

# **Buses & Hospitals in the London Borough of Enfield**

December 2014  
Version 1.0

## 1 INTRODUCTION

- 1.1 London Borough (LB) Enfield is served by a network of 41 bus routes (day & night) plus 7 school-day only services. The Council and Enfield Transport Users Group (ETUG) undertook a review of bus services in the Borough and produced a report suggesting 29 changes to the network to address, inter alia, the following:
- Access to hospitals
  - Supporting the Borough's regeneration plans
- 1.2 TfL Buses have agreed with LB Enfield to consider how the current network contributes to these themes and, where appropriate, identify improvements.
- 1.3 This paper will discuss and address access to hospitals. In particular it seeks to identify whether there are geographic locations within Enfield without satisfactory access to hospitals and, if so, what might be done to improve access.
- 1.4 The methodology adopted and the outcomes of the analysis undertaken have been shared with Enfield officers at regular intervals as the paper has progressed. A summary of the key findings and option development was presented to Councillor Levy in November 2014 and to the Public Transport Consultative Forum in December 2014. Any significant schemes emerging from the paper will be subject to formal consultation.

## 2 BACKGROUND TO HOSPITALS IN ENFIELD

- 2.1 Enfield residents primarily seek hospital treatment from Chase Farm, North Middlesex and Barnet Hospitals. In December 2013 most A&E services together with in-patient maternity and paediatric services were relocated from Chase Farm Hospital to the Barnet and North Middlesex Hospital sites, resulting in the closure of the A&E department at Chase Farm. This long anticipated change has prompted concerns from the general public and their representatives regarding access to hospitals for Enfield residents.
- 2.2 As part of the re-organisation of medical services and in response to public concerns, the NHS North Central London Trust commissioned PBA to undertake a Transport Impact Assessment (TIA) of the changes. This was concluded in April 2013.
- 2.3 The TIA identified the following travel to hospital patterns for Enfield residents.

<b>Barnet Hospital</b>	<b>North Middlesex Hospital</b>	<b>Chase Farm Hospital</b>	<b>Total Hospital Attendances</b>
41,199 (12%)	71,321 (20%)	237,970 (68%)	350,490 (100%)

**Table 1:** Enfield Patient Attendances by Hospital for the year 2011/12  
(From Table 4.1 of NHS/PBA TIA)

- 2.4 It can be seen that Chase Farm Hospital is the main hospital for Enfield residents. The TIA then identified the number of patient attendances affected by the relocation of medical services to Barnet or North Middlesex Hospitals.

<b>Admitted Patient Care - Paediatrics</b>	<b>Admitted Patient Care - Maternity</b>	<b>A&amp;E</b>	<b>Total Affected Patient Attendances</b>	<b>Total Chase Farm Attendances</b>	<b>% Affected</b>
1,979	5,634	37,338	44,951	237,970	19%

**Table 2:** Estimated Enfield patients affected by changes to medical services at Chase Farm Hospital

(From table 4.2 of NHS/PBA TIA. Data is the year 2011/12 and is based on reason for patient attendance)

- 2.5 Despite the changes, Chase Farm was forecast to remain Enfield's main hospital. This is due to the majority of medical services remaining at Chase Farm. Even the medical services that have been re-organised are in some respects still available. For example, outpatient maternity services like antenatal classes remain available. This reduction in travel to Chase Farm might also be offset by the planned increase in availability of elective surgery.
- 2.6 The TIA then broke down each of these affected patient attendances by electoral ward to identify the trip origin. Using the electoral ward centroid the journey time to the nearest alternative hospital was calculated by public transport (using TfL Journey Planner) and by car.
- 2.7 The TIA concluded that, in terms of journey times, the impact of the hospital changes was relatively minor. However, it did identify the following wards as most adversely affected:
- Southbury (4,150 patient attendances per annum)
  - Enfield Highway (3,974 patient attendances per annum)
  - Enfield Lock (3,726 patient attendances per annum)
  - Chase (3,697 patient attendances per annum)
  - Town (3,515 patient attendances per annum)
- 2.8 These wards essentially represent the north of the Borough above the A110 Southbury / Enfield Road.

### **3 REPORT METHODOLOGY**

- 3.1 This paper seeks to further understand travel to hospital by Enfield residents. In particular it seeks to answer the following questions:

- Where do Enfield residents travel to and from to receive healthcare?
- To what extent does the coverage of the bus network match those travel patterns?
- How much do people use the bus to access each hospital and has this changed following hospital re-configuration?

- What does the origin and destination of hospital bus trips tell us about accessing healthcare by bus?
- What are the weaknesses in bus service provision to hospital and how might this be improved?

3.2 The following approach has been adopted to answer these questions:

- Briefly discuss access to GP surgeries and walk-in clinics using the existing bus network in line with greater provision of services at GP practices.
- Summarise direct bus service provision at each hospital in terms of frequency and hours of operation.
- Use the 2012 NHS study to map travel to each hospital by electoral ward in Enfield. This tells us volume of travel from each electoral ward by all modes.
- Overlay direct bus services onto the above maps to identify the geographical coverage of the bus routes and how they relate to hospital travel patterns.
- Identify a relevant location near the hospital from where interchange is likely to occur from direct bus services onto other routes. Routes serving that interchange are then overlaid onto the above maps to see a more complete picture of the bus network coverage in geographical terms and how it relates to hospital travel patterns.
- Review bus usage data on routes serving each hospital including comparing bus boarding data at hospitals prior to and post NHS restructure.
- Review travel patterns of those trips starting and ending at each hospital.
- Summarise the findings of the analysis and identify, with reference to the ETUG report, how access to hospital by bus might be improved.
- Evaluate relevant schemes to understand the cost and benefits in more detail.

3.3 The 2012 hospital attendance data used in the NHS TIA has been used to inform the scale of travel to hospital and Enfield residents' choice of hospital. This data is for an entire year and covers all modes. Since it is based on patient attendances, it will not include staff travel and those accompanying the patient. Ideally it would be useful to have the same data post the hospital changes. However TfL understand that the NHS team which led the study has been re-organised and no longer exist.

3.4 Ticket machine data has been used to identify travel trends on a route level basis. Then bus origin-destination survey data (BODS) has been used to identify how many passengers board and alight at each hospital and where they have travelled to/from. BODS is a one day survey of a route occurring every 5 years.

3.5 Since the BODS data for the routes relevant to this paper is prior to the hospital re-configuration, Oyster card data has been used to identify number of boarders at each hospital since the NHS re-configuration. One days worth of data has been used. The data relates to Oyster and other smart card tap-ins. This does not include those using paper tickets or Under 11s. Therefore the data has been factored up by 7% which is the network average of those under 11 using the bus.

#### 4 ACCESS TO GP & WALK-IN CLINICS

- 4.1 A key aspect of the 2012 Health and Social Care Act was greater provision of healthcare at a more local level e.g. at GP surgeries as opposed to hospital. This means more local trips being made.
- 4.2 Map 1 depicts the location of all registered GP surgeries and clinics within Enfield together with the bus network. It can be seen that all registered GPs and clinics are comprehensively served by the bus network.



**Map 1: Map of bus services and all NHS registered GPs in LB Enfield**

Source: NHS Enfield CCG website

## 5 CHASE FARM HOSPITAL

### *Direct bus service provision*

- 5.1 Table 3 provides information on the three routes directly serving Chase Farm Hospital. It can be seen that a good level of service is provided at all times and buses serve the hospital from early in the morning till late at night. Route W9 has slightly shorter hours of operation compared to other routes. However, TfL has not received complaints regarding this.

Route	Frequency in buses per hour (bph)				First / Last Buses	
	MF	Sat	Sun	Eves	First bus arriving	Last bus departing
313	3	3	3	2	05:42	01:02
W8	7.5	7.5	7.5	5	05:40	00:10
W9	4	4	2	2	06:48	23:20
<b>Total</b>	<b>14.5</b>	<b>14.5</b>	<b>12.5</b>	<b>9</b>		

**Table 3: Chase Farm Hospital Bus Service Provision**

### *Relationship between hospital attendance and bus services*

- 5.2 Using the 2012 data from the NHS TIA, the volume of trips to Chase Farm Hospital by electoral ward has been mapped (see map 2). This data covers travel by all modes. There is a strong correlation between distance and volume of trips with the majority of trips from wards local to the hospital (shown as red). This essentially equates to the north and centre of the borough with less trips from the south of the borough and the extreme west. Of particular note is the high level of usage from the North East of the borough.
- 5.3 The Winchmore Hill, Bush Hill Park and Ponders End areas represent the boundary where people start to attend North Middlesex Hospital instead.
- 5.4 Also depicted on the map are the bus routes directly serving the hospital (shown in black). Together, these routes provide a reasonably comprehensive coverage of the Borough. It is noticeable that these routes particularly serve the electoral wards coloured yellow, representing lower volumes of trips to hospital. However, it should be noted that these volumes of trips are still relatively higher than trips to other hospitals. Further, it should not be forgotten that the routes perform a variety of other (generally higher trip generating) functions such as serving local town centres and rail connections.
- 5.5 Of note is the lack of a direct link from the North East of the Borough to Chase Farm.
- 5.6 The majority of trips on the bus network are not hospital related. The bus network is most effectively provided when it serves corridors where a variety of trip purposes become concentrated. Inevitably this will create hubs (often town centres) from which interchange between bus routes (and other modes) can extend the journey offer while still remaining attractive to potential passengers. Through unified branding, passenger information, integrated ticketing, service planning and vastly improved service reliability, TfL has addressed many of the issues around interchanging allowing the bus service to perform as a *network*.

- 5.7 Enfield town centre is an obvious interchange location for Chase Farm as all three direct routes serve it. The map depicts bus routes emanating from Enfield town centre in blue – routes 121, 191, 192, 231, 307, 317, 329, 377 and W10. It can now be seen that most of the borough is within one change of bus from Chase Farm Hospital. Of course, in practise, locations such as Southbury Road and Edmonton will also be interchange locations.



**Map 2: Travel to Chase Farm Hospital by electoral ward & selected bus routes serving the hospital**

*TfL bus usage analysis*

- 5.8 Figure 1 shows recorded ridership since mid-2009 for the three routes serving Chase Farm Hospital. It can be seen that usage has increased on all days across the time

period although demand plateaued between 2011 and 2013. The data covers all trips and not just those related to the hospital and so changes in demand cannot be directly attributed to hospital travel. However, figure 1 provides no evidence of changes in medical services radically changing bus ridership on the route as a whole.

**Figure 1: Patronage on routes serving Chase Farm Hospital 2009 – 2014**

5.9 At a stop level, BODS data from 2011 suggests broadly 2,700 trips per day board or alight at the hospital on routes 313, W8 and W9.

5.10 To identify changes in demand following hospital re-configuration, recent Oyster boardings at stops A, B and C were compared with 2011 BODS boarding data. The results are in table 4.

Hospital	Route	Freq (bph)	Boarders (2011)	Boarders (2014)	Difference	%
Chase Farm	313	3	300	270	-30	-10%
	W8	7.5	1058	692	-366	-35%
	W9	4	183	190	7	4%
Sub Total			1541	1152	-389	-25%

**Table 4: Chase Farm Hospital bus boardings at stops A, B & C**

2011 Data: BODS    2014 Data: Oyster tap-ins



5.11 This data suggests there has been a 25% reduction in boarders, of which most have been on route W8. The change in hospital services seems a likely explanation for this reduction. If hospital changes are the reason then the scale of the change is in line with the 19% reduction in hospital attendance forecast by the NHS TIA.

*Hospital bus trip destinations*

5.12 Tables 5 - 7 show survey data between the stops closest to the hospital i.e. bus stops A (main entrance); B (The Ridgeway) (route 313 only) and stop C (Hunters Way) and groups of stops along the route.

Zone name	No. of stops	To-From	No. of trips to/from CFH	% of trips to/from CFH
Dame Alice Owen School	6	Dame Alice Owen School to Mutton Lane	9	2%
Potters Bar Station	6	Potters Bar Station to The Ridgeway, Holly Hill Farm	98	17%
The Ridgeway, Holly Hill Farm	4	The Ridgeway, Holly Hill Farm to Chase Farm Hospital	4	1%
<b>Chase Farm Hospital</b>	<b>3</b>	<b>Chase Farm Hospital (Bus stops A, B &amp; C) to The Ridgeway, Drapers Road</b>	<b>7</b>	<b>1%</b>
The Ridgeway, Drapers Road	3	The Ridgeway, Drapers Road to Windmill Hill/The Ridgeway	86	15%
Enfield Chase Station	2	Enfield Chase Station to Enfield, Cecil Road	80	14%
Enfield Church Street	2	Enfield Church Street to Enfield Town Station	76	13%
Southbury Road, Eaton Road	3	Southbury Road, Eaton Road to Southbury Road, Percival Road	40	7%
Southbury Road/ Great Cambridge Road	1	Southbury Road/Great Cambridge Road to Safeways, Southbury Road	11	2%
Southbury Road, Safeway	3	Southbury Road, Safeways to Southbury Road, Tesco's	32	5%
Southbury Road Tesco's	1	Southbury Road, Tesco's to Hertford Road/Nags Head	69	12%
Hertford Road/Nags Head Road	5	Nages Head Road to Lea Valley Road (LB Enfield/LB Waltham Forest boarder).	33	6%
LB Enfield/LB Waltham Forest Boarder	10	Lea Valley Road to LB Waltham Forest	43	7%
Weekday trips to/from CFH			588	100%
<b>Total weekday trips on route 313</b>			<b>4199</b>	<b>14%</b>

**Table 5: Origin & Destination of Route 313 trips related to Chase Farm Hospital**

Zone name	No. of stops	To-From	No. of trips to/from CFH	% of trips to/from CFH
<b>Chase Farm Hospital (CFH)</b>	<b>3</b>	<b>N/A (Bus stops A, B &amp; C)</b>	<b>0</b>	<b>0%</b>
Lavender Hill	3	Lavender Hill/Hunters Way to Blossom Lane	153	9%
The Hop Poles	3	Lancaster Road to The Hop Poles	301	17%
Baker Street	4	Baker Street to Enfield Police Station	61	3%
Enfield Town	3	Silver Street to Enfield, Cecil Road	496	28%
London Road/Church Street	14	London Road to Church Street/Edmonton Green Bus Station	297	17%
Edmonton Green Bus Station	2	Edmonton Green Station to Hertford Road/Monmouth Road	397	22%
Bounces Road	3	Hertford Road to Bounces Road	32	2%
Picketts Lock	6	Bounces Road to Picketts Lock	54	3%
Weekday trips to/from CFH			1791	100%
<b>Total weekday trips on route W8</b>			<b>14308</b>	<b>13%</b>

**Table 6: Origin & Destination of Route W8 trips related to Chase Farm Hospital**

Zone name	No. of stops	To-From	No. of trips to/from CFH	% of trips to/from CFH
<b>Chase Farm Hospital (CFH)</b>	<b>3</b>	<b>N/A (Bus stops A, B &amp; C)</b>	<b>0</b>	<b>0%</b>
Lavender Hill/Hunters Way	5	Lavender Hill/Hunters Way to Enfield Police Station	25	8%
Enfield Police Station	1	Enfield Police Station to Silver Street	6	2%
Enfield Town	3	Silver Street to Enfield, Cecil Road	125	39%
Enfield, Church Street	4	Church Street to Grange Park Station	9	3%
Grange Park Station	3	Grange Park Station to Worlds End Lane	12	4%
Worlds End Lane, Highlands	10	Worlds End Lane to Wades Hill/Winchmore Hill Green	21	7%
Winchmore Hill Stn	11	Winchmore Hill Green to Southgate, The Bourne	41	13%
Southgate Station	1	The Bourne to Southgate Station	78	25%
Total weekday trips to/from CFH			317	100%
<b>Total weekday trips on route W9</b>			<b>3033</b>	<b>10%</b>

**Table 7: Origin & Destination of Route W9 trips related to Chase Farm Hospital**

- 5.13 Of the 2,700 bus trips surveyed starting or ending at Chase Farm on a typical weekday, 98% are made by Enfield passengers.
- 5.14 As might be expected given the higher frequency, route W8 carries the most passengers although the correlation between usage and frequency does not apply to the 3 bph 313 and the 4 bph W9. Hospital travel represents between 10 and 14% of all trips on each route. However, as we have seen, usage to/from the hospital on route W8 (and 313) is likely to have decreased.
- 5.15 Most trips occur closest to the hospital. For example, the distance between Chase Farm and Enfield town centre represents 42% of hospital trips on route 313. The figures for W8 and W9 are 57% and 49% respectively.
- 5.16 There appears to be some evidence that passengers are willing to interchange. As well as the high numbers of trips from Enfield town centre, 22% of hospital trips on route W8 commence from the two stops at Edmonton Green and 25% of hospital trips on route W9 relate to the stops at Southgate Station.

## 6 NORTH MIDDLESEX HOSPITAL

### *Direct bus service provision*

- 6.1 North Middlesex Hospital is directly served by routes 318, 444 and 491 which are shown in black on map 3. In practise it is also served by routes 34, 102, 144 and W6 which are shown in red. These operate to the north of the North Circular Road and require passengers to reach the hospital via an underpass. Although not ideal, the nearest stops are within 400m of the hospital and the underpass is accessible and reasonably well used. Table 8 provides information on these routes.

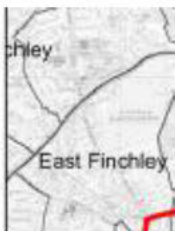
Route	Frequency in buses per hour (bph)				First / Last Buses	
	MF	Sat	Sun	Eves	First bus arriving	Last bus departing
318	4	4	3	2	06:55	00:23
444	4	4	3	3	05:04	00:51
491	4	4	2	2	06:55	23:55
<b>Sub-total</b>	<b>12</b>	<b>12</b>	<b>8</b>	<b>7</b>		
34	7.5	7.5	5	5	04:47	01:18
102	7.5	7.5	5	5	24 hour	24 hour
144	8	8	6	5	04:52	01:37
W6	6	6	4	3	05:56	23:44
<b>Grand Total</b>	<b>41</b>	<b>41</b>	<b>28</b>	<b>25</b>		

**Table 8: North Middlesex Hospital Bus Service Provision**

### *Relationship between hospital attendance and bus services*

- 6.2 Mapping the NHS TIA 2012 data as it applies to North Middlesex Hospital, it can be seen that the overall volume of trips are lower (see map 3). Again, there is a strong correlation between distance and volume of trips with the majority of trips from wards in the SE of the borough.
- 6.3 Wards like Winchmore Hill and Bush Hill Park might be considered to be bucking this trend, located as they are relatively close to the hospital but with lower volumes of trips to North Middlesex.
- 6.4 Routes 34, 102, 444 and W6 provide orbital links along the south of the borough boundary to the hospital. Route 491 provides north-south links through the eastern side of the borough. Together these routes provide very good links to the SE electoral wards and may partly explain the relatively high volume of trips. However, it can be seen that despite the direct service from the NE of the Borough to the hospital, the volume of hospital trips are relatively low with Chase Farm Hospital being the preferred hospital. This may be due to the longer distances from NE Enfield and the lower frequency of service on route 491 compared with other routes towards Chase Farm (via interchange at Enfield Town). However, the number of hospital trips may be increasing following the re-configuration.
- 6.5 Edmonton Green bus station represents a high quality location to interchange onto other bus routes. Shown in blue on map 3 are those routes serving Edmonton Green – routes 149, 191, 192, 259, 279, 349, and W8. It can be seen that most of the Eastern side of the borough is within one change of bus from North Middlesex Hospital.

- 6.6 It is the NW of the borough that is missing bus links to North Middlesex Hospital, although in practise bus interchange will occur at places other than Edmonton Green meaning access to the hospital is not as problematic as depicted in map 3. However the number of hospital trips from NW Enfield to North Middlesex Hospital is very low in number. This is primarily because most of NW Enfield sits within the catchment of Chase Farm and some within the catchment of Barnet Hospital which will be seen in section 7.



**Map 3: Travel to North Middlesex Hospital by electoral ward & selected bus routes serving the hospital**

*TfL bus usage analysis*

- 6.7 Figure 2 shows recorded ridership since mid-2009 for the 7 routes serving North Middlesex. It can be seen that usage has begun to increase on all days from around early 2012. Again, the data covers all trips and not just those related to the hospital and so changes in demand cannot be definitively attributed to hospital travel. However, figure 2 provides no evidence of changes in medical services (i.e. from December 2013) radically changing bus ridership.

**Figure 2: Patronage on routes serving North Middlesex Hospital 2009 – 2014**

- 6.8 At a stop level, BODS data prior to re-configuration, suggests broadly 6,500 trips per day board or alight at those stops nearest the hospital on routes listed in table 8. This is a higher total than the Chase Farm equivalent (2,700 trips). However, a good number of these trips will be people who are not Enfield residents. Also, due to the bus stops not all being within the hospital grounds, a number of these trips will be unrelated to the hospital.
- 6.9 To try and identify changes in demand following hospital re-configuration, recent Oyster boardings for 2014 were compared with BODS boarding data from 2011. Only the most direct routes were selected so as to reduce the influence of non-hospital trips. Route 318 was deselected because the frequency was increased between 2011 and 2014 which skews the results. Further, route 318 essentially serves LB Haringey as only 3 stops are within Enfield. The results are in table 9.

Hospital	Route	Freq (bph)	Boarders (2011)	Boarders (2014)	Difference	%
North Middlesex	491	4	504	702	198	39%
	444	4	430	441	11	3%
Sub Total			934	1143	209	22%

**Table 9: North Middlesex Hospital bus boardings at stops S, W & Z**

2011 Data: BODS 2014 Data: Oyster tap-ins

6.10 North Middlesex Hospital shows a 22% increase in boardings following the re-configuration when we consider the most direct services. The scale of the increase is similar to the scale of decrease at Chase Farm Hospital. However, drawing a firm conclusion is more problematic at this location due to the close proximity of other land uses (e.g. residential) to these stops and the influence of the other routes serving the hospital to the north of the North Circular Road.

*Hospital bus trip destinations*

6.11 Tables 10 - 12 show survey data between the stops closest to the hospital i.e. bus stops S and T (main entrance); and W (Bridport Road) and groups of stops along the route that are used by direct services.

Zone name	No. of stops	To-From	No. of trips to/from NMH	% of trips to/from NMH
<b>North Middlesex Hospital (NMH)</b>	<b>1</b>	<b>North Middlesex Hospital (Bus stops S &amp; T)</b>	<b>0</b>	<b>0%</b>
Bull Lane, Shaftsbury Road	2	Bull Lane to Queens Street, Middlesex University site	6	1%
LB Haringey	40	Queens Street to Stamford Hill	926	99%
Total weekday trips to/from NMH			932	100%
<b>Total weekday trips on route 318</b>			<b>4644</b>	<b>20%</b>

**Table 10: Origin & Destination of Route 318 trips related to North Middlesex Hospital**

Zone name	No. of stops	To-From	No. of trips to/from NMH	% of trips to/from NMH
LB Waltham Forest	16	Chingford Station to North Circular, Hall Lane	87	5%
North Circular, Hall Lane Retail Park	2	North Circular, Lea Valley Viaduct to Angel Road, Harbet Road	10	1%
Angel Road, Ravenside Retail Park	3	Angel Road, Ravensdale Retail Park to Edmonton Angel	72	4%
Angel Road/Fore Street	2	Angel Road/Fore Street to Silver Street, Gloucester Road	344	21%
Gloucester Road	2	Gloucester Road to Bridport Road, North Middlesex Hospital	35	2%
<b>North Middlesex Hospital</b>	<b>4</b>	<b>North Middlesex Hospital (Bus stops W &amp; Z)</b>	<b>45</b>	<b>3%</b>
LB Haringey boundary	9	Bridport Road, North Middlesex Hospital to Turnpike Lane Bus Station	1060	64%
Total weekday trips to/from NMH			1653	100%
<b>Total weekday trips on route 444</b>			<b>7402</b>	<b>22%</b>

**Table 11: Origin & Destination of Route 444 trips related to North Middlesex Hospital**

Zone name	No. of stops	To-From	No. of trips to/from NMH	% of trips to/from NMH
Borough of Broxbourne	1	Waltham Cross Bus Station to Waltham Cross, Hertford Road	13	1%
Waltham Cross, Hertford Road	2	Hertford Road to Ordanance Road Corner	1	0%
Enfield Island Village	4	Ordanance Road Corner to Enfield Island Village	24	2%
Ordanance Road, Enfield Lock	1	Ordanance Road to Newbury Avenue, Preston Gardens	9	1%
Newbury Avenue, Preston Gardens	4	Newbury Avenue, Preston Gardens to Brimsdown	18	2%
Mollison Avenue, Brimsdown Station	8	Brimsdwn Station to Nags Head Raod	17	1%
Ponders End/Hertford Road	2	Ponders End to Hertford Road/Clarence Road	65	5%
Hertford Road, Clarence Road	10	Hertford Road , Clarence Road to Hertford Road,Bury Street	113	10%
Hertford Road, Bounces Road	3	Hertford Road, Bounces Road to Hertford Road, Monmouth Road	40	3%
Edmonton Green Bus Station	2	Edmonton Green Bus Station to Lower Fore Street	325	27%
Fore Street, Plevna Road	3	Fore Street, Plevna Road to Fore Street/Angel Road	157	13%
Angel Road/Fore Street	4	Edmonton Angel to North Middlesex Hospital	406	34%
<b>North Middlesex Hospital (NMH)</b>	<b>2</b>	<b>North Middlesex Hospital (Bus stops S &amp; T)</b>	<b>1</b>	<b>0%</b>
Total weekday trips to/from NMH			1189	100%
<b>Total weekday trips on route 491</b>			<b>6313</b>	<b>19%</b>

**Table 12: Origin & Destination of Route 491 trips related to North Middlesex Hospital**

6.12 Tables 13 - 16 show survey data for those routes that serve the hospital to the north of the North Circular Road. It shows trips from those stops closest to the hospital i.e. bus stops M and N (Silver Street underpass) and groups of stops along the route.

Zone name	No. of stops	To-From	No. of trips to/from NMH	% of trips to/from NMH
LB Wal ham Forest	11	Walthamstow Central Station to North Circular, Hall Lane	134	21%
North Circular, Hall Lane Retail Park	2	North Circular, Lea Valley Viaduct to Angel Road, Harbet Road	9	1%
Angel Road, Ravenside Retail Park	3	Angel Road, Ravensdale Retail Park to Edmonton Angel	33	5%
Angel Road/Fore Street	3	Angel Road/Fore Street to Silver Street, Pymmes Park	178	28%
<b>Alight for North Middlesex Hospital (NMH)</b>	<b>1</b>	<b>Silver Street Subway (Bus Stops M &amp; N)</b>	<b>0</b>	<b>0%</b>
Silver Street, Lopen Road	2	Silver Street, Lopen Road to Great Cambridge Roundabout	37	6%
Silver Street, Great Cambridge Roundabout	1	Great Cambridge Roundabout to North Circular Road	48	7%
North Circular Road, Great Cambridge Roundabout	9	North Circular Road to Bowes Road,Amos Grove Sta ion	88	14%
Amos Grove Station	3	Amos Grove Station to Bowes Road, Ravenscraig Road	41	6%
Bowes Road, Ravenscraig Road	2	Bowes Road, Ravenscraig Road to Bowes Road, Betstyle Road	11	2%
LB Barnet	23	Betstyle Circus to Barnet Church	63	10%
Total weekday trips to/from NMH			642	100%
<b>Total weekday trips on route 34</b>			<b>22286</b>	<b>3%</b>

**Table 13: Origin & Destination of Route 34 trips related to North Middlesex Hospital**

Zone name	No. of stops	To-From	No. of trips to/from NMH	% of trips to/from NMH
Edmonton Green Bus Station	4	Edmonton Green Bus Station to Edmonton Police Station	172	33%
Upper Fore Street, Park Road	1	Upper Fore Street, Park Road to Edmonton Angel	39	7%
Fore Street/Angel Road	3	Fore Street/Angel Road to	98	19%
<b>Alight for North Middlesex Hospital (NMH)</b>	<b>1</b>	<b>Silver Street Subway (Bus Stops M &amp; N)</b>	<b>0</b>	<b>0%</b>
Silver Street, Lopen Road	2	Silver Street, Lopen Road to Great Cambridge Roundabout	21	4%
Silver Street, Great Cambridge Roundabout	2	Great Cambridge Roundabout to North Circular Road	56	11%
North Circular Road, Great Cambridge Roundabout	8	North Circular Road to Brownlow Road, Bounds Green Station	73	14%
LB Haringey & LB Barnet	46	Bounds Green Station to Brent Cross Bus Station	67	13%
Total weekday trips to/from NMH			526	100%
<b>Total weekday trips on route 102</b>			<b>23013</b>	<b>2%</b>

**Table 14: Origin & Destination of Route 102 trips related to North Middlesex Hospital**

Zone name	No. of stops	To-From	No. of trips to/from NMH	% of trips to/from NMH
LB Haringey	25	Muswell Hill to LB Haringey/Enfield boundary	411	40%
Great Cambridge Road, Emprie Avenue	2	Great Cambridge Road, Empire Avenue to Great Cambridge Road (south side)	11	1%
Great Cambridge Road (south side)	2	Great Cambridge Road (south side) to Silver Street, Windmill Road	35	3%
Silver Street, Windmill Road	2	Silver Street, Windmill Road to Silver Street Subway	37	4%
<b>Alight for North Middlesex Hospital (NMH)</b>	<b>1</b>	<b>Silver Street Subway (Bus Stops M &amp; N)</b>	<b>0</b>	<b>0%</b>
Silver Street Station	2	Silver Street Station to Edmonton Angel	166	16%
Angel Road/Fore Street	2	Edmonton Angel to Edmonton Police Station	78	8%
Upper Fore Street	3	Edmonton Police Station to Edmonton Green Bus Station	143	14%
Edmonton Green Bus Station	1	N/A	141	14%
Total weekday trips to/from NMH			1022	100%
<b>Total weekday trips on route 144</b>			<b>21852</b>	<b>5%</b>

**Table 15: Origin & Destination of Route 144 trips related to North Middlesex Hospital**

Zone name	No. of stops	To-From	No. of trips to/from NMH	% of trips to/from NMH
Southgate Station	1	Southgate Station to Southgate High Street	90	16%
High Street, Blagdons Lane	7	Southgate High Street to Palmers Green, Broomfield Park	50	9%
Palmers Green Station	1	Palmers Green Station to Palmers Green Tesco's	25	4%
Palmers Green Tesco's	3	Palmers Green Tesco's to Hedge Lane/Green Lanes	92	16%
Hedge Lane/Green Lanes	5	Hedge Lane to Great Cambridge Roundabout	41	7%
Hedge Lane, Great Cambridge Road	2	Great Cambridge Road/Silver Street to Silver Street, Windmill Road	27	5%
Silver Street, Windmill Road	1	Silver Street, Windmill Road to Silver Street, Lopens Road	6	1%
<b>Alight for North Middlesex Hospital</b>	<b>1</b>	<b>Silver Street, Lopens Road (Bus stops K &amp; J)</b>	<b>0</b>	<b>0%</b>
Haselbury Road, Silver Street	8	Silver Street, Lopens Road to Hase bury Road	182	33%
Edmonton Green Bus Station	1	Haselbury Road to Edmonton Green Bus Station	47	8%
Total weekday trips to/from NMH			560	100%
<b>Total weekday trips on route W6</b>			<b>6972</b>	<b>8%</b>

**Table 16: Origin & Destination of Route W6 trips related to North Middlesex Hospital**



- 6.13 In total 6,500 bus trips start or end at North Middlesex Hospital on a typical weekday prior to re-configuration. Of these, 2,750 (42%) start or end near the hospital (within walking distance) and 3,774 (58%) start or end at the hospital site. Given that all 'near services' are high frequency there is no correlation between the number of hospital trips and frequency of service with routes 444 and 491 providing the overall highest numbers. Furthermore, given the geographic location of the 'near stops' it is likely that a proportion of these trips will not be related to the hospital.
- 6.14 Approximately 3,750 of the 6,500 North Middlesex Hospital trips begin and end within LB Enfield demonstrating the importance of the hospital for other Boroughs.
- 6.15 Route 491 is the most popular route for LB Enfield passengers to get to and from North Middlesex Hospital, with 19% of trips directly related to hospital travel and 99% of passengers travelling within the borough. However many of these 491 hospital trips are quite short. For example, 75% are made between the hospital and Edmonton Green.
- 6.16 This pattern of short trips between the hospital and locations as far as Edmonton Green is repeated on other routes too with the equivalent figure for route W6 being 41%, 52% on route 144 and 59% on route 102. There are similarly high percentage of trips made between North Middlesex and Angel Lane / Fore Street on routes 34 and 444. This correlates with hospital attendance data recorded by the NHS.
- 6.17 The relatively high numbers of trips made from locations such as Edmonton Green suggest a willingness for passengers to interchange.

## 7 BARNET GENERAL HOSPITAL

### *Direct bus service provision*

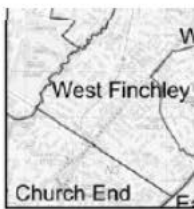
- 7.1 Barnet Hospital is directly served from the borough of Enfield by route 307 following the recent change to its terminus and route 384. Table 17 provides information on these routes.

Route	Frequency in buses per hour (bph)				First / Last Buses	
	MF	Sat	Sun	Eves	First bus arriving	Last bus departing
307	6	6	3	3	05:18	01:25
384	4	4	2	2	06:17	00:04
<b>Total</b>	<b>10</b>	<b>10</b>	<b>5</b>	<b>5</b>		

**Table 17: Barnet Hospital Bus Service Provision**

### *Relationship between hospital attendance and bus services*

- 7.2 Mapping the NHS TIA 2012 data as it applies to Barnet Hospital, it can be seen that the overall volume of trips are lower still than the other hospitals (see map 4). The correlation between distance and volume of trips continues with the majority of trips from Cockfosters and Southgate in the far west of the Borough (shown as tan). Minimal trips are from the south and east of the borough which is within the North Middlesex catchment.
- 7.3 Direct services link the populated part of Cockfosters and the hospital with route 307 continuing across Enfield providing connections to north-south tube and rail lines and key bus hubs such as Enfield town centre and Southbury.
- 7.4 Shown in blue on the map are routes 34, 121, 184, 299, 377 and 399. These provide interchange from Barnet town centre or the Oakwood area onto a direct hospital service. It can be seen that the 399 connects Hadley Wood to Barnet and much of the far south and far west of the Borough are within one change of bus from Barnet Hospital.



**Map 4: Travel to Barnet Hospital by electoral ward & selected bus routes serving the hospital**

*TfL bus usage analysis*

- 7.5 Figure 3 shows recorded ridership since mid-2009 for the 2 routes serving Barnet Hospital from Enfield. It can be seen that usage has begun to increase on all days from around autumn 2013. Again, the data covers all trips and not just those related to the hospital and so changes in demand cannot be attributed to hospital travel. It is probable that the increase in usage relates more to general changes in the economy than because of changes in medical services.

**Figure 3: Patronage on routes serving Barnet Hospital 2009 – 2014**

- 7.6 At the stop level, there were around 800 trips on a typical weekday starting or ending at stops near the hospital on routes 307 and 384 prior to re-configuration.
- 7.7 The BODS data relates to 2011 when only route 384 entered Barnet General Hospital grounds from LB Enfield. Route 307, which also served the hospital from Enfield, did so from Wood Street, around 300m away. In June 2012, the 307 was re-routed to terminate within the hospital.
- 7.8 Comparing 2011 BODS boarding data with 2014 Oyster boarding (table 18) shows a significant increase in weekday boardings at the hospital. However it is extremely difficult to attribute this to changes in hospital service re-configuration since it might be better explained by the impact of the 307 re-routeing.

Hospital	Route	Freq (bph)	Boarders (2011)	Boarders (2014)	Difference	%
Barnet General Hospital	307	6	300	747	447	149%
	384	4	158	129	-29	-18%
Sub Total			458	876	418	91%

**Table 18: Barnet General Hospital bus boardings**

*Hospital bus trip destinations*

- 7.9 Tables 19 and 20 show data between the stops closest to the hospital and groups of stops along the route. These are stops A & C for route 384 and stops L and D (on Wood Street) for route 307.

Zone name	No. of stops	To-From	No. of trips to/from BGH	% of trips to/from BGH
Brimsdown Station	1	Brimsdown Station to Green Street, Mayfield Road	2	0%
Green Street, Mayfield Rd	4	Mayfield Road to Hertford Road, Enfield College	10	2%
Hertford Road/Nags Head Road	1	Nags Head to Hertford Road/Southbury Road	0	0%
Southbury Road, Tesco's	3	Southbury Road, Tesco's to Southbury Road, Safeway	43	8%
Southbury Road, Safeway	2	Southbury Road, Safeway to Southbury Road, Bertram Road	5	1%
Southbury Road, Percival Road	3	Southbury Road, Percival Road to Southbury Road, Eaton Road	7	1%
Enfield Town	3	Enfield Town Station to Cecil Road	71	14%
Enfield Chase Station	1	Enfield Chase Station to Windmill Hill/The Ridgeway	9	2%
Windmill Hill/The Ridgeway	6	Windmill Hill/The Ridgeway to Bramley Road, South Lodge Drive	7	1%
Oakwood Station	1	Oakwood Station to Bramley Road, Peak Close	34	7%
Bramley Road, Peace Close	1	Bramley Road Peace Close to Bramley Road Chase Side	8	2%
Bramley Road, Chase Side	1	Bramley Road, Chase Side to Cat Hill, Heddon Court Avenue	7	1%
Cat Hill, Heddon Court Avenue	8	Cat Hill, Heddon Court Avenue to East Barnet Sainsbury's	59	11%
New Barnet Station, Station Road	3	New Barnet Station to Station Road Fire Station	28	5%
Barnet Odeon	1	Barnet Odeon, Great North Road to High Barnet Station	0	0%
Barnet Town Centre	8	High Barnet Station to Wood Street, Black Horse	228	44%
<b>Wood Street, Wellhouse Lane - alight for Barnet General Hospital (BGH)</b>	<b>1</b>	<b>Wood Street, Wellhouse Lane (Bus stops L &amp; D) to the Arkley Hotel</b>	<b>0</b>	<b>0%</b>
Arkley Hotel	1	N/A	4	1%
Total weekday trips to/from BGH			522	100%
<b>Total weekday trips on route 307</b>			<b>13285</b>	<b>4%</b>

**Table 19: Origin & Destination of Route 307 trips related to Barnet Hospital**

Zone name	No. of stops	To-From	No. of trips to/from BGH	% of trips to/from BGH
Quinta Drive, Aikten Road	5	Quinta Drive to Wellhouse Lane, Elmbank Avenue	36	13%
<b>Barnet General Hospital (BGH)</b>	<b>1</b>	<b>Barnet General Hospital (Bus stops A &amp; C)</b>	<b>0</b>	<b>0%</b>
Wood Street, Black Horse	8	Wood Street, Black Horse to Barnet Post Office	76	28%
Barnet Town Centre	5	High Barnet Station to Barnet Hill/Odeon	76	28%
Barnet Odeon	9	Barnet Odeon to York Road, Richmond Road	21	8%
New Barnet Station	1	New Barnet Station to Sainsbury's	12	4%
East Barnet Sainsbury's	18	East Barnet Sainsbury's to Mount Pleasant, Belmont Close	47	17%
Cockfosters Station	1	N/A	8	3%
Total weekday trips to/from BGH			276	100%
<b>Total weekday trips on route 384</b>			<b>2804</b>	<b>10%</b>

**Table 20: Origin & Destination of Route 384 trips related to Barnet Hospital**

7.10 Of the 800 bus trips that start or end at Barnet hospital on a typical weekday, around 210 trips are related to the borough of Enfield, although this will in part be due to the 384 only just serving Enfield borough.

7.11 Again the majority of trips occur closest to the hospital. There appears to be further evidence of willingness to interchange e.g. 14% of route 307 hospital trips relate to Enfield town centre and 7% to Oakwood station. There are also a high number of hospital trips related to Barnet town centre.

## 8 SUMMARY OF FINDINGS & ISSUES

*Where do Enfield residents travel to and from to receive healthcare?*

- 8.1 2012 NHS data tells us that Chase Farm was Enfield's main hospital followed by North Middlesex then Barnet. The NHS data strongly indicates that people travel to their nearest hospital. More specifically, North Middlesex Hospital attendance is most strongly concentrated in the SE of the borough and Barnet attendance most strongly concentrated in the west of the borough. Attendance at Chase Farm is from across the borough but most concentrated in the centre and NE of the borough.

*To what extent does the coverage of the bus network match those travel patterns?*

- 8.2 The bus network provides good quality links between each hospital and its main catchment area. These links are provided everyday of the week and from early in the morning until late at night. There is also excellent access to local GP surgeries by bus.

*How much do people use the bus to access each hospital and has this changed following hospital re-configuration?*

- 8.3 BODS data prior to re-configuration (largely from 2011) shows there to be around 2,700 trips to/from Chase Farm Hospital on a typical weekday. Almost all of these were within LB Enfield. The equivalent figure for North Middlesex Hospital is 3,750 trips per day and for Barnet, 200 trips per day. This typically represents 10% to 20% of all bus trips on those routes that directly serve hospitals although this will be influenced by the attributes of each route. Hospital trips can be as little as 3% of all trips on the route.
- 8.4 The NHS TIA predicted around 19% of hospital attendances would be affected by the re-configuration of services. This would still make Chase Farm Enfield's main hospital in terms of numbers of patient attendances. There is no data available for the actual change.
- 8.5 Measuring changes in bus demand at each hospital pre- and post re-configuration present a number of difficulties. On the face of it there appears to have been a reduction in numbers of bus boardings at Chase Farm that are in line with the NHS forecasts. It would appear that there has been a corresponding increase at North Middlesex Hospital. While Chase Farm remains Enfield's main hospital, it seems that the general trend has been one of decline while North Middlesex has seen an increase.

*What does the origin and destination of hospital bus trips tell us about accessing healthcare by bus?*

- 8.6 Bus trips in general tend to be short in length and this seems to apply with hospital trips by bus too. For example, a very large proportion of trips that board at North Middlesex Hospital have alighted no further than Edmonton Green. Of course, many of these trips will be just one stage of a longer journey. The number of trips which board or alight at key interchange locations suggests that passengers are willing to interchange to access hospital by public transport.

*What are the weaknesses in bus service provision to hospital and how might this be improved?*

8.7 Overall the bus network provides a good level of coverage to hospital and is commensurate with travel demand. However, relative weaknesses with regard to hospital access by bus have been identified, some of which correlate with aspirations in the ETUG report and NHS study. These are summarised as follows:

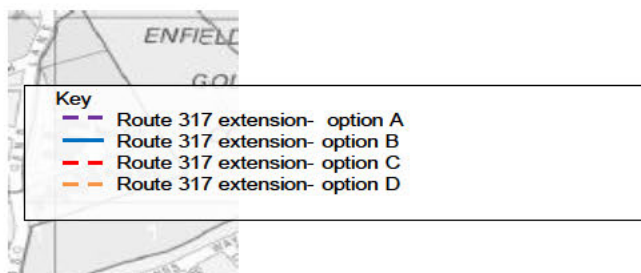
- No direct link from the NE of the Borough to Chase Farm Hospital
- Relatively low frequency of service to North Middlesex Hospital from Eastern Enfield
- Weak links from Winchmore Hill and Grange Park to North Middlesex Hospital

## 9 SERVICE PLANNING IDEAS

### *NE Enfield to Chase Farm Hospital*

9.1 **Extend 317 to Chase Farm.** Four different ways of extending the 317 from Enfield Town to Chase Farm Hospital were considered (see map 5):

- A. *Extend via Church Street, Windmill Hill and The Ridgeway (route 313 approach)*
- B. *Extend via Church Street, Chase Side and Lavender Hill (route 191 approach)*
- C. *Extend via Church Street, Silver Street, Lancaster Road and Lavender Hill (route W8 approach)*
- D. *Extend via Church Street, Silver Street and Holtwhite's Hill route W9 approach)*



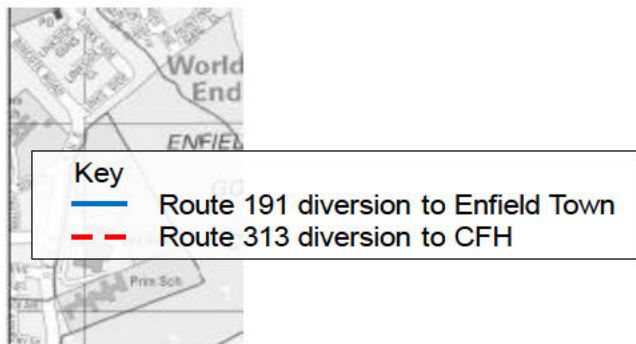
**Map 5: Route 317 extension including scheme options**

9.2 Each of option costs around £330,000 per annum as they all require an estimated one additional bus in service. To make this level of investment value for money around 570 additional passenger trips each weekday would need to be generated by the extension.



- 9.3 All four options duplicate existing services that run between Chase Farm and Enfield town centre and provide sufficient capacity to meet existing demand. This limits the passenger benefit that can be realised.
- 9.4 However running the 317 on top of these existing bus corridors would have the benefit of increasing the frequency by up to 3 bph. This enhanced service provision would generate some additional trips. *Option A* generates around 200 additional trips per day, *option B* generates 260 additional trips, *option C* generates 300 additional trips and *option D* generates 50 additional trips.
- 9.5 Each option will also create new direct links from the Great Cambridge Road area (north of Southbury) to locations between Enfield town centre and Chase Farm Hospital. Route 498 operates from Brentwood to Queens hospital at 3 bph via Colchester Road. This has been used as a proxy to estimate likely demand from the Great Cambridge Road area. Around 85 additional trips per day have been assumed to be generated. This is considered reasonable since the 317 serves the relatively lower density Great Cambridge Road corridor rather than the higher density Hertford Road corridor.
- 9.6 Option B also provides new 'round the corner links' from Chase Side into Lavender Hill / Chase Farm Hospital. Based on 'round the corner trips' on route W9 from Silver Street into Holtwhite's Hill, 110 new trips per weekday are estimated to be generated by this new link.
- 9.7 Re-development of part of the Chase Farm Hospital site is being considered. Around 750 new residential units are planned. An additional 750 bus trips per day have been assumed in connection with this development. However, the existing Chase Farm Hospital routes have sufficient capacity to meet this travel demand and only a small proportion of these new trips are likely to benefit from the specific links that the 317 extension would provide. An additional 20 trips from the new development have therefore been applied to the 317 scheme.
- 9.8 *Option B* generates the most benefit with an additional 475 trips per day estimated to be generated. However this is still less than the 570 required and does not meet the investment criteria. The main weakness of the scheme is that it does not serve the heart of NE Enfield either side of the Hertford Road corridor. However diverting the 317 onto the Hertford Road corridor would break too many existing trips and increase the overall cost of the scheme.
- 9.9 LB Enfield representatives recognised the issues preventing this scheme being good value for money and suggested diverting the 317 at Carterhatch Lane to serve Chase Farm Hospital and Enfield town centre as a possible way of enhancing the scheme. A routeing via Carterhatch Lane, Willow Road, Enfield town centre and onwards to Chase Farm via option B would be less expensive than serving the hospital first. Such a routeing does not address the key weakness in this scheme which is that Great Cambridge Road is not the residential heart of NE Enfield. It also introduces disbenefit to existing users by breaking 330 passenger trips per day or 12% of all trips on the 317. It would have the benefit of bringing a higher level of service to the relatively high density Willow Road area. However, much of this benefit is realised under the W10 scheme discussed below.

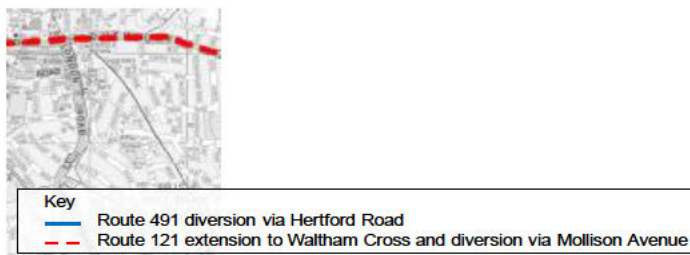
- 9.10 **Re-route the 191 to Enfield Town via Chase Farm.** Route 191 would be diverted at Lancaster Road via Lavender Hill, Chase Farm, The Ridgeway and Windmill Hill and back to line of route in Enfield town centre. Route 313 would be diverted via Chase Side and Lavender Hill to re-establish some of the direct links from Chase Side provided by the 191 (see map 6). Compared to the 317 scheme, it would provide a direct link to Chase Farm from more of NE Enfield but would have a higher cost requiring two additional buses at an estimated price of £547,000 per annum.
- 9.11 This scheme breaks 1,065 passenger trips per weekday as a consequence of the route changes (785 on route 191 and 280 on route 313). It would also increase journey times for through passengers on the 191 by up to 9 minutes in each direction. Around 1,800 passenger trips would be affected by this.
- 9.12 The new links created by the re-routing, including the direct link to the hospital, are estimated to generate an additional 360 trips per day. Since the beneficiaries are smaller in number than those who disbenefit the scheme was not taken any further.



**Map 6: Route 191 and 313 diversions**

*Relatively low frequency to North Middlesex Hospital from Eastern Enfield*

- 9.13 **Diverting routes 121 and 491** - Route 491 would be diverted via Hertford Road and route 121 extended to Waltham Cross and diverted via Newbury Avenue, Mollison Avenue and Nags Head Road to normal line of route. This creates a more direct service through the heart of eastern Enfield to North Middlesex while retaining links to Brimsdown and creating new links to Enfield Town. However, this also prevents around 1,045 passenger trips per day from the Enfield Lock, Island Village and Brimsdown areas from travelling south of Ponders End without interchanging. Due to the scale of the disruption no further analysis was undertaken.



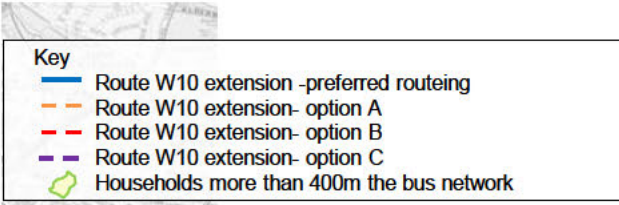
**Map 7: Route 121 and 491 diversions**

- 9.14 **Increase route 491 to 5 bph** – By making the route a high frequency service, this scheme would improve journey times and reduce interchange wait times from Edmonton Green Bus station to North Middlesex. Increasing the frequency in the peak periods only is estimated to cost £280,500 per annum and require three additional buses.
- 9.15 Testing the scheme shows that there is a current gap in the demand required to take the scheme forward with an estimated 800 trips per weekday being generated from the improved wait time. However, to justify the level of investment required around

1,000 trips per weekday would be required. The 491 serves the Upper Lea Valley growth area where significant increases in housing and employment are forecast. By working with LB Enfield and developers it may be possible to pump-prime a frequency improvement through the planning process as new development comes forward in anticipation of the new trips generated by the new development.

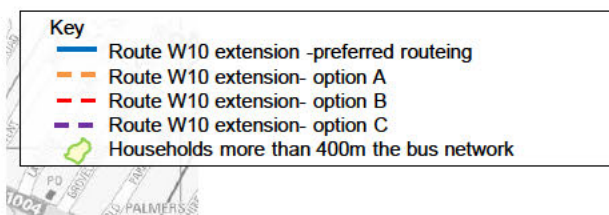
*Winchmore Hill / Bush Hill Park to North Middlesex*

- 9.16 **W10 enhanced to an all day Monday to Saturday service at 2 bph between Crews Hill and North Middlesex Hospital** – This would provide a direct service to North Middlesex Hospital for Winchmore Hill and Grange Park passengers. It would also strengthen links from the Carterhatch area into Enfield town centre, including for onward travel to Chase Farm Hospital. This is estimated to cost £738,000 per annum and require 4 additional buses.
- 9.17 The scheme has significant cost implications which could be offset slightly by the withdrawal of a school journey on route 377. This is because the W10 extension would provide the necessary capacity from Worlds End Lane to Enfield town centre.
- 9.18 The scheme assumes the current W10 routeing but with extended hours of operation. It would then be extended beyond Enfield town centre to North Middlesex Hospital via Slades Hill, Worlds End Lane, Eversley Park Road, Church Hill, Farm Road, Firs Lane, Cambridge Roundabout and Wilbury Way (see map 8).
- 9.19 One of the main benefits of the scheme would be the opportunity to bring an area of around 480 households in the Firs Lane area within 400m of the bus network. This is assumed to generate around 410 trips per day. Other benefits include an intensification of the existing service; new direct passenger links between various locations it passes through and a slight frequency increase on some corridors. From a healthcare perspective the scheme would provide a direct north-south routeing through the borough to North Middlesex Hospital. It would also improve links into Enfield town centre for onward connections to Chase Farm and Barnet hospitals. In total it is estimated that the new route could generate around 1,250 trips per day which is line with other half hourly services across London.
- 9.20 Delivering the scheme would have some practical difficulties. Stand space would need to be secured at both ends of the routes. Operating the route along Station Road and Firs Lane may require highway amendments and prove controversial with some local residents. Alternative routeings could be considered but it should be noted that this may reduce the likely benefits and could result in the scheme not meeting the usual cost benefit criterion. The alternative routeings are shown in map 9 and can be summarised as:
- A. Green Dragon Lane and Green Lanes rather than Church Hill.
  - B. Green Dragon Lane, Wades Hill and Station Road rather than Church Hill,
  - C. Green Lanes, Barrowell Green and Firs Lane rather than the entire length of Firs Lane.



**Map 8: Enhanced W10 Option**





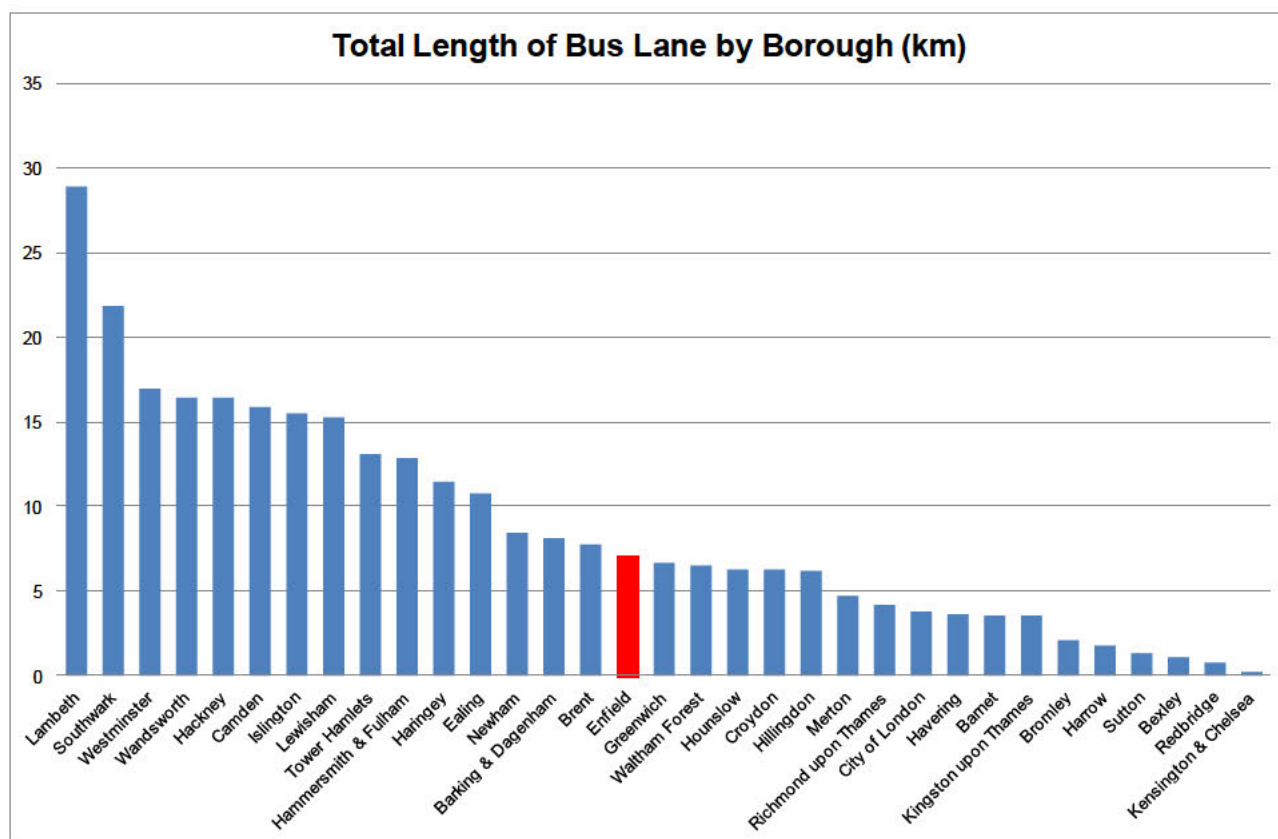
**Map 9: W10 Routing Options through Winchmore Hill & the Firs Lane Network Hole**

- 9.21 **318 extension to Hedge Lane / Green Lanes Junction via Firs Lane at current frequencies** – Previous attempts to better link the Winchmore Hill area with North Middlesex Hospital have focussed on extending the 318 through the Firs Lane area. The most recent scheme considered, envisaged an extension via Silver Street, Firs Lane and either Farm Road or Barrowell Green. Due to lack of stand space at Green Lanes, Station Road the scheme assumed terminating the route at Green Lanes / Hedge Lane junction.
- 9.22 Both route options required two additional buses and cost £410,000 - £420,000. The routing via Farm Road generated the most benefit as it entirely closed the Firs Lane network hole.
- 9.23 Concerns over the scheme are the ability to serve the main amenities at Winchmore Hill (e.g. the shops), especially if routed via Barrowell Green. Another concern is that it makes the route 50% longer making it more difficult to operate. Currently route 318 has relatively high lost mileage. This creates the risk of the extension requiring a third bus which would make the scheme not worthwhile.

## 10 INFRASTRUCTURE

### *Bus Priority*

- 10.1 Providing bus priority protects bus passengers from traffic congestion resulting in improved wait times at bus stops and potentially improving on-bus journey times. Quicker journey times will reduce the barrier to healthcare. Figure 4 shows the amount of bus lanes in the Borough.



**Figure 4: Bus lane provision in LB Enfield compared to London**

### *Bus Stop Accessibility*

- 10.2 Improvements to vehicle design have removed a significant barrier to using the bus by those with mobility issues. However, the benefits of the ramp and low floor access are only realised if the bus can get to the kerb. Currently 78% of bus stops within Enfield are accessible, which is the same as the London average. Progressing the Bus Stop Accessibility Programme to achieve the target of 95% of stops to be accessible by 2016 would further reduce barriers.

### *Bus Infrastructure*

- 10.3 Changes to the bus network can result in the need for additional bus standing space. A number of stands relevant to this study are at capacity including those at Chase Farm Hospital, North Middlesex Hospital, Barnet Hospital, Little Park Gardens and Waltham Cross. Additional stand space will be necessary to introduce schemes such as the extension of route W10. Furthermore, there have been complaints in the past from Chase Farm Hospital regarding current bus stopping and standing arrangements and concerns over their impact on blue light services.

## 11 SUMMARY & CONCLUSIONS

- 11.1 Data from the NHS demonstrates that patients generally access their nearest hospital. Chase Farm Hospital was therefore Enfield's main hospital prior to the re-configuration of medical services and the indications are that this remains the case. However, the change in medical services has resulted in some patients accessing North Middlesex and Barnet Hospitals instead. Analysis of bus boarding data at Chase Farm hospital suggests that the scale of reduction in patient trips is in line with the predictions made in the NHS TIA. In terms of bus passengers, the indications are that North Middlesex will be the main alternative for Enfield patients in those cases where treatment cannot be obtained from Chase Farm Hospital or local health care facilities like GP surgeries.
- 11.2 The Enfield bus network provides comprehensive coverage to local health facilities and very good connections to all three hospitals. The data suggests that passengers are willing to interchange to access hospital where no direct bus is available.
- 11.3 A number of options of have been identified to address areas where the bus network might be improved further. Many of these are presently not worth pursuing either because this disrupts too many existing passenger journeys or because the benefits to passengers generated by the scheme are insufficient to justify the increased year-on-year operating costs.
- 11.4 However two schemes are considered worth looking at in more detail in conjunction with relevant delivery partners. The first is the extension of route W10 from Enfield town centre to North Middlesex Hospital together with an extension of the hours of operation. As well as more work on the business case, it would require highway interventions, local support and increased standing provision.
- 11.5 The second is the conversion of route 491 from a low frequency (4 bph) route to a high frequency (5 bph) route. At present this scheme is not worthwhile but this is anticipated to change if predicted new housing and employment opportunities come forward. By working with LB Enfield through the planning process it may be possible to seek developer funding to pump-prime a frequency increase.
- 11.6 Enhancing bus infrastructure such as making bus stops accessible and protecting buses from traffic congestion can also reduce the barriers to accessing healthcare by bus.



## APPENDICES

### I. TABLE OF TESTED SERVICE CHANGES

#### *Estimated costs*

Route	Scheme	Cost £pa	Revenue £pa	Passenger Benefits £pa	Net Cost £pa	Benefit to Net Cost Ratio X:1	Mileage	PVR
317	Extend to CFH ( <i>option B</i> )	£330,014	£84,445	£380,003	£245,569	1.5	66,512	1
191	Re-route to Enfield Town via CFH	£547,087	£91,180	£410,310	£455,907	0.9	120,120	2
491	Freq increase 5 bph MF peaks	£280,431	£56,377	£294,620	£224,054	1.3	27,844	3
W10	Extend to NMH at 2 bph Mon-Sat	£738,148	£216,191	£972,860	£461,957	2.1	156,424	4
377	Withdraw afternoon SDO jny towards Ponders End	(£60,000)					(1,525)	(1)
W10 & 377	<b>W10 scheme total</b>	<b>£678,148</b>	<b>£216,191</b>	<b>£972,860</b>	<b>£461,957</b>	2.1	<b>154,899</b>	<b>3</b>
318	Extend to Green Lanes	£504,760	£124,500	£567,288	£380,260	1.5	152,685	3

#### Notes

- (1) Route 491 evaluation is based on 2011 data. The route has seen an increase in usage since then of circa 15%. Crudely applying this increase to the evaluation would increase the BCR to 1.6 to 1.
- (2) The W10 or 318 schemes incorporate some of the same passenger benefits meaning that it would not be appropriate to pursue both schemes.
- (3) 318 scheme assumes a third bus to maintain reliability.

## II. Enfield Transport Users Group (ETUG) Response

ETUG sought to identify how the Enfield bus network might be amended to increase links to hospitals, regeneration areas and schools while mindful of the need to minimise the increase to bus operating costs. A comprehensive restructuring of the current Enfield bus network was suggested.

The ideas suggested relating to hospitals are summarised below and depicted on the attached map with feedback provided after.

- **Restructuring of routes 231, 307, 313, 318, 329, 377, 388, 389, 491, W4, W8 and W9**

### *ETUG Suggestion*

The changes related to these routes represent ETUGs ideas for increasing access to hospitals. They sit within a wider set of service changes related to other objectives. Consequently areas left unserved by the restructuring are typically replaced by another service change not summarised here. Although this ensures a bus service, it does not guarantee that existing direct journey opportunities are retained.

Route 313 would be diverted at Ponders End so as to operate through the Bush Hill Park area. It would also be re-routed between Enfield Town and Chase Farm Hospital via Chase Side and Holtwhite's Hill. This would enable the 377 to be re-structured. The western terminus would be extended from Oakwood to Barnet Hospital. This would enable the 307 frequency to be reduced. At its eastern end, route 377 would be diverted away from the Bush Hill Park area. From Highlands Village it would be diverted via the W9 routing to Chase Farm Hospital.

Route W8 would no longer operate between Edmonton Green and Picketts Lock and instead be extended to Tottenham Hale. In order to accommodate this extension route W8 would be curtailed at Enfield Town at its northern end and replaced between Enfield Town and Chase Farm hospital by extending route 329.

Route 318 would be extended from North Middlesex Hospital to Chase Farm via Firs Lane, Winchmore Hill, Highlands Village, Slades Hill and The Ridgeway

Route W9 would be withdrawn in its entirety, in part due to the changes to routes 318, 377 (and also route W10 in the Southgate area).

The scheme suggests splitting route 491 into two separate routes: Waltham Cross to Enfield Island Village and Enfield Chase to North Middlesex Hospital. (The resulting gap in the Mollison Avenue area is partly filled by associated changes to the 121 and 327).

Route 231 would be restructured. It currently operates Turnpike Lane to Enfield Chase Station via Great Cambridge Road. It would be withdrawn between Great Cambridge

Junction and Turnpike Lane and diverted to North Middlesex Hospital. It would also be extended from Enfield Chase via the Ridgeway, Chase Farm Hospital, Lavender Hill, Carterhatch Lane, Great Cambridge Road and Bullsmoor Lane to Waltham Cross. (Related to this change is an idea to withdraw route 317 in its entirety and increase the frequency of route 217).

Route W4 would be extended from its current terminus on Oakthorpe Park into North Middlesex Hospital.

Routes 389 and 399 would be combined into one route. From Barnet town centre it would proceed to Hadley Wood along the 399 alignment then extended to Cockfosters and then onto Southgate via the 299 routeing. (There would be associated changes to the 298 and 299).

### *Response*

The ETUG changes achieve an increase in service provision at each Hospital. Chase Farm, currently served by 3 routes providing 15 bph, would be served by 5 routes providing 23 bph. North Middlesex Hospital would be served by 9 routes providing 51 bph compared to 7 routes providing 41 bph as now. Barnet Hospital increases from 2 routes providing 10 bph to 3 routes providing 11 bph. They also provide a number of hospital to hospital links e.g. North Middlesex to Chase Farm.

However analysis of bus travel demand at each hospital shows that current service provision is more than sufficient to meet demand. Indeed demand is falling at Chase Farm hospital which would make it difficult to justify the additional 8 bph proposed. Also, it is not clear why many people wish to travel between hospital sites. Patients typically have appointments at one specific hospital and hospital staff increasingly work at one location only.

The ETUG suggestions increase the number of different bus routes serving each hospital which in turn increase the number of locations with direct links to a hospital. For example, the proposals pretty much provide direct links from each compass point within a 3km radius around Chase Farm Hospital. With the exception of the 329, these are low frequency routes. Some of these routeings (e.g. the 318 and 231) prioritise links to the hospital as opposed to the town centre. Analysis of bus demand and travel patterns shows that town centre trips are higher in volume than hospital trips. By prioritising hospital trips, the schemes inherently build in a lot of disbenefit to most passengers. The current approach of focusing service on Enfield town centre for onward interchange to the hospital (where a direct bus service is not provided) provides greater levels of passenger benefit overall as well as a more efficient network.

The TfL analysis of hospital and bus travel patterns identified three key issues.

First is the lack of a direct link from NE Enfield to Chase Farm Hospital. TfL options which sought to address this did not generate sufficient benefit to justify the additional costs. A key issue was the difficulty in identifying marginal cost options that served the Hertford Road corridor in NE Enfield. The ETUG proposal, namely the restructuring of the 231,

experiences the same problem of serving the Great Cambridge Road corridor rather than the Hertford Road corridor. This results in the same difficulty in justifying the scheme as the TfL option to extend route 317 to the hospital - either by Southbury Road or Carterhatch Lane.

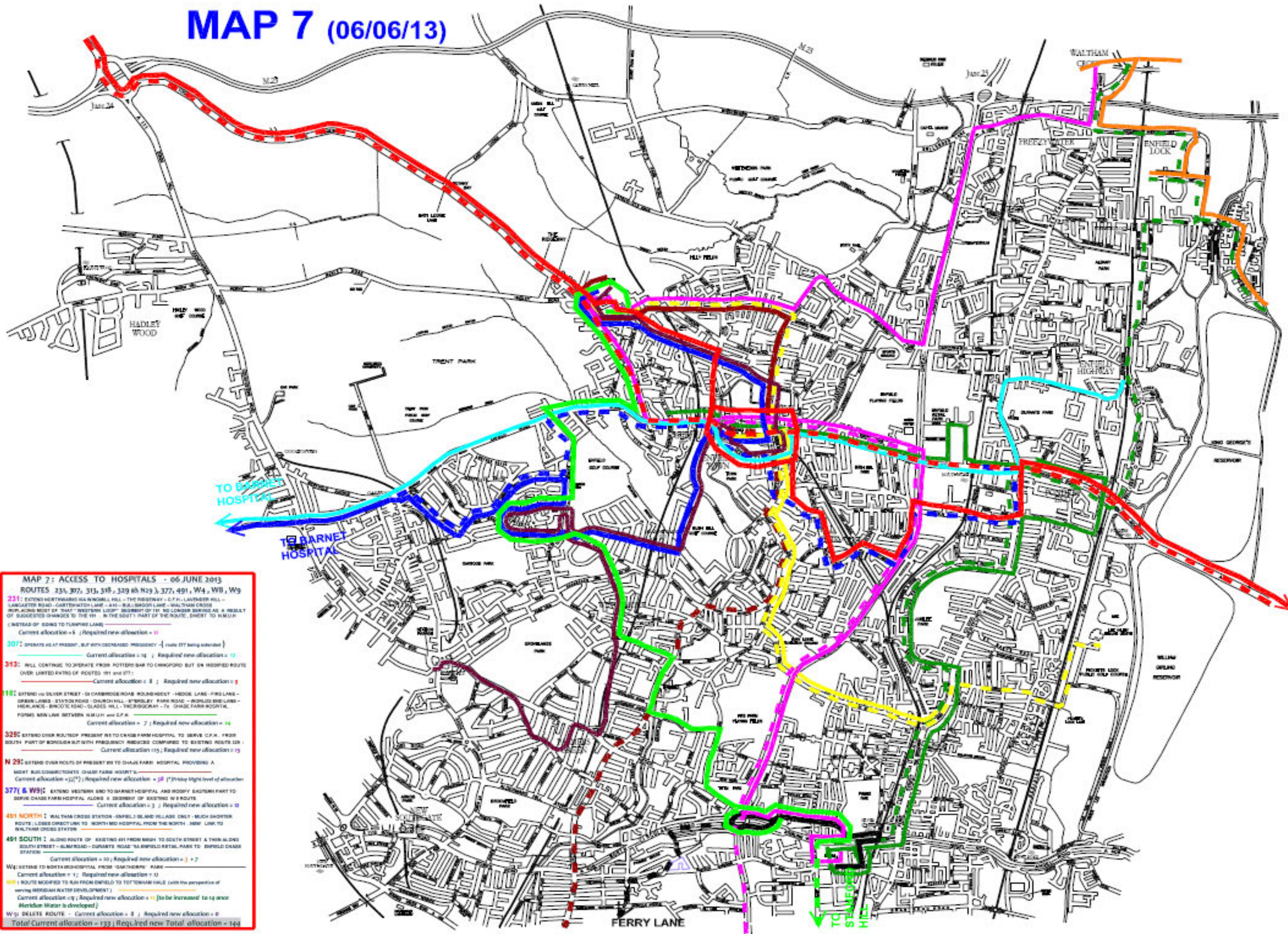
The second issue was the relatively low frequency of direct service from Eastern Enfield to North Middlesex Hospital. Through the restructuring of the 491, the ETUG proposals remove all direct links to North Middlesex Hospital to NE Enfield.

The third issue was lack of a direct link from the Winchmore Hill area to North Middlesex Hospital. The ETUG proposals address this through the extension of the 318 to Chase Farm Hospital. However this would significantly increase the length of the bus route from around 12 miles (return) to 21 miles (return). This would make the route much harder to operate reliably. The TfL W10 option has many of the elements of the ETUG 318 proposal, such as linking Winchmore Hill and Firs Lane to North Middlesex Hospital, albeit at lower frequencies.

As described above, the ETUG proposals are to a large extent interdependent. One service change requires a further service change either to reduce the number of broken trips or prevent locations being unserved by a bus route. This results in a virtual re-casting of the entire Enfield bus network. Since for many people their home, place of work, school or choice of amenity is relatively fixed, most journey patterns are well established. Introducing the scale of change suggested by the ETUG proposals are likely to prove highly controversial and therefore difficult to implement. The removal of direct links from NE Enfield to North Middlesex Hospital and from Edmonton Green to Chase Farm hospital are two examples of how the schemes would be controversial. However, there would be many more examples, often not related to healthcare.



# MAP 7 (06/06/13)



**MAP 7: ACCESS TO HOSPITALS - 06 JUNE 2013**  
**ROUTES 231, 307, 313, 318, 329 (N29), 377, 491, W4, W8, W9**

**231:** EXTEND NORTHWARDS VIA WINDMILL HILL - THE ROBINWAY - C.P.H. - LAVENDER HILL - LANGSTON ROAD - GARTHWATER LANE - 410 - BILBROOK LANE - WALTHAM CROSS REPLACING MOST OF "HAY" "WESTERN LOOP" SEGMENT OF 191. NO LONDON SERVICES AS A RESULT OF SUGGESTED CHANGES TO THE 191 IN THE SOUTH PART OF THE ROUTE. SHORT TO HANLUK (INSTEAD OF GOING TO TURNPIKE LANE)  
 Current allocation = 6 | Required new allocation = 11

**307:** OPERATE AS AT PRESENT, BUT WITH DECREASED FREQUENCY (ONLY 277 being retained)  
 Current allocation = 14 | Required new allocation = 12

**313:** WILL CONTINUE TO OPERATE FROM POTTERS BAR TO CHINGFORD BUT ON PROPOSED ROUTE OVER LIMITED PARTS OF ROUTES 391 AND 377  
 Current allocation = 8 | Required new allocation = 3

**118:** EXTEND VIA SILVER STREET - 50 CARBRIDGE ROAD - ROUNDABOUT - HEDGE LANE - FRO LANE - GREEN LANE - STATION ROAD - CHURCH HILL - SPINLEY PARK ROAD - ROPLES BRIDGE LANE - HEDGECROFT - BRIDGECROFT ROAD - SLADES HILL - THE BRIDGEWAY - TO CHASE FARM HOSPITAL. FORMS NEW LINK BETWEEN WALTHAM CROSS AND C.P.H.  
 Current allocation = 7 | Required new allocation = 14

**329:** EXTEND OVER ROUTES OF PRESENT 191 TO CHASE FARM HOSPITAL TO SERVE C.P.H. FROM SOUTH PART OF BORDEN BUT WITH FREQUENCY REDUCED COMPARED TO EXISTING ROUTE 329  
 Current allocation 15 | Required new allocation = 15

**N 291:** EXTEND OVER ROUTES OF PRESENT 191 TO CHASE FARM HOSPITAL PROVIDING A NIGHT BUS CONNECTION TO CHASE FARM HOSPITAL  
 Current allocation = 10 (\*) | Required new allocation = 18 (\*) (Friday night level of allocation)

**377 & W9:** EXTEND WESTWARDS TO BARNET HOSPITAL AND BODDY KIDDERLEY PART TO SERVE CHASE FARM HOSPITAL ALONG A SEGMENT OF EXISTING W9 ROUTE  
 Current allocation = 3 | Required new allocation = 10

**491 NORTH:** WALTHAM CROSS STATION - ENFIELD ISLAND HILLS - ONLY - MUCH SHORTER ROUTE. LONES DIRECT LINK TO NORTH MED HOSPITAL FROM THE NORTH. NEW LINK TO WALTHAM CROSS STATION  
 Current allocation = 10 | Required new allocation = 3 + 7

**491 SOUTH:** ALONG ROUTE OF EXISTING 491 FROM HIGH TO SOUTH STREET & THEN ALONG SOUTH STREET - ALM ROAD - DURANTS ROAD - 5A ENFIELD RETAIL PARK TO ENFIELD CHASE STATION  
 Current allocation = 11 | Required new allocation = 3 + 7

**W4:** EXTEND TO NORTH MED HOSPITAL FROM "GARTHWATER" PARK  
 Current allocation = 11 | Required new allocation = 12

**W8:** ROUTE MODIFIED TO RUN FROM ENFIELD TO TOTTERHAM HALL (with the perspective of serving BERKHAM WATER DEVELOPMENT)  
 Current allocation = 10 | Required new allocation = 11 (to be increased to 12 once Berkham Water is developed)

**W9:** DELETE ROUTE - Current allocation = 8 | Required new allocation = 0

**Total Current allocation = 133 | Required new Total allocation = 144**

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- EXISTING ROUTE 231
- PROPOSED ROUTE 231 EXTENSION/DIVERSION
- EXISTING ROUTE 307 (DECREASED FREQUENCY)
- EXISTING ROUTE 313
- PROPOSED NEW ROUTE 313
- EXISTING ROUTE 318
- PROPOSED ROUTE 318 EXTENSION
- EXISTING ROUTE 329(N29)
- PROPOSED ROUTE 329(N29)EXTENSION
- EXISTING ROUTE 377
- PROPOSED ROUTE 377 (&W9)
- EXISTING ROUTE 491
- PROPOSED ROUTE 491 NORTH
- PROPOSED ROUTE 491 SOUTH
- EXISTING ROUTE W4
- PROPOSED ROUTE W4 EXTENSION
- EXISTING ROUTE W8
- PROPOSED ROUTE W8
- ROUTE W9 DELETED

Bus Services	Review Date	Line
ETUG SUBMISSIONS	Job Title	Line 3
MAP 7 - 1		
ENFIELD Council		
No. 1000 - 10000 (Inches) 1:25,000 (1:63,000) 1:50,000 (1:126,000) 1:100,000 (1:252,000)		
Date	Time	Sheet
05/03/13	TS	
NTS	ES2071	Plan No. AD
Daily No. LBE-TE/1764/7/1		