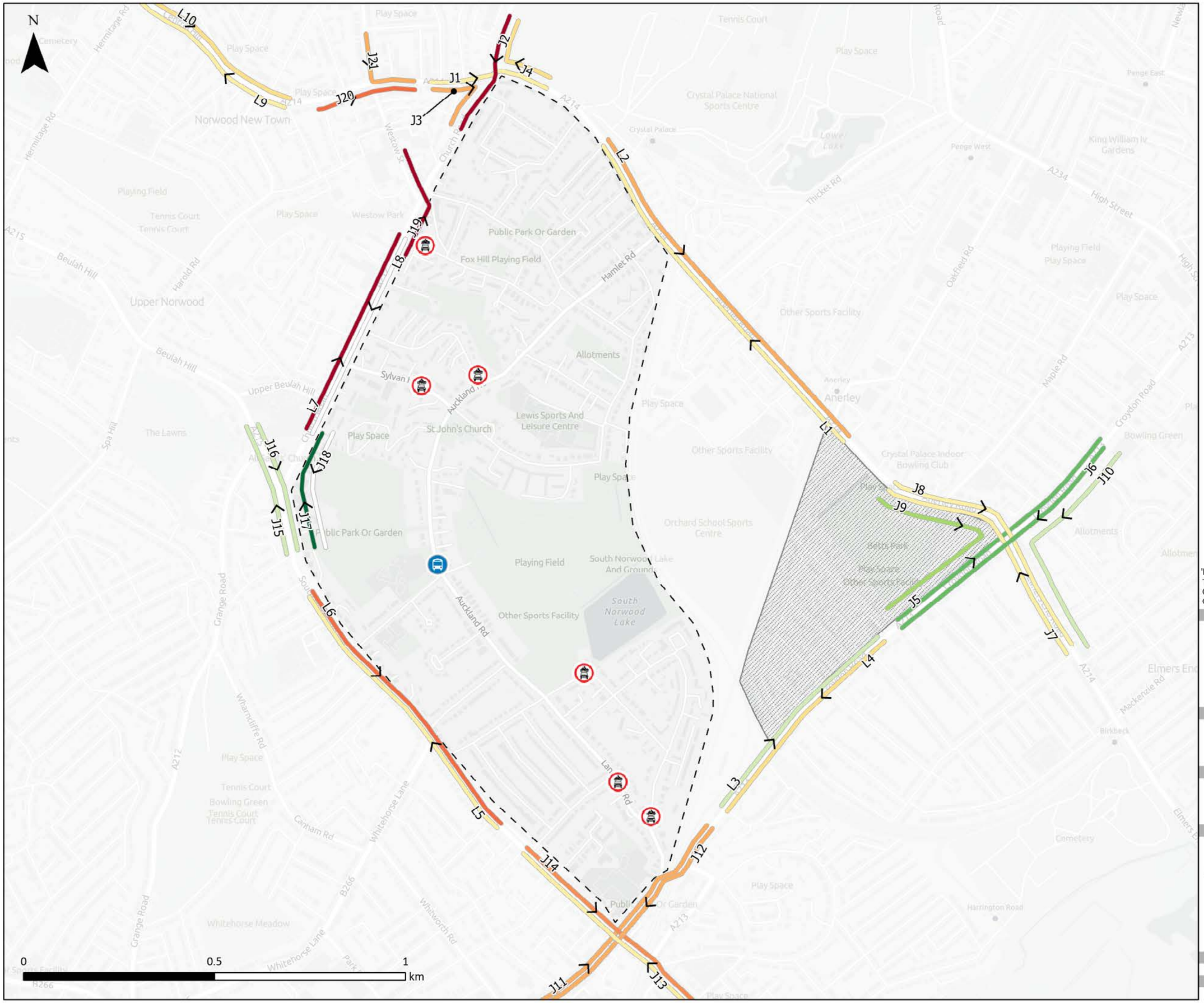
## GENERAL TRAFFIC (PM PEAK)

A total of 31 routes was monitored, with results presented for the PM peak. The table of results are laid out on the right, with their location shown on the plan overleaf.

About two-third of the routes have recorded more than 1% increase in median journey time. The increase ranges from 4 seconds to 2.6 minutes. These routes cover most road segments around the temporary LTN. Similar to the AM peak, Church Road northbound and the Crystal Palace Triangle are amongst the area with most percentage increase in median journey time. South Norwood Hill southbound, down to Portland Road, also saw a large increase in the PM peak.

A more detailed analysis about the journey time difference is included in the Discussion section at the end of this chapter.

| Route Label | Median PM Peak journey time, Before LTN | Median PM Peak journey time, During LTN | Journey time range for 80% of journeys in PM Peak, During LTN | Difference in median journey time in PM Peak | % Change in median journey time in PM Peak |
|---|---|---|---|---|---|
| J1 | 159.5 s | 168 s | 93s - 274s | +8.5 s | +5.3% |
| J2 | 68 s | 192 s | 89s - 286s | +124 s | +182.3% |
| J3 | 193 s | 266 s | 178s - 370s | +73 s | +37.8% |
| J4 | 123 s | 143 s | 69s - 237s | +20 s | +16.3% |
| J5 | 142 s | 127 s | 80s - 196s | -15 s | -10.6% |
| J6 | 112 s | 98 s | 75s - 140s | -14 s | -12.5% |
| J7 | 126 s | 137 s | 89s - 216s | +11 s | +8.7% |
| J8 | 97 s | 106 s | 74s - 162s | +9 s | +9.3% |
| J9 | 98 s | 92 s | 75s - 157s | -6 s | -6.1% |
| J10 | 106.5 s | 105 s | 83s - 130s | -1.5 s | -1.4% |
| J11 | 255 s | 328.5 s | 182s - 477s | +73.5 s | +28.8% |
| J12 | 147.5 s | 221 s | 148s - 289s | +73.5 s | +49.8% |
| J13 | 173 s | 180 s | 116s - 297s | +7 s | +4.0% |
| J14 | 274 s | 426 s | 247s - 621s | +152 s | +55.5% |
| J15 | 67.5 s | 64.5 s | 41s - 108s | -3 s | -4.4% |
| J16 | 68 s | 65 s | 51s - 86s | -3 s | -4.4% |
| J17 | 69 s | 56.5 s | 37s - 88s | -12.5 s | -18.1% |
| J18 | 49 s | 49 s | 40s - 73s | 0 s | +0.0% |
| J19 | 82 s | 243 s | 116s - 320s | +161 s | +196.3% |
| J20 | 108 s | 192.5 s | 67s - 377s | +84.5 s | +78.2% |
| J21 | 71 s | 97 s | 48s - 153s | +26 s | +36.6% |
| L1 | 146 s | 159 s | 113s - 225s | +13 s | +8.9% |
| L2 | 174 s | 238 s | 146s - 387s | +64 s | +36.8% |
| L3 | 80 s | 79 s | 57s - 117s | -1 s | -1.3% |
| L4 | 75 s | 89 s | 61s - 225s | +14 s | +18.7% |
| L5 | 121.5 s | 126 s | 99s - 243s | +4.5 s | +3.7% |
| L6 | 112 s | 252 s | 126s - 426s | +140 s | +125.0% |
| L7 | 72 s | 219 s | 92s - 424s | +147 s | +204.2% |
| L8 | 65 s | 65 s | 53s - 91s | 0 s | 0.0% |
| L9 | 49 s | 53 s | 48s - 75s | +4 s | +8.2% |
| L10 | 153 s | 181 s | 144s - 276s | +28 s | +18.3% |




Temporary Crystal Palace & South Norwood LTN

Neighbourhood 2

LTN Measures

Modal Filter

Bus Gate

% Change in PM Peak median journey time

- -15-20 %
- -10-14 %
- -5-9 %
- -1-4 %
- 0 %
- +1-10 %
- +11-25 %
- +26-50 %
- +51-75 %
- +76-100 %
- +101-125 %
- +126-150 %
- +151-210 %

'PM peak' means 3-hour average taken between 4-7pm

Traffic data obtained from Floow



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# JOURNEY TIME DIFFERENCE (PM PEAK) (BEFORE AND DURING LTN)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:9,000 | JY | - | 09/12/2020 |
| FIGURE NUMBER | | REVISION | |
| 22 | | - | |

# 3.4 JOURNEY TIME DIFFERENCE (BUSES)

Bus journey time data, as provided by TfL from the iBus system, has been analysed to understand if the temporary LTN scheme has had an effect in the running times of local bus routes. The latest data we obtained cover the period from January 2019 to the second week of October 2020.

The timeline graph, showing changes in average weekday bus journey time during a 12-hour peak (7am-7pm), are presented by each road corridor around the LTN. These corridors are listed below.

- Anerley Road (northbound)
- Anerley Road (southbound)
- Penge Road (eastbound)
- Penge Road (westbound)
- South Norwood Hill (northbound)
- South Norwood Hill (southbound)
- Church Road (northbound)
- Church Road (southbound)

On top of each graph, we also added he timeline of road works, LTN measures and COVID-19 restrictions at the time along the bus performance timeline. For the precise location and details of particular LTN measure or road works, please refer to page 34-35.

## ANERLEY ROAD (NORTHBOUND)

The average journey time of buses along Anerley Road northbound dropped with the first lockdown in late March 2020, then remained below the baseline of 3.2 minutes per kilometre (min/km).

The figure started increase, to about 4.2 min/km starting from August 2020. It then increased to about 4.9 min/km in October.

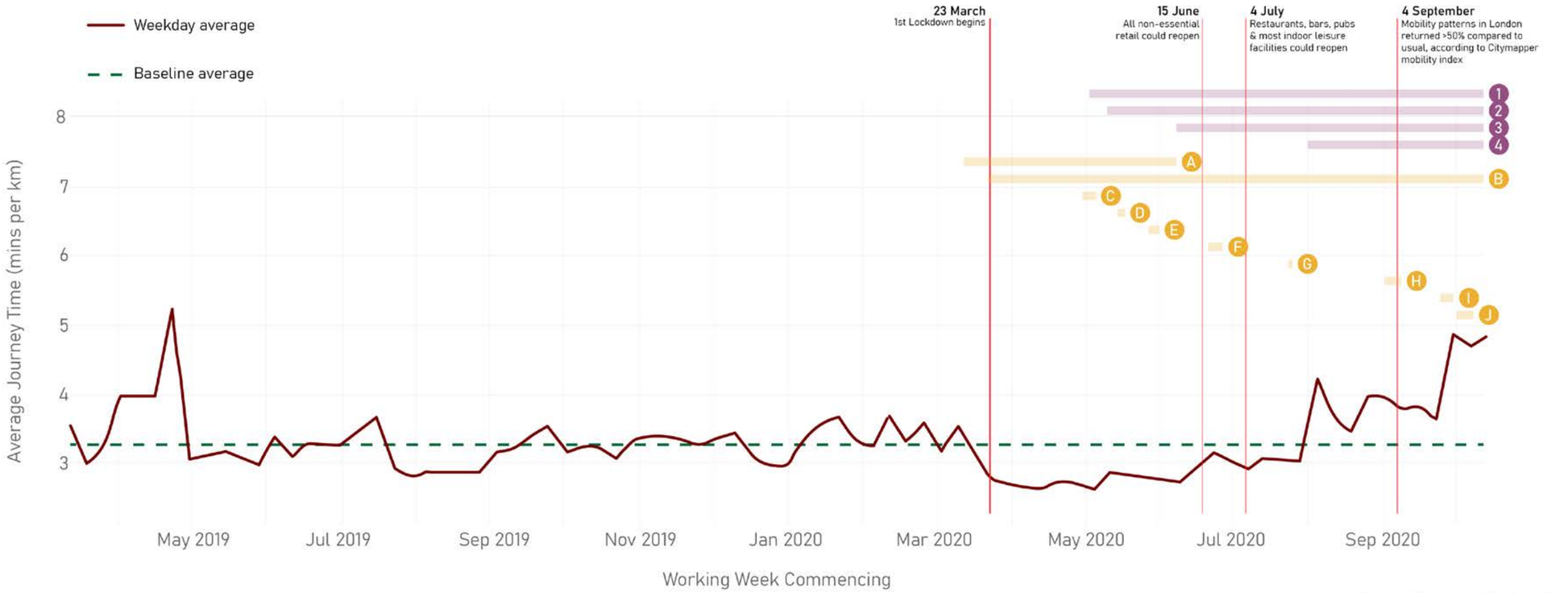
The first spike in journey time coincided with the period when the modal filters were installed on Stambourne Way, Sylvan Hill and Fox Hill. Despite the figure fell to around 3.8 min/km in late Septmber, the figure reached 4.9 min/km again when the road works were in place on Auckland Road.

## ANERLEY ROAD (SOUTHBOUND)

The average journey time of buses along Anerley Road southbound also stayed below the baseline of 3.3 minutes per kilometre (min/km) after dropping with the first lockdown in late March 2020.

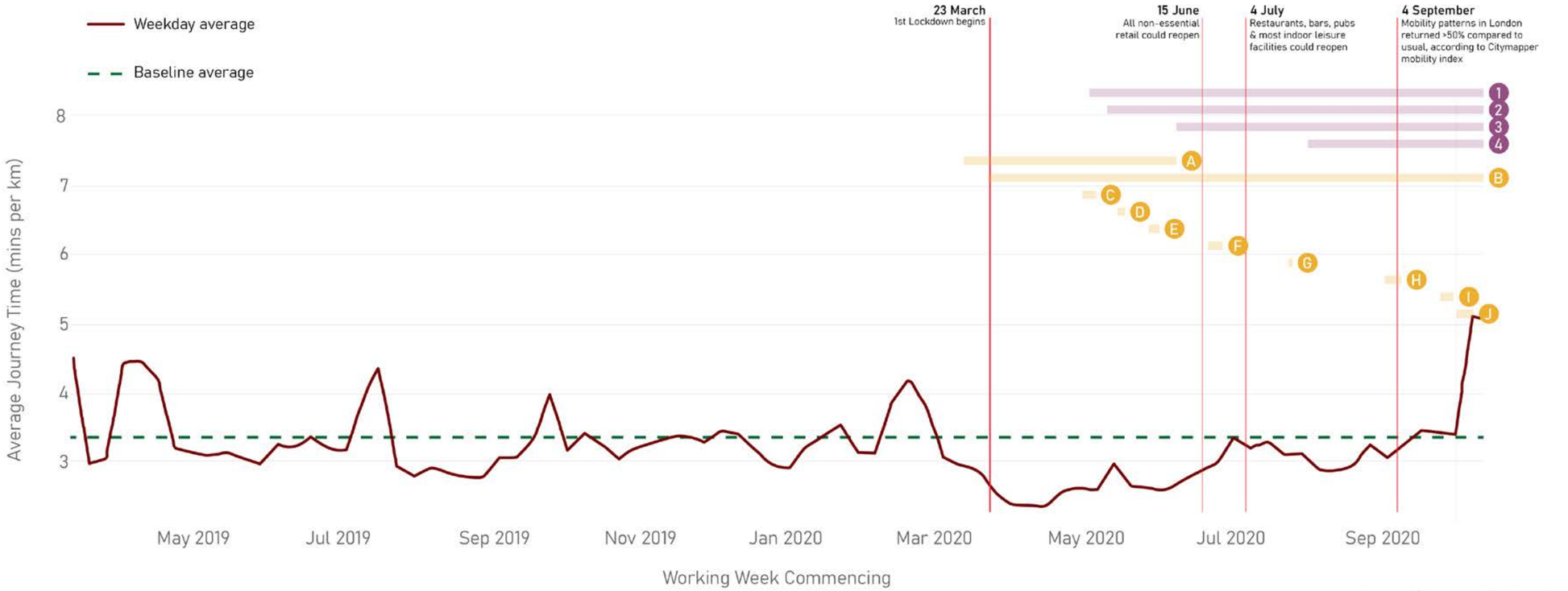
The figure did not increase over the baseline until early October, when it soared to about 5.1 min/km.

## Anerley Road NB corridor




Source: Transport for London

## Anerley Road SB corridor




Source: Transport for London

### Tempoary LTN Measures

1. **9 May 2020**
   Modal filter at
   - Junction of Lancaster Road/ Southern Avenue
   - Junction of Woodvale Avenue/ Avenue Road
2. **9 May 2020**
   Modal filter at Junction of Lancaster Road/ Warminster Road
3. **7 June 2020**
   Modal filter (now a Bus Gate) at Auckland Road by Cypress Road
4. **3 August 2020**
   Modal filter on
   - Stambourne Way
   - Sylvan Hill
   - Fox Hill

### Road works

- A Auckland Road
- B Church Road
- C Westow Hill
- D Church Road
- E Sylvan Road
- F Westow Hill
- G Woodvale Avenue
- H South Norwood Hill
- I Auckland Road
- J Auckland Road

## PENGE ROAD (EASTBOUND)

The baseline average of bus journey time along Penge Road eastbound is around 3.6 min/km. The figure stayed below the baseline after the lockdown measures were enforced since late March 2020.

Some fluctuations were identified, such as a spike after non-essential retail were allowed to reopen on 15 July, as well as at the start of a roadwork on South Norwood Hill. Nevertheless, the figure stayed at around 3.5 min/km at the end of the data period.

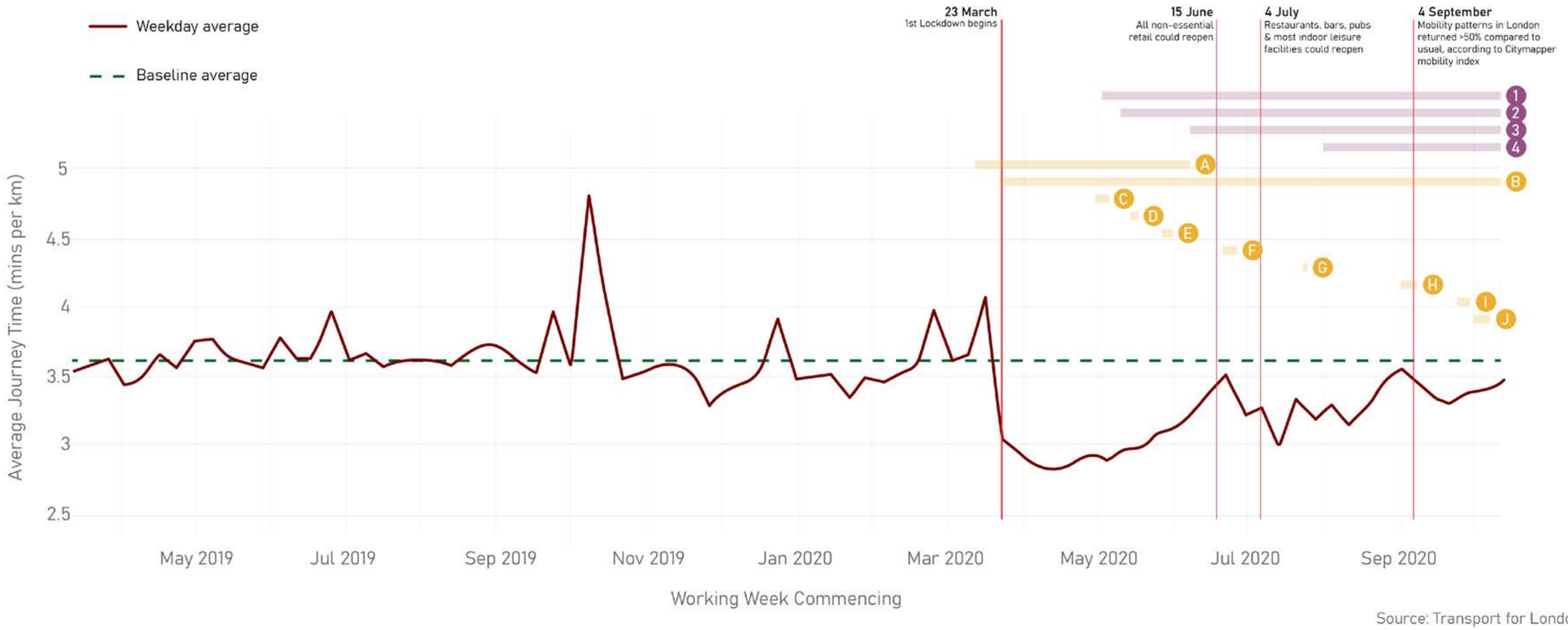
## PENGE ROAD (WESTBOUND)

The baseline average of bus journey time along Penge Road westbound is around 4.6 min/km. The average decreased to around 3.5 min/km after the first lockdown.

The figure started increase above the baseline average starting from mid-July, after the restaurants were allowed to reopen. It then increased to around 6 min/km in September. That was the time when the mobility patterns in London returned to at least 50% of the usual, according to Citymapper mobility index.[1]

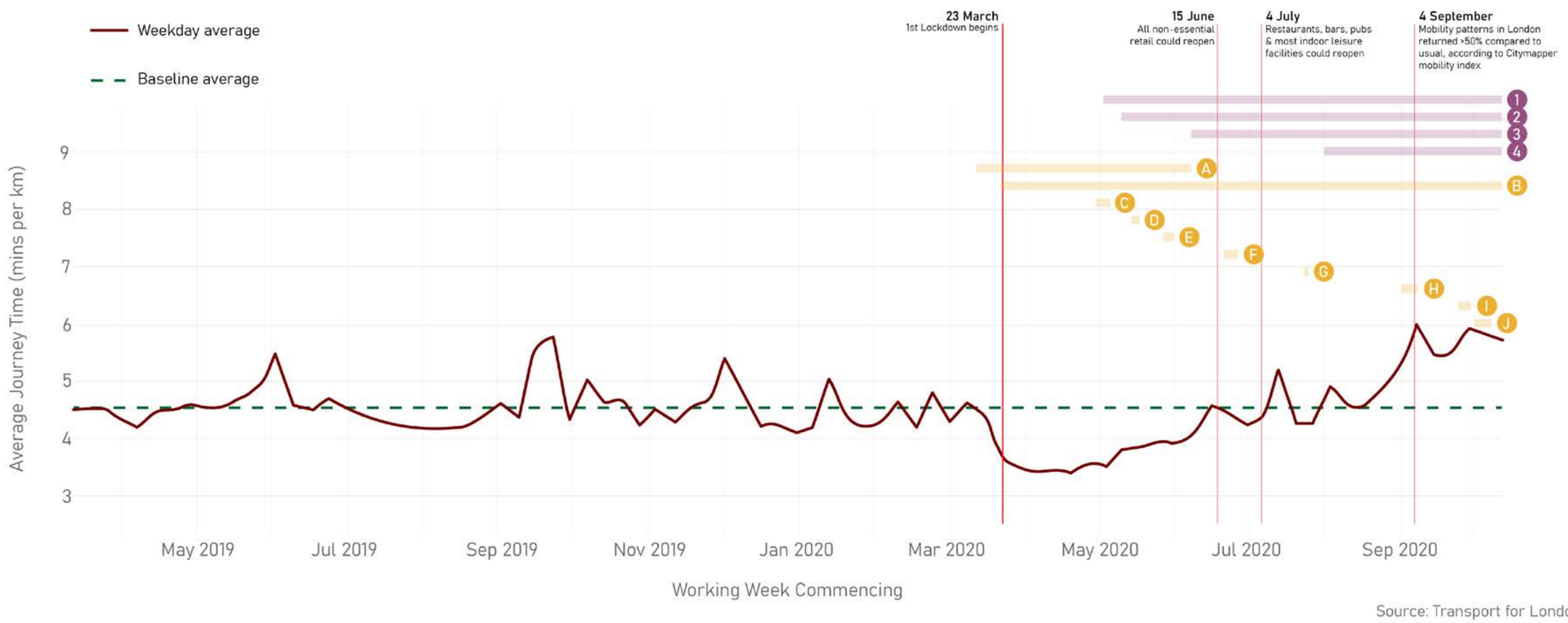
1 - Citymapper Mobility Index (2020) '% of London moving compared to usual'

## Penge Road EB corridor




Source: Transport for London

## Penge Road WB corridor




Source: Transport for London

### Tempoary LTN Measures

1. **9 May 2020**
   Modal filter at
   - Junction of Lancaster Road/ Southern Avenue
   - Junction of Woodvale Avenue/ Avenue Road
2. **9 May 2020**
   Modal filter at Junction of Lancaster Road/ Warminster Road
3. **7 June 2020**
   Modal filter (now a Bus Gate) at Auckland Road by Cypress Road
4. **3 August 2020**
   Modal filter on
   - Stambourne Way
   - Sylvan Hill
   - Fox Hill

### Road works

- A Auckland Road
- B Church Road
- C Westow Hill
- D Church Road
- E Sylvan Road
- F Westow Hill
- G Woodvale Avenue
- H South Norwood Hill
- I Auckland Road
- J Auckland Road

## SOUTH NORWOOD HILL (NORTHBOUND)

The baseline average of bus journey time along South Norwood Hill northbound is around 3.8 min/km. After lockdown in March 2020, the average bus journey time reduced to less than 3 min/km.

While the figure gradually increased over a six month period, it stayed below the baseline average, before it soared to over 5 min/ km in early October.

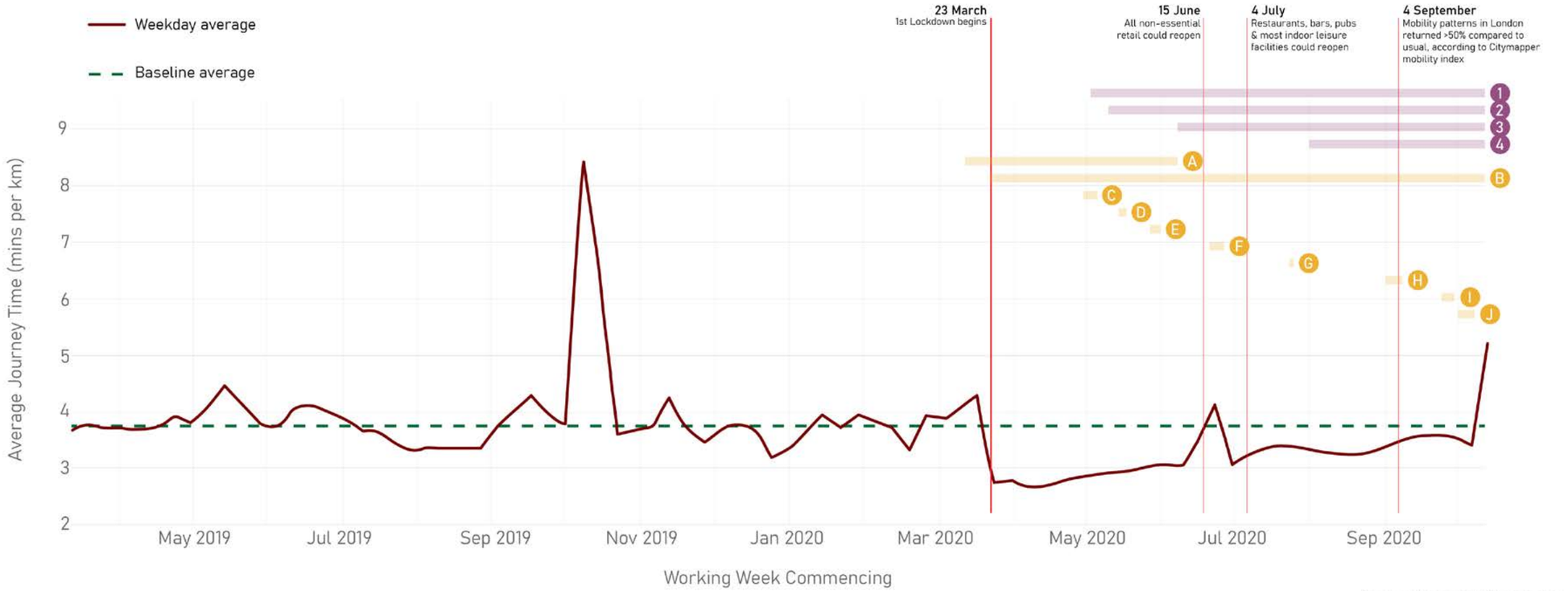
## SOUTH NORWOOD HILL (SOUTHBOUND)

The baseline average of bus journey time along South Norwood Hill southbound is around 4 min/km. After lockdown, the average reduced to less than 3 min/km, then increased above the baseline after non-essential retailers were back in business since mid-June 2020.

The figure fluctuated for a few months before October, which at times it soared to near 6 min/km. This spike happened around the period when the modal filters were installed on Stambourne Way, Sylvan Hill and Fox Hill.

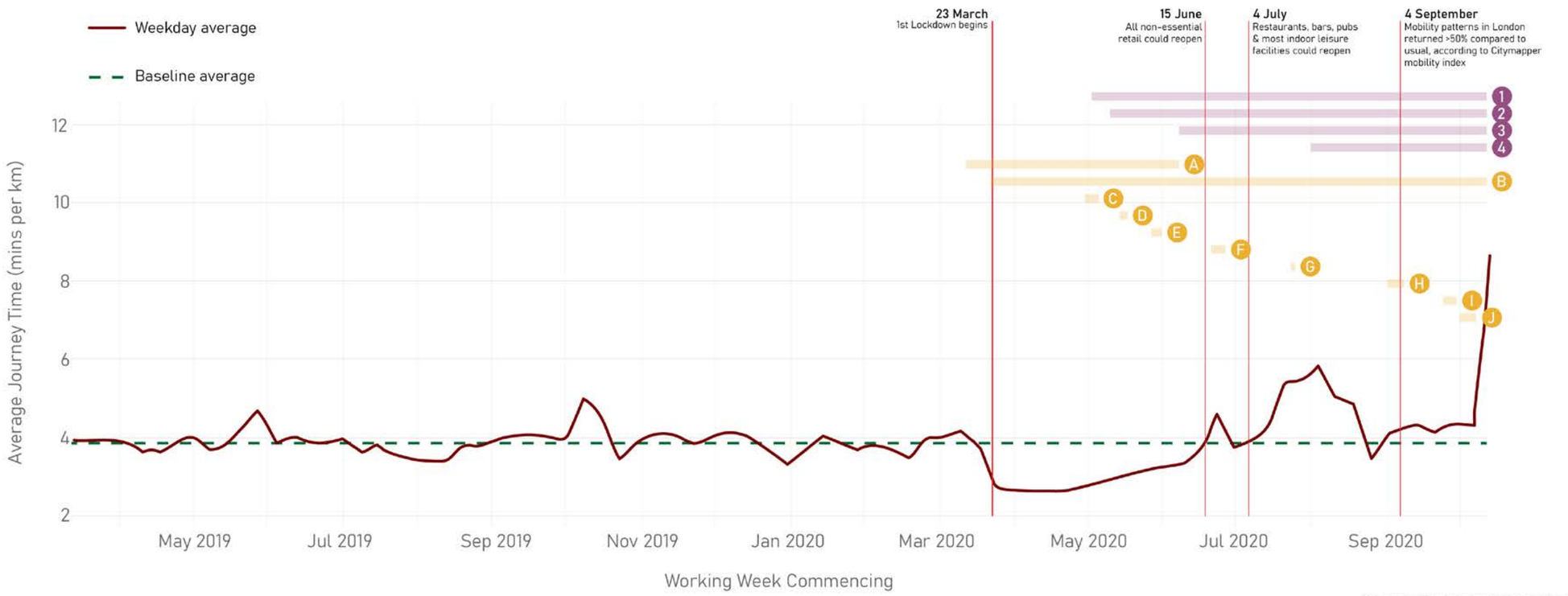
The figure fell back to just above the baseline (around 4.2 min/km) around September and remain steady until early October, when soared to over 8 min/ km.

## South Norwood Hill NB corridor




Source: Transport for London

## South Norwood Hill SB corridor




Source: Transport for London

### Temporary LTN Measures

1. **9 May 2020**
   Modal filter at
   - Junction of Lancaster Road/ Southern Avenue
   - Junction of Woodvale Avenue/ Avenue Road
2. **9 May 2020**
   Modal filter at Junction of Lancaster Road/ Warminster Road
3. **7 June 2020**
   Modal filter (now a Bus Gate) at Auckland Road by Cypress Road
4. **3 August 2020**
   Modal filter on
   - Stambourne Way
   - Sylvan Hill
   - Fox Hill

### Road works

- A Auckland Road
- B Church Road
- C Westow Hill
- D Church Road
- E Sylvan Road
- F Westow Hill
- G Woodvale Avenue
- H South Norwood Hill
- I Auckland Road
- J Auckland Road

## CHURCH ROAD (NORTHBOUND)

The baseline average of bus journey time along Church Road northbound is around 3 min/km. There was a spike in the average before the first lockdown in early March. It was very likely to be caused by the Candle shop car crash. As a result, the figure did not plummet a lot after the lockdown in March 2020, unlike all the other roads mentioned above.

Shortly before June, the figure increased above the baseline of 3 min/km and settled around 4 min/km for around a month and a half. The second spike brought the figure to around 9 min/km shortly after 4 July, when all restaurants were allowed to reopen.

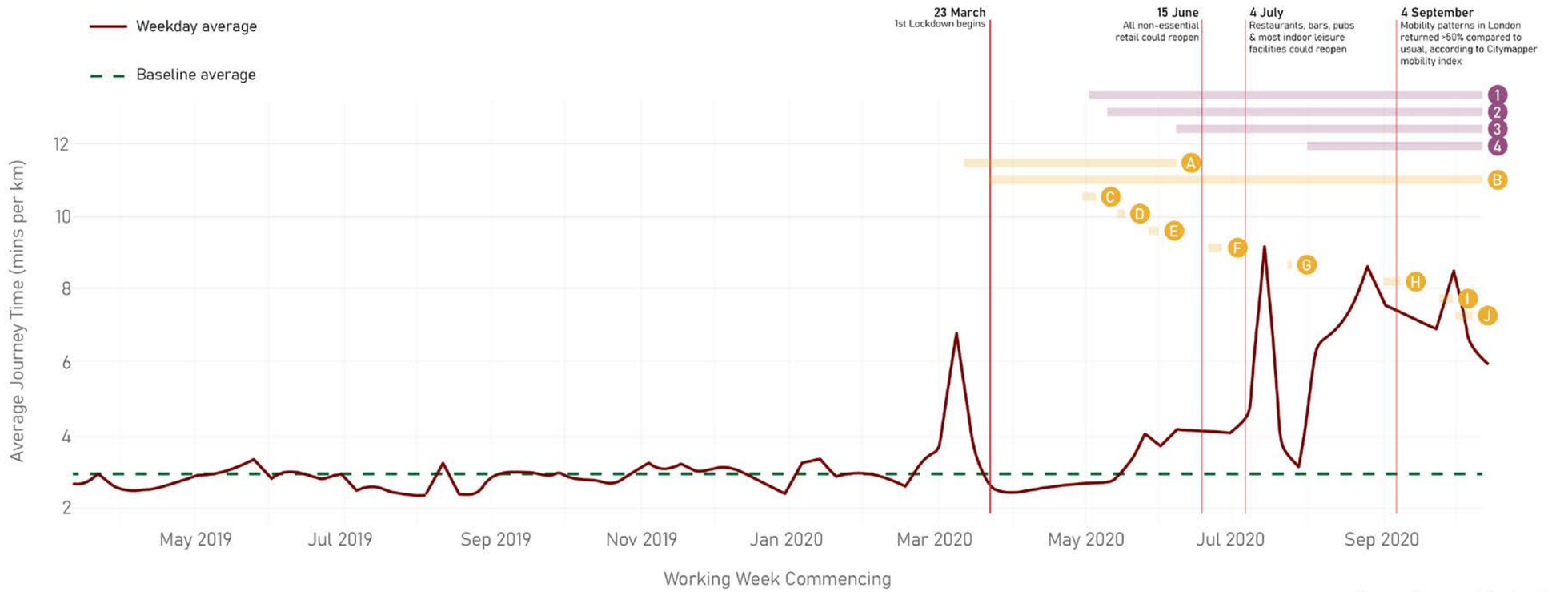
There was a large range of fluctations between August and early October, ranging between 3 and 8.2 min/km. After the figure reached around 8.2 min/km, it decreased steadily to around 6 min/km at the end of the data period.

## CHURCH ROAD (SOUTHBOUND)

The baseline average of bus journey time along Church Road southbound is around 3 min/km. Similar to the northbound, there was a spike in the average before the first lockdown in early March, likely to be due to the Candle shop car crash. The figure stayed mostly above the average since lockdown.

The figure gradually increased to around 4 min/km in July. There was then a spike to around 5.5 min/km after 4 July, when all restaurants were allowed to reopen. After that, there were fluctations between an average of 4 to 4.5 min/km until the end of the data period.

## Church Road NB corridor




Source: Transport for London

## Church Road SB corridor


Source: Transport for London

### Temporary LTN Measures

**1 9 May 2020**
Modal filter at
- Junction of Lancaster Road/ Southern Avenue
- Junction of Woodvale Avenue/ Avenue Road

**2 9 May 2020**
Modal filter at Junction of Lancaster Road/ Warminster Road

**3 7 June 2020**
Modal filter (now a Bus Gate) at Auckland Road by Cypress Road

**4 3 August 2020**
Modal filter on
- Stambourne Way
- Sylvan Hill
- Fox Hill

### Road works

- A Auckland Road
- B Church Road
- C Westow Hill
- D Church Road
- E Sylvan Road
- F Westow Hill
- G Woodvale Avenue
- H South Norwood Hill
- I Auckland Road
- J Auckland Road

# 3.5 DISCUSSION

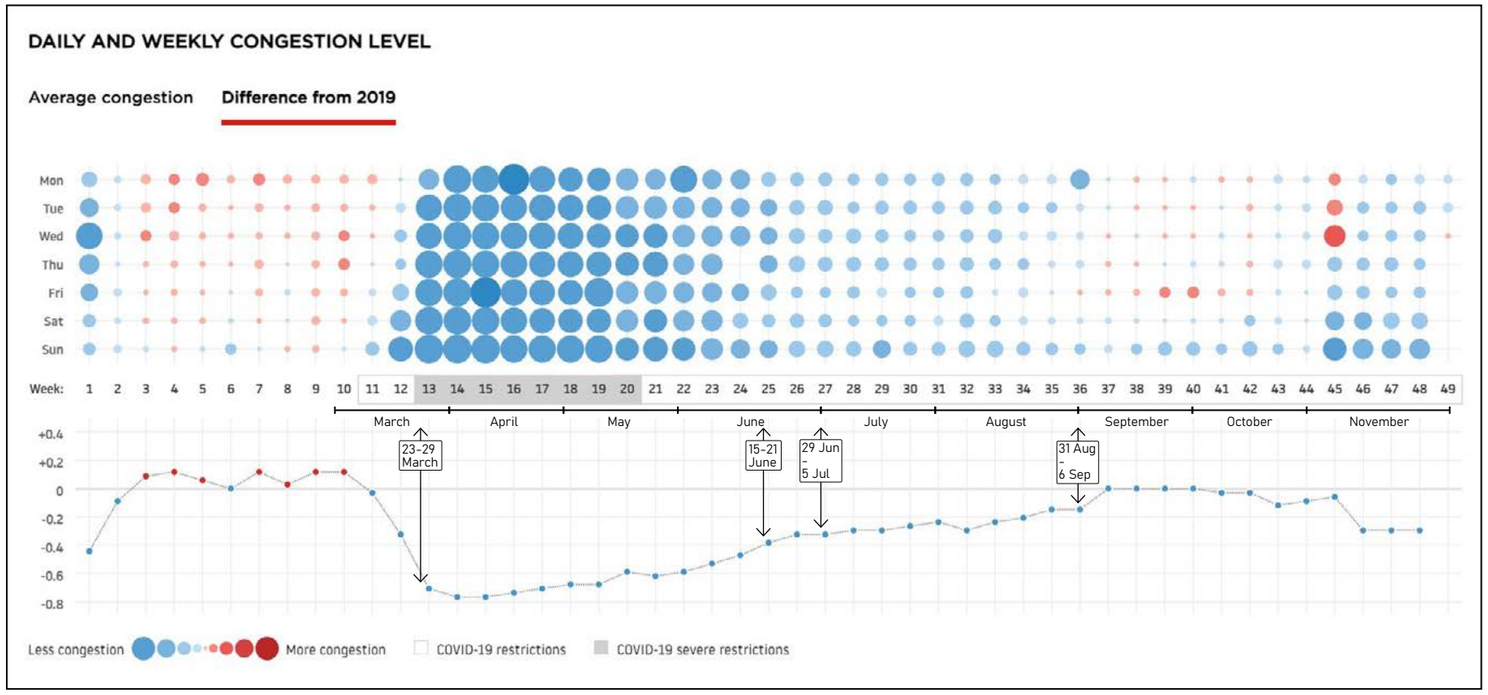
This section presents further analyses about the traffic data results. It begins with an overview on the background constraints in the study, then explains the traffic effects on the selected roads outside of the temporary LTN.

## BACKGROUND CONSTRAINTS

The year of 2020 has seen an unprecedented drop and fluctuations in mobility patterns due to COVID-19. It has casued immense difficulty in the collection and analysis of traffic data.

As seen in TomTom's graph on the right showing London's daily and weekly congestion level in 2020, over half of the year has seen at least 20% less congestion than 2019. On the other hand, COVID-19 may also have changed the way how many people choose to travel, i.e. choosing private car over public transport for social distancing; or choosing cycling rather than private car due to less traffic on the road. The mode choice and travel patterns can change quickly over time.

As a result, it is difficult to determine whether the temporary LTN has a direct impact on the difference in traffic flows and journey time, as many of the assumptions we normally use in traffic analysis no longer apply.




55% of the time this year has shown at least 20% less than the daily congestion level in 2019 (TomTom)

We are able to suggest likelihood of relationships between the temporary LTN measures and the traffic situation nearby. However, we cannot determine direct causations with detailed calculation.

Since there was no comprehensive set of 'before LTN' ATC data covering the area we wish to monitor, we have used telematic data. The data presents in the format of estimated flow per hour for each road segment. As they are not actual, observed traffic counts, we cannot use the data to provide a robust calculation for traffic displacement.

## TRAFFIC FLOWS AND JOURNEY TIME DIFFERENCE OUTSIDE LTN

Based on the data results presented in the previous sections, we are going to analyse the relationships between the changes in traffic flows and journey time, and to explain possible factors attributable to these traffic effects on the selected roads outside the temporary LTN.

### Anerley Road

Anerley Road shows a general reduction of traffic flows, up to -29%, in both directions

for the daily average and the AM peak period. However, it shows a change in traffic flows ranging from +20% to -29% southbound in the PM peak. The increase was detected in proximity to the junction with Croydon Road.

The journey time difference shows a similar picture. It shows a reduction in median journey time in both directions (between -4.7% for route L2; and -9.3% for route L1) in the AM peak. For the PM peak, it shows a slight increase for northbound (+8.9%; +13s for route L1), but a large increase for southbound (+36.8%; +64s for route L2).

While the average bus journey time for northbound shows a considerable increase (from below the baseline of 3.8 min/km in late March to 4.9 min/km in October), it is unlikely to be caused by the temporary LTN measures as the data shows a clear reduction of traffic flow on the northbound. The bus journey time graph shows a fluctuation between 3.8 and 4.2 min/km between August and October, when mobility patterns gradually increased back to about 50% of the usual in London. The figure only increased drastically to 4.9 min/km since the start of October, but the last stage of LTN measures were introduced at the start of August.

For the southbound direction, while the daily average shows an overall reduction of traffic flows on the southbound, there are has been increase in both the traffic flows and journey time for general traffic in PM peak. The average bus journey time for southbound remained below the baseline for most of the data period, without much changes in reponse to road works or different stages of the temporary LTN.

In addition, the increase on southbound was detected in proximity to the junction with Croydon Road, which could be contributed by the potential increase of traffic on Thicket Road, Oakfield Road and Maple Road. Therefore, we cannot establish a clear relationship on the journey time increase on southbound with the temporary LTN.

### High Street-Penge Road

The road link of High Street-Penge Road shows a mixed picture in the change of the traffic flows. For eastbound, there has predominantly been a reduction in traffic in both AM peak (up to -43%; -370 vph), but a change between +18 and -104 vph (+3% to -14%) in the PM peak. The slight increase on eastbound in the PM peak was detected close to the junction with Portland Road and South Norwood Hill. For westbound, it shows an increase (up to +69%; +134 vph) in the AM peak and a reduction (up to -31%; -278 vph) in the PM peak. The increase on westbound in the PM peak can be seen to have begun from Croydon Road to the east.

In term of journey time difference for general traffic, it also shows a mixed picture. There was a negligible increase in median journey time (+2.3%; +4s for route J11) on both directions in the AM peak. In the PM peak, the median journey time increase for both directions (+73.5s for both route J11 and J12) were also confined to the section near the junction with Portland Road and South Norwood Hill. This suggests that the increase in journey time along this road link is a result of traffic increase on High Street (west of the junction with South Norwood Hill).

The average bus journey time for both directions show minimal effect from the temporary LTN, as there were no spike in the figures around or after the first two modal filters were installed on or near Lancaster Road. Those measures have closed the through route from Penge Road since May. It is therefore safe to say the temporary LTN has a minimal effect on the traffic flows and journey time along High Street and Penge Road.

### South Norwood Hill

South Norwood Hill shows a mixed picture in the change of traffic flow. For northbound,

there was a clear increase in the AM peak (up to +21%; +88 vph), but predominantly a reduction in the PM peak (between +18 and -140 vph; +4% to -20%).

As mentioned in Section 3.2, a continuous pattern of traffic increase in northbound direction can be observed in the AM peak, which begins from the southern end of South Norwood Hill. This pattern then continues along Church Road-Westow Street, turns right onto Westow Hill and travels up towards Crystal Palace Parade.

The traffic increase could be associated with the displacement of some northbound through traffic from the temporary LTN. This traffic increase also contributed to an +8.8% increase (+15s; route J13) of median journey time in AM peak. However this explanation could also be subject to challenge. As mentioned in Section 3.1, there has been more reduction in through traffic within the LTN in the PM peak than the AM peak. However, South Norwood Hill still saw predominantly a reduction (between +18 and -140 vph; +4% to -20%) in PM peak northbound. Decrease was also detected in southbound direction on both peaks as well.

The average bus journey time shows that the LTN measures might have posed some effect to the jounrey time. The figure for northbound spiked up to around +50% (6 min/km) of the baseline in early August, shortly after the final stage of modal filters were installed on Stambourne Way, Sylvan Hill and Fox Hill. However, the figure reduced quickly back to around slightly more than the baseline in the end of August, suggesting limited impacts.

In contrast to the predominant decrease in traffic flows southbound, there was a huge increase in median journey time for general traffic in the PM peak (+125%; +140s for route L6 and +55.5%; +152s for route J14). Since there has been large increase in traffic on High street eastbound west of the junction with South Norwood Hill in the PM peak, it is suggested that the journey time increase on South Norwood Hill southbound was predominantly affected by the increase of right turning traffic from High street.

### Church Road (Westow Street-Beulah Hill)

Similarly to South Norwood Hill, the Church Road section between Westow Street and Beulah Hill only shows an increase in traffic flows in the AM peak (up to +39%; +129 vph). PM peak for northbound, as well as both peaks for southbounf have shown significant reduction in traffic flows (up to -62%; -268 vph). The traffic increase could also be associated with the displacement of some northbound through traffic from the temporary LTN.

The journey time for general traffic in the northbound direction, however, shows a conflicting picture. There was huge increase in the median journey time for both AM (+104.2%; +74.5s for route L7) and PM peak (+204.2%; +147s for route L7), despite there was only traffic increase recorded in the AM peak. The southbound median journey time decreased (-7%; -4.5s for route L8) and stayed the same in AM and PM peak respectively.

Unlike all the other roads mentioned above, the average bus journey time in both peak periods for both directions stayed above the baseline after first lockdown and increased steadily. For northbound, the figure fluctuated between 3 and 8.2 min/km, between August to early October. For southbound, the figure fluctuated between 4 to 5.5 min/km after 4 July and until the end of the data period.

After the candle shop car crash on 21 March, temporary signals were in place from 22 March to 1 November, with only one lane of traffic from either direction can pass at a time. This is identified as one of the major factors contributing to the sharp increase of journey time in both directions.

A spike in the average bus journey time can be spotted soon after 4 July when most restaurants could reopen. The journey

time increase could be associated with the temporary LTN, as there was a spike in average bus journey time soon after the final set of modal filters were installed on Stambourne Way, Sylvan Hill and Fox Hill on 3 August. These filters closed the remaining bidirectional through traffic route across the LTN between Anerley Road and Church Road. However, this does not explain why the traffic flows on Church Road only increased in the northbound direction for the AM peak (up to +39%; +129 vph), during all temporary LTN measures were being put in place.

The duration of the temporary signal arrangement on the southern section of Church Road overlapped almost exactly with the road closure/ temporary LTN measure have been in place on Auckland Road. In addition, the fluctuating mobility patterns due to easing and tightening of COVID related restrictions have complicated the relationship further. Therefore, it is unclear how much of the journey time increase on Church Road could be attributed to the temporary LTN.

## Crystal Palace Triangle

Crystal Palace Triangle is a gyratory formed by the northern section of Church Road (between Anerley Hill and Westow Street), Westow Street and Westow Hill. In the AM peak, Westow Street and Westow Hill both had an increase of traffic flow of +49% (+260 vph) and 7% (+114 vph) respectively, while the northern section of Church Road had a reduction of -11% (-57 vph). In the PM peak, all three roads had a reduction in traffic flows, with the rate ranging between -23% (-174 vph) and -45% (-258 vph).

Nevertheless, the median journey time for general traffic on almost all routes around the Triangle have recorded moderate to significant increase for both peak periods, with a more serious picture showing in the PM peak. These routes and their results are presented in the table on the right.

No average bus journey time data was provided by TfL for Westow Hill or Westow Street. As mentioned previously, the average bus journey time for Church Road southbound stayed above the baseline after first lockdown and increased steadily until early July, before it fluctuated between a range of 1.5 min/km before the end of the data period.

Due to the nature of one-way gyratory system in place around the Triangle, disruption close to any of the arms can cause grid relatively quickly. The temporary signal arrangement, located just south of the Triangle, was a potential cause of the increase in journey time for route J2 and J19. Traffic going to the southern section of Church Road had to wait longer in the northern section. In addition, the increase of traffic flows (up to +39%; +129 vph) on Church Road (Westow Street-Beulah Hill) northbound has also contributed to the journey time increase around the Triangle in the AM peak, which might be pursuant to the temporary LTN.

While the PM peak shows a serious increase in journey time around the Triangle, all three

| Route | | AM Peak | | PM Peak | |
|---|---|---|---|---|---|
| | | % Change | Change in seconds | % Change | Change in seconds |
| J1 | Anerley Hill (Beardell Street-Cintra Park) EB | +1.0% | +1 s | +5.3% | +8.5 s |
| J2 | Crystal Palace Parade-Church Road (Bus station-St Aubyns Road) SB | +73.3% | +42.5 s | +182.3% | +124 s |
| J3 | Westow Hill-Church Road (Beardell Street-N of Stoney Lane) | +16.3% | +20 s | +37.8% | +73 s |
| J19 | Church Road-Westow Street (Fox Hill-Carberry Road) NB | +127.3% | +116.5 s | +196.3% | +161 s |
| J20 | Central Hill (Gatestone Road-Beardell Street) EB | -1.1% | -1 s | +78.2% | +84.5 s |
| J21 | Gipsy Hill-Westow Hill (Camden Hill Road-Beardell Road) | +18.3% | +7.5 s | +36.6% | +26 s |

Journey time difference on routes associated with Crystal Palace Triangle

roads around it has shown reductions in traffic flows. Apart from the temporary signal arrangements, it could also be contributed by the significant increase of traffic along Central Hill westbound (+198 vph).

### Selby Road-Seymour Villas

The road link of Selby Road and Seymour Villas in Neighbourhood 2 shows traffic flow increase on the northbound in both AM (up to +87%; +106 vph) and PM peak (up to +32%; +47 vph). In contrast, the southbound direction shows no change in traffic flows or a reduction up to -35% (-64 vph) amongst the two peak periods.

No journey time data for general traffic were collected for this road link. Majority of the routes around Neighbourhood 2 shows reductions in the median journey time (up to -12.5%; -14s for J6). There were a few routes with moderate increase, ranging from +1.2% (+1s, route J8 in AM peak) to +18.7% (+14s, route L4 in PM peak).

Majority of the roads outside Neighbourhood 2 had significant reductions in traffic flows, for instance, up to -31% (-278 vph) on Penge Road in the PM peak. As there were no considerable increase in journey time or traffic flows around Neighbourhood 2 during the temporary LTN was introduced, there is no evidence to suggest that the temporary scheme has caused displacement of traffic towards the area. Therefore, there is minimal evidence to establish a direct relationship between the temporary LTN and the increase of south-north traffic flows along Selby Road and Seymour Villas in the AM peak.

# 4

# CONCLUSIONS

# 4 CONCLUSIONS

PJA has conducted a study reviewing the Temporary Crystal Palace and South Norwood LTN. We have conducted a baseline analysis for the neighbourhood, and performed traffic analysis to review the effect of the temporary scheme.

## BASELINE ANALYSIS

The key findings on baseline conditions of the neighbourhood are listed below:

- The neighbourhood is located between two District Centres and surrounded by trip attractors.
- Trip attractors are linked together by LCN and Croydon cycle routes, within 10-minute cycle distance
- Two railway links were located at both the northern and southern ends. Over half of the area has a modest PTAL between 1-3.
- Areas with lower accessibility to public transport generally have a higher car ownership percentage
- Most pupils attending the local schools located in the neighbourhood live within 3.1km of their school. These distances would be considered comfortably cyclable and potentially walkable.
- Two collisions within the neighbourhood involved children walking over the last three years.
- A school street scheme has been introduced on Cypress Road since February 2020, not long before the first Lockdown in March.
- Most areas in and around the neighbourhood have PM10, PM2.5 and NO2 concentrations over the WHO limit.

## TRAFFIC EFFECTS

Through the process of Temporary Traffic Management Orders, LB Croydon installed six modal filters and a bus gate in the temporary LTN in four stages between May and August 2020.

Using the telematic data provided by The Floow, we have reviewed the traffic effects of the temporary LTN by comparing the through traffic levels, general traffic flows as well as journey time differences, before and during the temporary LTN was introduced.

### Estimated Through Traffic Levels

Before the temporary LTN was introduced, the Hamlet Road-Auckland Road-Lancaster Road route was a popular through traffic route, heavily used by 70-170 vph (vehicle per hour) through traffic in both directions. PM peak generally recorded more through traffic than the AM peak.

The temporary scheme successfully reduced the percentage and volume of through traffic across the LTN area. Through volume in AM peak reduced to less than or around 10 vph. PM peak saw slightly more through traffic left, with through volume generally reduced to below or around 20 vph on most roads.

Auckland Road section between Sylvan Hill and Cypress Road, being the only route connecting the northern and southern part of the temporary LTN, has shown a reduction of 80-120 vph in both peaks for the northbound, and 40-120 vph for the southbound.

### Estimated Traffic Flows and Journey Time Difference

The key findings on the change in estimated traffic and jounrey time are listed below:

#### Anerley Road

- General reduction in traffic flows in both peak periods.
- Minimal or no journey time increase on most associated routes.
- No clear relationship can be drawn between the journey time increase on southbound with the temporary LTN. The increase was detected in proximity to the junction with Croydon Road.

#### High street-Penge Road

- Predominant reduction in traffic flows in both peak periods.

- Average bus journey time for both directions show minimal effect from the temporary LTN.
- Some increase in journey time along this road link in both peak periods; result of traffic increase on High Street (west of the junction with South Norwood Hill).

### South Norwood Hill

- Traffic flow increase for northbound AM peak, while reduction on PM peak and southbound in both peaks.
- This traffic increase also contributed to a moderate increase of median journey time in AM peak.
- Potential traffic displacement from Auckland Road in the AM peak. A continuous pattern of traffic increase in northbound direction can be seen in the AM peak, which begins from the southern end of South Norwood Hill.
- This pattern then continues along Church Road-Westow Street, turns right onto Westow Hill and travels up towards Crystal Palace Parade.

### Church Road (Westow Street-Beulah Hill)

- Traffic flow increase for northbound AM peak, while reduction on PM peak and southbound in both peak periods.
- Serious increase in northbound median journey time in both peak periods.
- Potential traffic displacement from Auckland Road might have effect on journey time in the AM peak.
- Due to temporary signal arrangement on the southern section of Church Road overlapped almost exactly with the road closure/ temporary LTN measure, it is unclear how much of the journey time increase on Church Road could be attributed to the temporary LTN.

### Crystal Palace Triangle

- Median journey time for general traffic on almost all routes around the Triangle have recorded moderate to significant increase for both peak periods, with a more serious picture showing in the PM peak.
- Potential traffic displacement from Auckland Road might have effect on journey time around the Triangle in the AM peak.
- While the PM peak shows a serious increase in journey time around the Triangle, all three roads around it have shown reductions in traffic flows.
- Under the nature of one-way gyratory system, the temporary signal arrangements and the significant increase of traffic along Central Hill westbound have caused the gridlock in the PM peak.

### Neighbourhood 2

- Increase of south-north traffic flows along Selby Road and Seymour Villas in the AM peak.
- No considerable increase in journey time or traffic flows around Neighbourhood 2 during the temporary LTN was introduced.
- No evidence to suggest that the temporary scheme has caused displacement of traffic towards the area.

## RECOMMEDATIONS

Due to an anomaly for the through traffic data, which shows the roads between Hamlet Road, Auckland Road and Sylvan Hill still being heavily used by through traffic (despite an intact modal filter in place), we recommend LB Croydon to verify the actual situation along this section of roads using Automatic Traffic Counters (ATCs).

In addition, we suggest LB Croydon should consider monitoring the effects of the temporary LTN comprehensively, with ATCs after the traffic flows have returned normal.

We recommended LB Croydon to collaborate with LB Bromley, to coordinate change to the area. These include the installation of modal filters on Selby Road and Seymour Villa to stop through traffic passing through Neighbourhood 2, and the enhancement of cycle connection to Crystal Palace Park.

# APPENDIX

# APPENDIX: TRAFFIC COUNTS DURING SECOND LOCKDOWN

To supplement the traffic flow estimates generated with telematic data, LB Croydon has commissioned a series of traffic flow counts between 26 November and 2 December 2020. The plan showing the average weekday flow of vehicles, per day by direction, is presented overleaf.

The traffic counts were collected after all temporary LTN measures were introduced, but during the second Lockdown. Therefore, the flows are likely to be lower than periods with looser COVID restrictions, and should be taken as reference only. This data cannot be used for like-for-like comparison with telematic data.

Some key findings on the traffic counts are listed below:

- Auckland Road: The section north of Cypress Avenue only recorded circa 250 vehicles per day (vpd) on each direction. That is about 10 vpd divided by 24 hours (and 16 vpd if divided by 16 hours).
- Church Road: More flows were recorded on the southbound (9171 vpd) than the northbound (6253 vpd).
- Westow Street/Church Road junction:
  - 50-55% of traffic on Westow Street came from Church Road northbound
  - 40-45% of traffic on Westow Street came from Church Road southbound (mostly heading to Central Hill westbound)
- South Norwood Hill: About 30-40% of traffic in both direction were related to Whitehorse Lane. Only about 60-70% of traffic were recorded coming from or heading to the junction with High street and Portland Road.

In addition, 85th percentile speeds were also collected by direction on Church Road, South Norwood Hill and Croydon Road. All of which show 85th percentile speeds below the posted speed limit of 30mph.


Temporary Crystal Palace & South Norwood LTN

Remarks:
- vpd = average weekday daily vehicle flow (24-hour average)
- Speed shown in this plan are 85th percentile speeds over the 7-day data collection period

Traffic Count data collected between 26 November and 2 December 2020 (During 2nd lockdown)



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CLIENT

London Borough of Croydon

PROJECT

Crystal Palace & South Norwood LTN

TITLE

TRAFFIC COUNTS
26 NOV-2 DEC 2020
(AVERAGE WEEKDAY DAILY FLOW AND
85TH PERCENTILE SPEED)

| SCALE | DRAWN | REVIEWED | DATE |
|---|---|---|---|
| A3 @ 1:9,000 | JY | - | 17/12/2020 |

| FIGURE NUMBER | REVISION |
|---|---|
| 35 | - |

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