# EXHIBIT LIST

Reference No: HOL/10018
Petitioner: EUSTON STANDARD PACK
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# Interaction between the London stations at Old Oak Common and Euston

P2241 (1)

HOL/10018/0002

# Old Oak Common London terminus station

- Petitioner's proposal of Old Oak Common as London terminus station for HS2 falls outside Select Committee instruction
- Second Reading establishes principle of Euston as London terminus station for HS2

A

**B I L L**

TO

Make provision for a railway between Euston in London and a junction with the West Coast Main Line at Handsacre in Staffordshire, with a spur from Old Oak Common in the London Borough of Hammersmith and Fulham to a junction with the Channel Tunnel Rail Link at York Way in the London Borough of Islington and a spur from Water Orton in Warwickshire to Curzon Street in Birmingham; and for connected purposes.

BE IT ENACTED by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

# Selection process – summary

- Both Euston and Old Oak Common were appraised as potential locations for London terminus station
- HS2 Ltd recommended Euston as preferred location for London terminus station in 2009 report to Government
- In March 2010, Government supported Hs2 Ltd recommendation as basis for public consultation
- National public consultation during 2011
- January 2012, Government confirmed selection of Euston as London terminus station for Hs2
- March 2013, High Court rejected legal challenge to Government decision
- November 2013, High Speed Rail  Phase One Bill presented to Parliament

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# London terminus station selection process

## Key stages

- High Speed Rail - London to the West Midlands and Beyond (Hs2 Ltd, December 2009)
- High Speed Rail Command Paper (DfT, March 2010)
- High Speed Rail: investing in Britain's future – public consultation (DfT, 2011)
- High Speed Rail: investing in Britain's future – decisions and next steps (DfT, 2012)
- Volume 1 - Introduction to the Environmental Statement and the Proposed Scheme | Strategic and route-wide alternatives – Alternatives Report (2013)

# Sift process for London terminus station (2009)

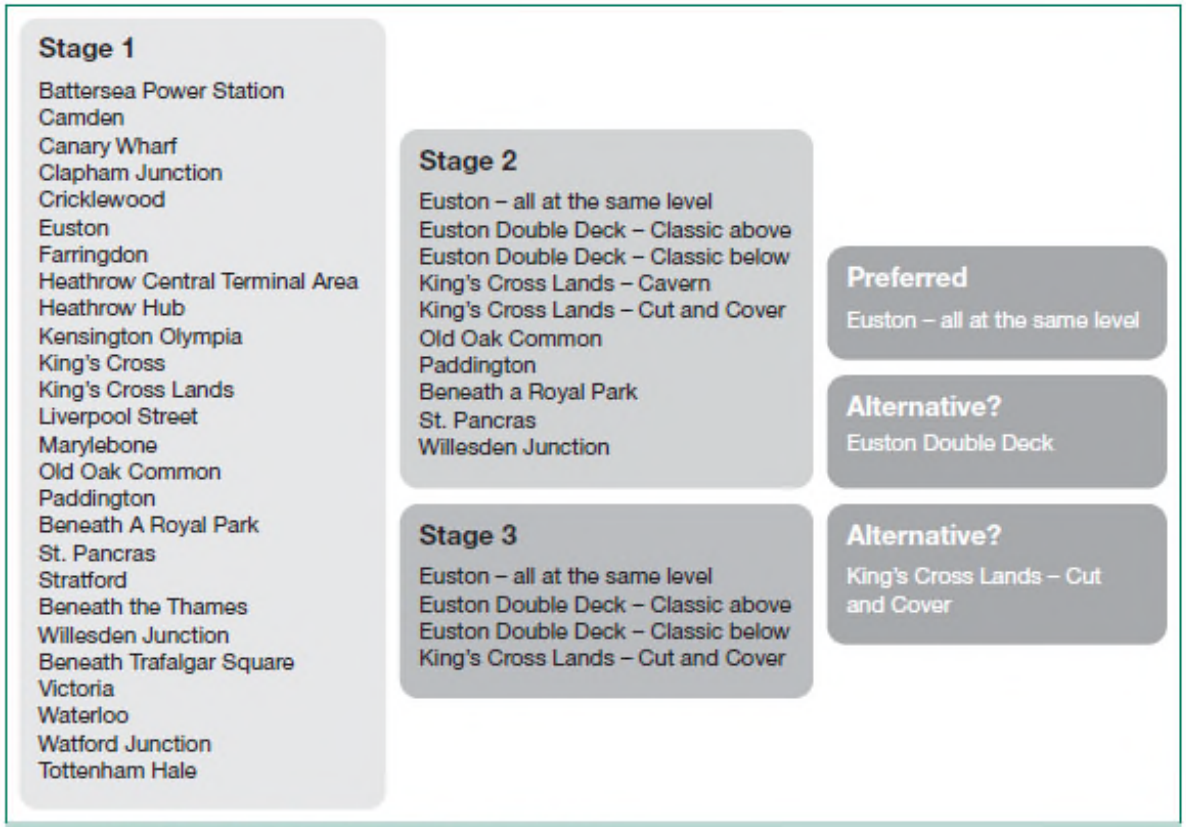


Figure B1 – **London Terminus sifting process**



P2241 (5)

# London terminus station recommendation (2009)

- Majority of rail passengers from London to Birmingham start their journey from inner London

- Euston has good existing connectivity; Victoria Line, two Northern Line branches, Metropolitan, Hammersmith & City and Circle lines at Euston Square, and close proximity to services at St Pancras including Eurostar



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# Rejection of Old Oak Common as London terminus station (2009)

- Demand analysis showed journey time penalty for central London passengers using Old Oak Common as London terminus station would severely reduce the benefits of HS2

- Bulk of demand for HS2 would come from central, north and south London - best served by a central London terminus station

# High Speed Rail Command Paper (DfT, 2010)

- A central London terminus for High Speed Two is essential
- A single-level station at Euston identified as the most promising option
- Significant redevelopment potential at Euston
- Clear and appropriate proposals needed to address local environmental impacts
- Government accepted recommendation for Euston as London terminus station for HS2 as basis for public consultation

# High Speed Rail Command Paper (DfT, 2010)

- Interchange at Old Oak Common would make a major contribution as catalyst for the regeneration of surrounding area
- Interchange station at Old Oak Common would provide good, fast and convenient onward rail connections (including Crossrail)
- Government accepted recommendation for Old Oak Common as London interchange station for HS2 as basis for public consultation

# Government decision (2012)

- Euston is the right site for a London terminus, best serving passenger requirements and offering greater access to alternative onward travel networks than either Old Oak Common or Stratford

- Any terminus other than Euston would offer a worse overall balance of costs and benefits

- Old Oak Common is the right site for a London interchange station

# HS2 Bill Environmental Statement (November 2013)

- London station – appraisal of options and selection process summarised and explained in Alternatives Report

- Public participation on Environmental Statement (including London terminus and interchange station proposals) under Standing Orders reported to House before Second Reading

# Old Oak Common – 'temporary' terminus

- Running tunnels must be completed as far as Euston prior to completion and coming into operation of Old Oak Common station

- Construction of running tunnels to Euston after Old Oak Common station in operation would require tunnelling activities from Park Village East and onward transport of excavated material by road from that location. Unacceptable and unnecessary levels of disruption

- Not practicably feasible to fit out Euston tunnels and throat track from Euston station. Significant constraints and programme delays in fitting out Euston tunnels and throat track from an operational Old Oak Common

# Old Oak Common – 'temporary' terminus

## Transport for London review, 2011

### Key conclusions

- **Onward dispersal** - journey time penalties
- **Crowding on Crossrail** – significant pressure on the line, additional journey times being unable to get on trains
- **A reliable train service** – increase in train loadings leading to extended dwell times
- **Higher level of network resilience level at Euston** - multiple journey opportunities via a range of modes available
- **Growth in jobs and homes** - taking valuable capacity off Crossrail services for passengers making onward journeys into central London, could limit the potential for growth in this area
- **Future perception of high speed services** – passengers want ability to travel from city centre to city centre

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# Euston/Old Oak Common shared London terminus

- Proposal to stop 30% of trains at Old Oak Common and 70% of trains at Euston would result in at least 21% of passengers having to change at Old Oak Common in order to reach Euston. They would each incur several minutes additional journey time and would have the inconvenience of having to change train

- Timetabling impacts of this proposed change would have adverse capacity consequences

# The implications of HS2 Euston Action Group's proposal to locate the main HS2 London terminus at Old Oak Common

17 July 2015

## Executive Summary

**The key points are:**

- **Even if the journey time and other passenger disbenefits could be justified, there are no viable options locating the main London terminus at Old Oak Common with some trains continuing to Euston;**
- **The proposal for a link to Euston via the West Coast Main Line has major disadvantages compared with the Promoter's Euston tunnel, and it would be more expensive;**
- **A main terminus at Old Oak Common would not be consistent with the transport strategy in the London Plan, and would substantially compromise the regeneration proposals for the surrounding area.**

This paper summarises the Promoter's analysis of a HS2 Euston Action Group (HEAG) proposal to locate the main HS2 terminus at Old Oak Common with a link to Euston for a few HS2 trains. The link would be from Old Oak Common to the West Coast Main Line (WCML) in the vicinity of Queens Park.

The transport and train operation conclusions of this paper are:

- Terminating all HS2 trains at Old Oak Common would reduce the HS2 overall patronage and the revenue by over 10% and the economic benefits of the Phase by 15%. Patronage between London and the West Midlands would be reduced by over 20%;
- Compared with the Proposed Scheme for a terminus at Euston and an interchange at Old Oak Common the two terminus proposal would increase journey times for HS2 passengers to many parts of central, north and south London;
- When Phase 2 of HS2 is implemented, there would be insufficient capacity on Crossrail to accommodate HS2 passengers to Central London; and
- The proposal to run only a few classic compatible trains to Euston would not be capable of supporting a viable train service specification, nor justify the cost of the Euston tunnel. A 5-6 platform HS2 station at Euston would incur most of the property demolition, adverse environmental effect and cost of the Proposed Scheme, but result in a much reduced HS2 train service to Euston. There are therefore no viable two terminus options.

The Promoter remains of the view that the HEAG proposal to locate the main HS2 terminus at Old Oak Common would be contrary to the principle established at Second Reading that the London terminus should be located at Euston. Nor would there be any purpose in further consideration of the HEAG option or any two terminus solution as none would be capable of supporting a credible operational specification, or demonstrate sufficient passenger benefits to justify the cost.

**Introduction**

1. On 7 July the HS2 Euston Action Group (HEAG) presented proposals for locating the main HS2 terminus at Old Oak Common. It was contended that, given the challenges of terminating HS2 at Euston, there is an argument for the role of Old Oak Common to be much expanded with a link to Euston via the existing WCML tracks. (Transcript p.18). In support of this proposal the Petitioner maintained (Transcript p. 5):

    - Old Oak Common has the advantage over Euston of being on the route of Heathrow Express and Crossrail;
    - Passengers getting off at Old Oak Common would get quicker connections to most of central London than by going to Euston;
    - Not only would Old Oak Common be better for passengers, it would cost less than Euston … 'especially as Euston would only be able to cope with the extra passengers if an additional £25 billion is spent on Crossrail [2]'; and
    - Using Old Oak Common would avoid decades of disruption to classic services in and out of Euston.

    The Petitioner also claimed that the Promoter has not assessed whether Old Oak Common should be the major London terminus.

2. In his response to the HEAG presentation on 7 July, Counsel explained that the Promoter has examined and consulted on the options since 2009, including terminating HS2 at Old Oak Common. The principle of locating the London terminus at Euston was established at Second Reading and this is reflected in the instructions and remit of the Select Committee.

**The HEAG proposal**

3. In essence, the core elements of the HEAG proposal are:

    - A terminus station at Old Oak Common of similar design to the Proposed Scheme, but with twelve HS2 platforms instead of six;
    - A tunnel link from Old Oak Common to a grade separated junction on the WCML in the vicinity of Queens Park station so that while most HS2 services would terminate at Old Oak Common, a few could continue to Euston via the WCML; and
    - Little or no land-take or works to the track layout or platforms at Euston.

4. The HS2 indicative London service pattern comprises 10ph for Phase One and 16tph for Phase Two with all trains stopping at both Old Oak Common and Euston. The HEAG proposal does not include a service pattern. As the proportion of trains terminating at Old Oak Common and Euston is a defining feature of the proposal, two possibilities are considered in this paper – a four train per hour (tph) HS2 service to Euston to reflect the Petitioner's aspiration that Old Oak Common should be the main terminus, and a 10tph HS2 to Euston scenario which the Promoter considers to be the minimum that is operationally practicable and consistent with the Government's strategic objectives for HS2. Other service possibilities between 4tph and 10tph can then be interpolated.

**Previous consideration of Old Oak Common terminus options**

5. Since 2009 the Promoter has prepared, sifted and selected options for the London stations. The reasons for not promoting a terminus at Willesden Junction or Old Oak Common were set out in December 2009 and remain the same today:

> **'***Willesden Junction and Old Oak Common.* Further demand analysis continued to suggest that the journey time penalty for central London passengers using these stations as the only London terminal was likely to severely reduce the benefits of HS2. A Crossrail connection at Old Oak Common or Willesden Junction would allow some passengers a quicker journey time to the East or West of London, but the bulk of the demand for HS2 would come from the central, north and south of London which would be best served by a central London station.'[1]

6. The economic analysis in 2010/11[2] assessed the benefits of a terminus at Old Oak Common compared with a terminus at Euston and an interchange station at Old Oak Common (as in the Proposed Scheme) for Phase One of HS2 in 2033 as follows:

> 'The figures show that the removal of the onward service to Euston reduces PVB[3] by £3.8bn relative to Eus+OOC (over 15%) and revenue by £1.1bn (nearly 10%).
>
> The net reduction in PVB is the result of
>
> - Decreases in Local Leg[4] benefit (£1.9bn);
> - Decreases in in-vehicle time savings (£1.2bn);
> - Decreases in wait benefits (£0.5bn); and
> - Other more minor changes in other journey cost components.'

7. The geographical analysis showed that the biggest effect would be a 23% reduction in London-West Midlands patronage, (10,000 passengers per day, comprised of 6,500 transferring back to the WCML and 3,500 fewer generated trips). For journeys between London and the North West there would be a slight increase in patronage but a significant loss of benefits. It should be noted that this appraisal was undertaken using a previous version of the model and the forecasts, assumptions and train service specification have all changed since 2012.

8. In 2011/12 HS2 Ltd reviewed the option for terminating the line at Old Oak Common following representations made during the public consultation[5]. The analysis concluded:

> 'Old Oak Common was rejected as the London terminus given that the journey time penalty for many central London passengers would reduce the benefits of HS2. Passenger dispersal would also be an issue, Crossrail being the only option for passengers to continue their journey rapidly into London. Any service interruption to Crossrail services would potentially result in having to close HS2 as passengers

[1] London to West Midlands and Beyond, HS2 Ltd, December 2009, p.59.
[2] Report WP1 Analyses of London Interchange Options and Markets, Appendix A pp.8-10, HS2 Ltd May 2011.
[3] Present Value of Benefits
[4] Within London
[5] Route Selection and Speed, HS2 Ltd, January 2012, para.5.2.7.

would have no adequate alternative onward connection option at Old Oak Common. A terminus station would also require more land than an intermediate station, and given constraints in the area such a proposition would be difficult. The additional land would include the Crossrail depot area and extend across the North London Line and central Line into a significant part of Park Royal.'

9. Since then the Promoter has considered various other options and variants, many in response to suggestions by the community. They include double deck configurations at Euston and, most recently, Mr. Sam Price petitioned against the Bill in favour of a 'Euston Express' proposal for a route via Old Oak Common that would join the West Coast Main Line (WCML) at Queens Park and thence on the surface to Euston. This proposal was referred to in the HEAG evidence to the Committee on 7 July. It was reviewed for the Promoter by Parsons Brinkerhoff and Mott MacDonald (PB/Mott) earlier this year and their report is attached to this submission. The HEAG proposal for the HS2 link between Old Oak Common and Euston includes the Euston Express link to the WCML at Queens Park.

**Crossrail capacity, journey times and onward dispersal**

10. Transport for London (TfL) does not support proposals for terminating HS2 at Old Oak Common for two main reasons:
    - Crossrail would not have sufficient capacity for all the HS2 passengers with destinations into or across central London; and
    - there would be a substantial journey time penalty and increased number of interchanges required if these passengers had to change at Old Oak Common rather than at Euston.

    These issues are examined below. It should be noted that the patronage and onward dispersal analysis does not include the HS1-HS2 Link.

*Crossrail capacity*

11. If all HS2 passengers were to alight at Old Oak Common, a consequence would be significant crowding pressure on Crossrail as it provides the only high capacity access to central London. Passengers attempting to board eastbound services closer to central London would suffer increased station congestion and on-train crowding as well as additional journey times, due to an increased likelihood of being unable to board trains.

12. TfL estimates that, for Phase One of HS2, peak crowding on Crossrail trains would reach the practical capacity at 4 passengers/$m^2$ compared with 3.3 passengers/$m^2$, without HS2. These estimates indicate that crowding could (just) be accommodated. However there would be little space for passengers boarding services east of Paddington, with HS2 passengers using up more than 10% of Crossrail capacity on already crowded services, eroding the forecasted benefits generated by Crossrail.

13. By 2041, with both phases of HS2 are operational, Crossrail crowding is estimated to be over 5 passengers/$m^2$ (compared with 3.9 passengers/$m^2$ without HS2).Terminating Phase 2 services at Old Oak Common would thus overwhelm Crossrail HS2 passengers, taking up over 15% of Crossrail capacity, leading to unacceptable levels of crowding.

14. Providing a reliable train service for customers is a fundamental part of the operations of Crossrail and minimising factors that negatively impact upon service reliability is essential in achieving this aim. A marginal increase in train loadings as they pass through busy sections between Paddington and Liverpool Street risks causing extended station 'dwell' times as more passengers board and alight. This would result in a degradation of achievable train service frequencies, effectively reducing the actual capacity of Crossrail and its ability to deliver reliable services.

*Journey times*

15. Table 1 shows the actual time lost and saved by changing at Old Oak Common compared with changing at Euston. The Proposed Scheme combines the advantages of Old Oak Common and Euston, whereas the Petitioner's proposal would result in longer journeys to destinations where Euston is the better interchange. In terms of actual time to stations, Euston's is much the better interchange for north central and north London and is better for most of south London. Within central London the relative advantage in actual time can change significantly over a short distance depending on how many interchanges are necessary.

**Table 1 Journey times to/from OOC HS2 to selected key locations, alighting/boarding at Old Oak Common, or at Euston**

| To/From | | Railplan Routing | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | TO LONDON | | | FROM LONDON | | | OOC | | Euston | | |
| | | OOC HS2 platform (621487) | OOC via Euston HS2 platform (210287) | Difference (OOC minus Euston) | OOC HS2 platform (621487) | OOC via Euston HS2 platform (210287) | Difference (OOC minus Euston) | Lines | Changes | Lines | Changes | Difference |
| EUSTON STATION ENTRANCE 1 | 210201 | 29 | 12 | 17 | 29 | 14 | 15 | Crossrail, Northern | 1 | Walk | 0 | 1 |
| KING'S CROSS (M) STATION ENT 1 | 190201 | 30 | 16 | 14 | 30 | 18 | 12 | Crossrail, D/C, H&C/C | 2 | SSL | 0 | 2 |
| FINSBURY PARK STATION ENT 1 | 180301 | 36 | 24 | 12 | 36 | 26 | 10 | Crossrail, walk, Victoria | 1 | Victoria | 0 | 1 |
| WOOD GREEN STN ENTRANCE 1 | 510401 | 43 | 31 | 12 | 43 | 33 | 10 | Crossrail, walk, Victoria, Piccadilly | 2 | Victoria, Piccadilly | 1 | 1 |
| OLD STREET STN ENTRANCE 1 | 150201 | 33 | 23 | 10 | 33 | 26 | 7 | Crossrail, Northern | 1 | Northern | 0 | 1 |
| HENDON STATION ENTRANCE 1 | 550601 | 50 | 43 | 7 | 50 | 45 | 5 | *Bus*, NLL, MML | 2 | Northern (Kentish T), MML | 1 | 1 |
| BAKER STREET STN ENTRANCE 1 | 30101 | 24 | 18 | 6 | 24 | 20 | 4 | Crossrail, Bakerloo | 1 | SSL | 0 | 1 |
| VICTORIA STATION ENTRANCE 1 | 40201 | 30 | 24 | 6 | 30 | 27 | 3 | Crossrail, walk, Victoria | 1 | Victoria | 0 | 1 |
| BANK STATION ENTRANCE 1 | 10501 | 32 | 27 | 5 | 32 | 29 | 3 | Crossrail to LST, walk | 0 | SSL to Moorgate, walk | 0 | 0 |
| FARRINGDON STN ENTRANCE 1 | 160101 | 23 | 18 | 5 | 23 | 20 | 3 | Crossrail | 0 | SSL | 0 | 0 |
| CLAPHAM JUNCTION STATION ENT 1 | 290301 | 41 | 36 | 5 | 41 | 38 | 3 | Crossrail, walk, Victoria, Southern | 2 | Victoria, Southern | 1 | 1 |
| LIVERPOOL STREET STATION ENT 1 | 10301 | 28 | 23 | 5 | 28 | 26 | 2 | Crossrail | 0 | SSL | 0 | 0 |
| LONDON BRIDGE STATION ENT 1 | 350201 | 33 | 28 | 5 | 33 | 31 | 2 | Crossrail, Jubilee | 1 | Northern | 0 | 1 |
| WATERLOO STATION ENTRANCE 1 | 310101 | 29 | 25 | 4 | 29 | 28 | 1 | Crossrail, Northern | 1 | Northern | 0 | 1 |
| HARROW-ON-THE-HILL STAT ENT 1 | 590401 | 43 | 40 | 3 | 43 | 42 | 1 | *Bus*, NLL, Bus | 2 | Met | 0 | 2 |
| LEICESTER SQUARE STATION ENT 1 | 20201 | 24 | 21 | 3 | 24 | 23 | 1 | Crossrail, Northern | 1 | Northern | 0 | 1 |
| WESTMINSTER STN ENTRANCE 1 | 20901 | 28 | 26 | 2 | 28 | 28 | 0 | Crossrail, Jubilee | 1 | Northern, SSL | 1 | 0 |
| NEW CROSS GATE STATION ENT 1 | 390101 | 46 | 44 | 2 | 46 | 46 | 0 | Crossrail, ELL | 1 | Northern, Southern | 1 | 0 |
| TOTTENHAM COURT ROAD STA ENT 1 | 30601 | 21 | 20 | 1 | 21 | 22 | -1 | Crossrail | 0 | Northern | 0 | 0 |
| OXFORD CIRCUS STATION ENT 1 | 30501 | 21 | 20 | 1 | 21 | 22 | -1 | Crossrail to Bond St, walk | 0 | Victoria | 0 | 0 |
| STRATFORD STATION ENTRANCE 1 | 110501 | 35 | 35 | 0 | 35 | 37 | -2 | Crossrail | 0 | SSL, Central | 1 | -1 |
| WHITECHAPEL STN ENTRANCE 1 | 90701 | 29 | 31 | -2 | 29 | 33 | -4 | Crossrail | 0 | SSL, Crossrail | 1 | -1 |
| CANARY WHARF STATION ENT 1 | 80701 | 35 | 38 | -3 | 35 | 40 | -5 | Crossrail | 0 | SSL, Crossrail | 1 | -1 |
| ISLE OF DOGS STATION ENTRANCE 1 | 81001 | 32 | 35 | -3 | 32 | 37 | -5 | Crossrail | 0 | SSL, Crossrail | 1 | -1 |
| BOND STREET STN ENTRANCE 1 | 30701 | 20 | 24 | -4 | 20 | 27 | -7 | Crossrail | 0 | Victoria to Oxford C, walk | 0 | 0 |
| HIGH ST KENSINGTON STAT ENT 1 | 260101 | 25 | 32 | -7 | 25 | 34 | -9 | Crossrail, D/C | 1 | H&C/C, D/C, | 1 | 0 |
| RICHMOND STATION ENTRANCE 1 | 700501 | 43 | 51 | -8 | 43 | 53 | -10 | *Bus*, NLL | 1 | Northern, SWT | 1 | 0 |
| PADDINGTON STN ENTRANCE 1 | 50101 | 16 | 25 | -9 | 16 | 27 | -11 | Crossrail | 0 | H&C/C, D/C, | 1 | -1 |
| SOUTH RUISLIP STATION ENT 1 | 671001 | 34 | 53 | -19 | 34 | 56 | -22 | *Bus*, Central | 1 | SSL, Chiltern, walk, Met, walk | 2 | -1 |
| EALING BROADWAY STATION ENT 1 | 630301 | 14 | 41 | -27 | 14 | 43 | -29 | Crossrail | 0 | Northern, Crossrail | 1 | -1 |
| HEATHROW CTA Station Entrance | 983101 | 35 | 62 | -27 | 35 | 65 | -30 | Crossrail | 0 | Northern, Crossrail | 1 | -1 |

**NOTES**

1: Times rounded to nearest minute. Differences calculated based on rounded times

2: Euston HS2 to LU Ticket Hall is same level via "Comb" at end of HS2 platforms

3: Time from OOC to EUS assumed as 7 mins (arrival to arrival)

*Onward dispersal*

16. The geographical spread of passenger destinations has been modelled for each station. In order to predict passenger behaviour, the risk of delay and inconvenience of changing trains must be added. Travellers choose their routes and modes of transport largely on cost and journey time, but where they have a choice and cost is not an issue, as on the Underground, they are more heavily influenced by other factors such as crowding, comfort, convenience and reliability. The TfL 'Railplan' model predicts travel behaviour in response to proposals for changes to the networks using 'generalised time' in order more accurately to reflect actual passenger behaviour. Generalised time includes not only actual travel and wait time but also interchange, crowding and discomfort and inconvenience penalties.

17. Figure 1 shows the modelled geographical spread of destinations for passengers interchanging at Euston and Old Oak Common. Euston will be the preferred interchange for most passengers to central London because it has a much wider choice of lines and modes for onward journeys and a much wider area can be reached with fewer changes.

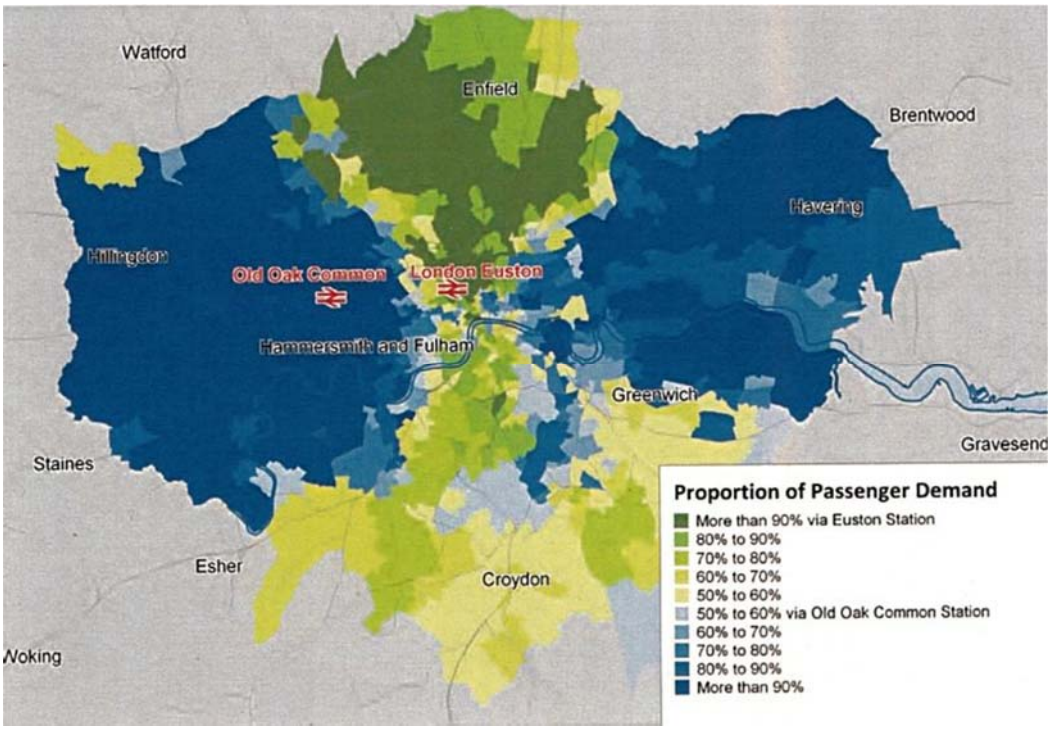



**Figure 1: Proportion of HS2 Passenger Demand via Euston and Old Oak Common [6]**

Figures 2 and 3 show the London destinations of HS2 passengers changing at Euston and Old Oak Common assuming implementation of the Proposed Scheme[7]. Euston is the interchange of preference for most passengers bound for the concentrations of destinations in Central and Inner London. Passengers for the West End, West London, Heathrow and Docklands are more likely to travel via Old Oak Common.

[6] Mott Macdonald 2012 (data represents example trips using HS2 from London to Manchester) from Demand and Appraisal Report: HS2 London - West Midlands, MVA, April 2012
[7] Source: TfL Railplan 2041 AM peak period destinations

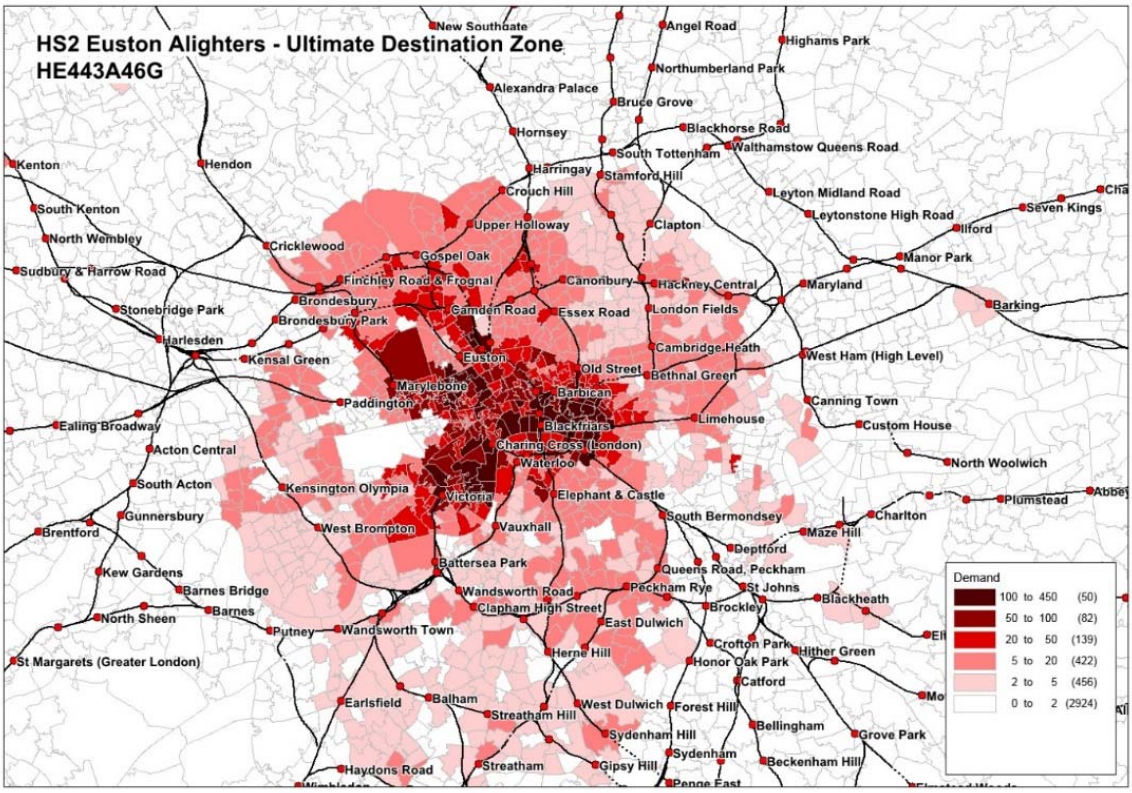



**Figure 2 Destinations of HS2 passengers interchanging at Euston**

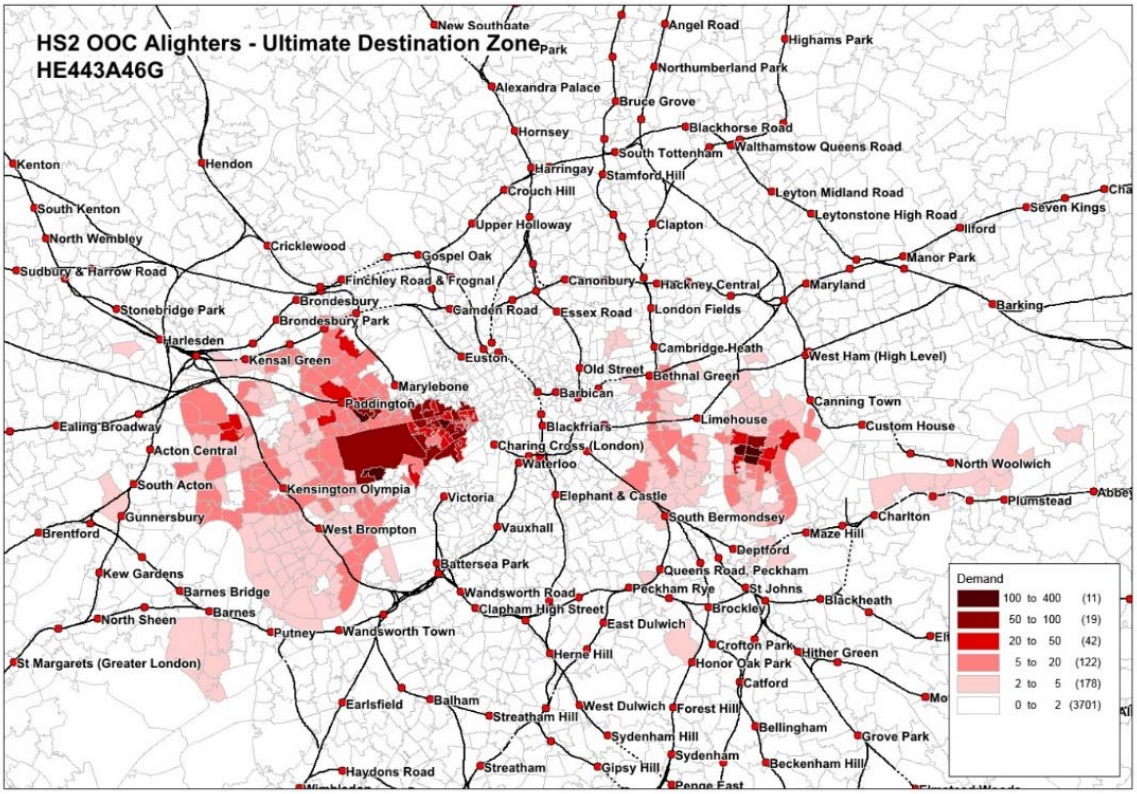



**Figure 3 Destinations of HS2 passengers interchanging at Old Oak Common**

**London connectivity and resilience**

18. Old Oak Common will be served by Crossrail for access to central and east London and indeed this is part of the rationale for an HS2 interchange station. But no other high capacity lines are planned. Stations on the North London Line and West London Line are proposed by TfL and would improve connectivity to the Old Oak Common area including the new development. But interchange times from HS2 would be long and capacity will be constrained to cater for a significant increase in demand at Old Oak Common.

19. If Crossrail is suspended for any reason, the only realistic option for most HS2 Crossrail passengers would be to queue to board Central Line trains at North Acton, 800m to the east of the HS2 station. In contrast, at Euston there is a choice of two branches of the Northern Line, the Victoria and the Circle/Metropolitan/Hammersmith & City Lines at Euston Square, which would be accessible via a new eastern ticket hall. If any one of these lines is suspended, the others offer alternative routes. In addition, unlike Old Oak Common, Euston is on the edge of the central area and buses, taxis, cycle or walking are viable alternatives for many passengers. In the much longer term there might be other transport schemes for Old Oak Common if the Mayor's development vision comes to fruition. But at this stage none are even envisaged, whereas at Euston the Promoter has safeguarded the route of Crossrail 2 and Transport for London is in the process of preparing proposals.

**West Coast Main Line and HS2 capacity**

*Capacity effect of HS2*

20. The step-change in rail capacity that would accrue as a result of implementing the Proposed Scheme is described in the Strategic Case for HS2[8]. HS2 has the potential to double the number of seats from Euston and is equivalent to building two three lane motorways between London and the Midlands and the North. However, this additional capacity can only be fully utilised and its benefits spread over a wide area if HS2 captures a large proportion of the long distance (over 100 miles) travel market. In order to do so, travellers must be persuaded to transfer from the existing main rail lines and other modes.

21. The effect of HS2 on WCML capacity is twofold:

- *Seat capacity* – It is estimated that HS2 Phase One would attract approximately half the passengers who would otherwise travel on WCML trains and, when Phase Two is operational, two thirds of these passengers would transfer. This would enable seats and train paths to be released on for shorter distance journeys – not only the WCML but with Phase Two the Midland Main Line and the East Coast Main Line as well. In order to achieve this transfer of passengers, origin to destination journey times are crucial.

- *Train path capacity* – The more HS2 trains continue via the WCML to Euston, the fewer train paths would be available for shorter distance journeys. A post-HS2-

[8] Strategic Case for HS2, DfT, paragraphs 3 2 12-22

opening train service on the WCML will be developed through the normal consultative railway industry processes. However, in broad terms the effect of transferring half the long distance passengers to HS2 would be that only approximately half of the fifteen WCML fast line train paths would be needed to serve those stations in the Midlands and the North that are not served by HS2. In addition, slow line services could be rationalised to serve shorter distance, inner suburban, destinations which would enable a 9tph slow line peak passenger service into Euston compared with the current maximum of 8tph, and there would be an additional hourly path for the Southern service to West Croydon (not going to Euston) and one for freight trains in off peak hours. Thus, depending on whatever post 2026 timetable is approved, HS2 would release very approximately 8 train paths on the WCML to Euston for other services.

*Effect of the HEAG proposal on capacity*

22. As noted above, in 2011 it was estimated that a terminus at Old Oak Common would reduce the HS2 patronage to/from the West Midlands by 23%. These passengers would prefer to travel on the WCML largely because it would be quicker as no price differential was assumed. Such a large loss of patronage would significantly compromise the objectives and business case of HS2 and would result in fewer seats being available for new passengers on the WCML.

23. Even if a 4tph service to Euston were practicable, it would reduce the capacity released by HS2 on the WCML by 40-50%, but in this scenario the capacity effect on the slow lines might not accrue either as it would be less likely that the train services could be rationalised. A 10tph service would absorb all the released capacity and call into question the point of building HS2.

24. A further capacity problem arises from platform length at Euston. The Petitioner proposes that classic compatible trains would run into Euston. The trains comprise 200m long units that have the capability to form a 400m long train. It is only possible to run 2 X 200m classic compatible train sets on the WCML if the platforms are long enough. If any significant number of trains to Euston were to be 400 metre formations, in practice all HS2 platforms at Euston would have to be 400m long, requiring major reconstruction and land-take as discussed below.

**Train services**

25. If the Petitioner's proposal were for only a token HS2 service to Euston, say 4tph, the first question that would arise is: which services would terminate at Euston? If only one of the three trains per hour to Birmingham, Manchester or Leeds assumed in the HS2 Economic Case were to go to Euston, the onward journey analysis suggests it would be by far the most popular train to catch. The Promoter does not consider that the consequent differential loadings would be practicable from an operational point of view.

26. The only practical solution would be for the least heavily patronised routes such as Liverpool, Preston or Scotland[9] to run to Euston, while services to Manchester and Birmingham would terminate at Old Oak Common. Thus the most heavily loaded trains would tend to be the ones terminating at Old Oak Common, implying that a disproportionately high number of the HS2 passengers would be disadvantaged. Consequently, the Promoter considers that an 8-10tph service to Euston is the minimum that would be credible.

**Is there a viable two terminus option?**

27. The Petitioner is proposing a two terminus scheme with the 'Euston Express' Link to the WCML and a few 200m classic compatible HS2 trains running into the existing Euston Station. Other possible two terminus options include:

- Substituting the Promoter's Euston Tunnel for the Petitioner's Euston Express Link; and
- Options for more and longer HS2 trains into a less ambitious Euston station than the Proposed Scheme.

*Euston Express Link or Euston tunnel?*

28. The Promoter's proposed Euston tunnel would provide a full HS2 train service in tunnel to Euston for an estimated £564m[10].

29. The PB/Mott analysis of the Euston Express proposal showed that it would be more expensive than the Euston Tunnel, more difficult to build and would have a far inferior operational capability. They estimated that the cost of the Euston Express proposed link to Queens Park and the associated works on the WCML would be £1,245m. This would be £681m more expensive than the Promoter's Euston tunnel proposal.

30. The Euston Express scheme that PB/Mott costed was for a full HS2 service to Euston. If, as the Petitioner proposes, only classic compatible trains continue to Euston, it would not be necessary to gauge clear the existing WCML tunnels and bridges between Queens Park and Euston for the larger HS2 trains. As a consequence the additional cost of the Euston Express scheme would be reduced. But it would still be approximately £100-200m more than the Proposed Scheme.

31. The Euston Express scheme would also entail substantial shortcomings, including:

- Severe disruption during construction
- Lack of capability to run 200m and 400m 'captive' HS2 trains
- Loss of released capacity
- Additional environmental effects and land take
- Longer journey times

[9] As the Glasgow/Edinburgh trains are assumed to operate as 400 metre trains splitting at Carstairs even this may present difficulties.
[10] PB/Mott p.104. All estimates excluding escalation, risk, contingency, land and property and client costs.

- Reduced capacity and capability for freight trains.

32. It is therefore concluded that any proposal for terminating most HS2 trains at Old Oak Common would include the Euston tunnel rather than the Euston Express Link.

*Euston station configurations*

33. The Petitioner's proposal for a few classic compatible trains terminating at Euston is not capable of providing a viable train service specification for the reasons explained, nor would such a limited service with no increase in capacity[11] offer sufficient benefits to justify the cost of the tunnel. The question that therefore arises is whether there are other options for a less ambitious Euston scheme if most of the HS2 trains terminate at Old Oak Common?

34. One possibility would be a five or six platform HS2 station. Any scheme for 400m trains at Euston would require widening the station 'throat' south of Mornington Street. Without the dive-under at Park Village east, such as station could accommodate seven HS2 trains per hour and, with a dive-under, ten trains per hour (as in the Promoter's AP3 scheme Stage A). Though the associated property demolition would be less than for twelve HS2 platforms, it would still be considerable, including property on the west side of Melton/Cardington Street, Wolfson House and most of the flats on the Regents Park Estate that are required for the Proposed Scheme. Despite this, the Euston train service options would be very limited – comprising, say, Birmingham and Manchester and Scotland, or else the other destinations, but not both.

35. Thus, the options are either for:

- a very limited 200m long HS2 classic compatible service with less capacity than the current WCML, the benefits of which would not justify the cost of the tunnel; or
- A 5-6 platform station that would incur most of the property demolition, adverse environmental effect and cost for a much reduced HS2 train service to Euston.

36. Neither of these options would offer an operationally viable train service specification and neither could be justified in benefit:cost ratio terms. It is therefore concluded that, even if the Euston tunnel is substituted for the proposed Euston Express link, there is no viable proposition for a two terminus solution.

**Cost and engineering**

37. As there is no viable option for a two terminus proposal, and no prospect of such a scheme being justified by a credible business case, there is no point in preparing a scheme and detailed costs for the infrastructure required for the Petitioner's proposals. However, some costs are known and the cost implications other elements can be inferred.

[11] In fact, without 400m capability, it is a capacity reduction as 200m HS2 trains have fewer seats than 11-car long distance or 12-car suburban trains.

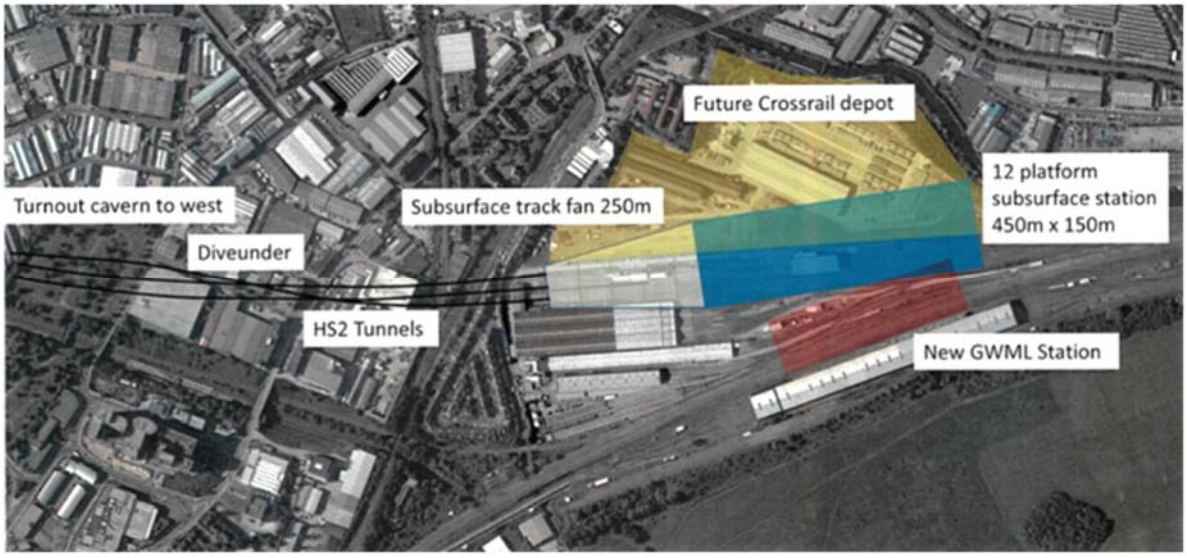



**Figure 4 Indicative footprint of a 12-platform station at Old Oak Common**

38. Figure 4 provides an indication of the land at Old Oak Common that would be required for a 12-platform station. The most significant additional costs would be:

- Construction of a much larger HS2 station at the same depth as the Proposed Scheme (approximately 15m below ground level). A terminus station would need not only additional platforms but also additional servicing circulation and interchange facilities.
- A subterranean dive under tunnel to the west of the North London Line.
- Relocation of the Crossrail depot to the north of the station. No alternative location has been identified.
- It might be necessary to acquire properties in Hythe Road and divert the Grand Union Canal in order to provide sufficient space for the platforms and circulation around the station.

39. It is assumed that the tunnel to Euston would be the same cost in either option as the Euston Express proposal is not viable and would in any event be more expensive.

40. It is very difficult to assess what cost savings at Euston would actually accrue. For the Petitioner's proposal to run only a few 200m HS2 trains to Euston, most of the cost of the Proposed Scheme could be saved. However, such a solution would not justify the cost of the tunnel and the existing station would remain unimproved. In due course the Underground interchange works would probably be necessary and at some stage the station would need to be upgraded. A scheme to provide a minimum viable train service with capability for 400m HS2 trains would incur most of the cost of the Proposed Scheme for a much reduced operational specification and a substantial reduction in passenger benefits.

**The London Plan and the longer term**

41. The London Plan sets the policy framework for an integrated approach to planning and transport in London over the next twenty years. It is prepared in the context of a forecast

increase in Greater London's population from 8.6 million in 2015 to 10 million in 2036. The Promoter has been working with the Mayor and Transport for London (TfL) to ensure an integrated approach to transport planning in London, and specifically that planning for passenger journeys from origin to destination is co-ordinated and not compromised by the design of the Proposed Scheme. This includes locating the London terminus at Euston, which the Mayor supports and is in the London Plan.

42. The capacity implications of an HS2 terminus at Euston are set out in the HS2 Environmental Statement (ES) Vol.5 Transport Assessment Part 4 and are assessed in the context of underlying growth in travel demand. Even without HS2, AM peak period rail passengers at Euston are forecast to increase by 19% 2012-26 and 46% 2012-41. The increases for the PM peak period are forecast to be 23% and 58% respectively (ES Vol. 5 Transport Assessment Part 3 paragraphs 6.3.58-9).

*The next ten years*

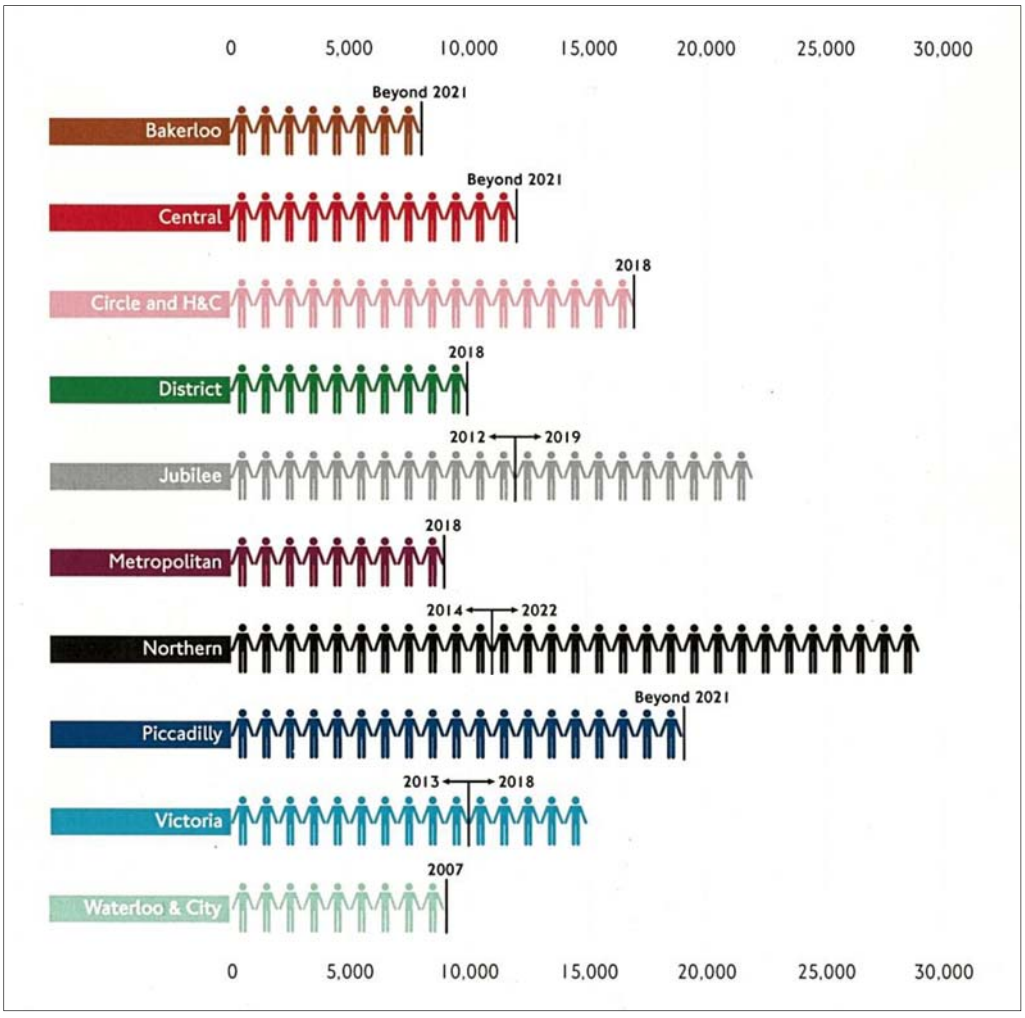



**Fig. 5 Additional peak hour Underground capacity since 2006 (Source: TfL Business Plan 2014)**

43. Underground capacity is and will be an issue for Government and TfL irrespective of HS2. The TfL Business Plan sets out the schemes to address this growth over the next ten years (See Fig. 5). On the Northern and Victoria lines major capacity enhancements have been implemented since 2006, in each case for over 10,000 additional peak

passengers. Further enhancements are planned on both these lines in the next few years. Current rolling stock and signalling programmes will increase capacity on the Circle and Hammersmith and City lines by 65% and by 27% on the Metropolitan Line. Similar projects have enhanced the Bakerloo and Jubilee lines and more are planned.[12]

*The longer term*

44. At some point the opportunities for increasing capacity on existing lines will be exhausted and if demand continues to grow between now and the middle of the century, new lines such as Crossrail 2 will be considered. The policies and proposals for addressing Underground capacity in the longer term are set out in Chapter 6 of the London Plan. The rationale for promoting Crossrail 2 is explained in paragraph 6.18 of the London Plan:

> 'Despite the committed investment in London's Underground and National Rail network (such as Crossrail and Thameslink), forecast demand shows that crowding and congestion remains a significant issue along the northeast to southwest corridor across central London. To help to address this, a route for a new line, commonly known as the Chelsea Hackney Line (and now referred to as Crossrail 2) has been safeguarded across London. It is essential that this safeguarding remains in place to protect this important new line, which would provide significant new rail capacity and congestion relief to existing rail and Tube lines.'

45. Any decision to implement Crossrail 2 is some years away and will depend, amongst other things, on the business case for whatever specific scheme is proposed and on Underground capacity and the forecasts for crowding at the time, including the effects of an HS2 terminus at Euston. Crossrail 2 will not be justified just in order to provide for onward dispersal of HS2 passengers from Euston. However, assuming Crossrail 2 is necessary, as is currently envisaged, the step change in capacity at Euston that it would provide will serve the additional demand created by Phase 2 of HS2.

46. Thus the medium and long term implications for onward dispersal of HS2 passengers at Euston have been thought through and are addressed in the context of a comprehensive approach transport provision in London both in the London Plan and the TfL Business Plan. No such planning framework for dispersal of HS2 passengers exists for a terminus at Old Oak Common, and it is difficult to see what it could comprise short of a new east-west railway in addition to the Central Line and Crossrail 1.

47. The Proposed Scheme is also integrated into the London Plan economic development and regeneration proposals. Both Old Oak Common and Euston are 'Opportunity Areas' designated for major development and regeneration. The proposals for both areas are supported by, and dependent on, the HS2 proposals for a terminus at Euston and an interchange station at Old Oak Common. In the case of Old Oak Common, the potential would not be enhanced by making the station the main terminus for HS2 and would be compromised by the larger footprint for the station and the crowding pressure on Crossrail.

[12] Transport for London Business Plan 2014, p.30-31

# Euston Express proposal

*Promoter's analysis*

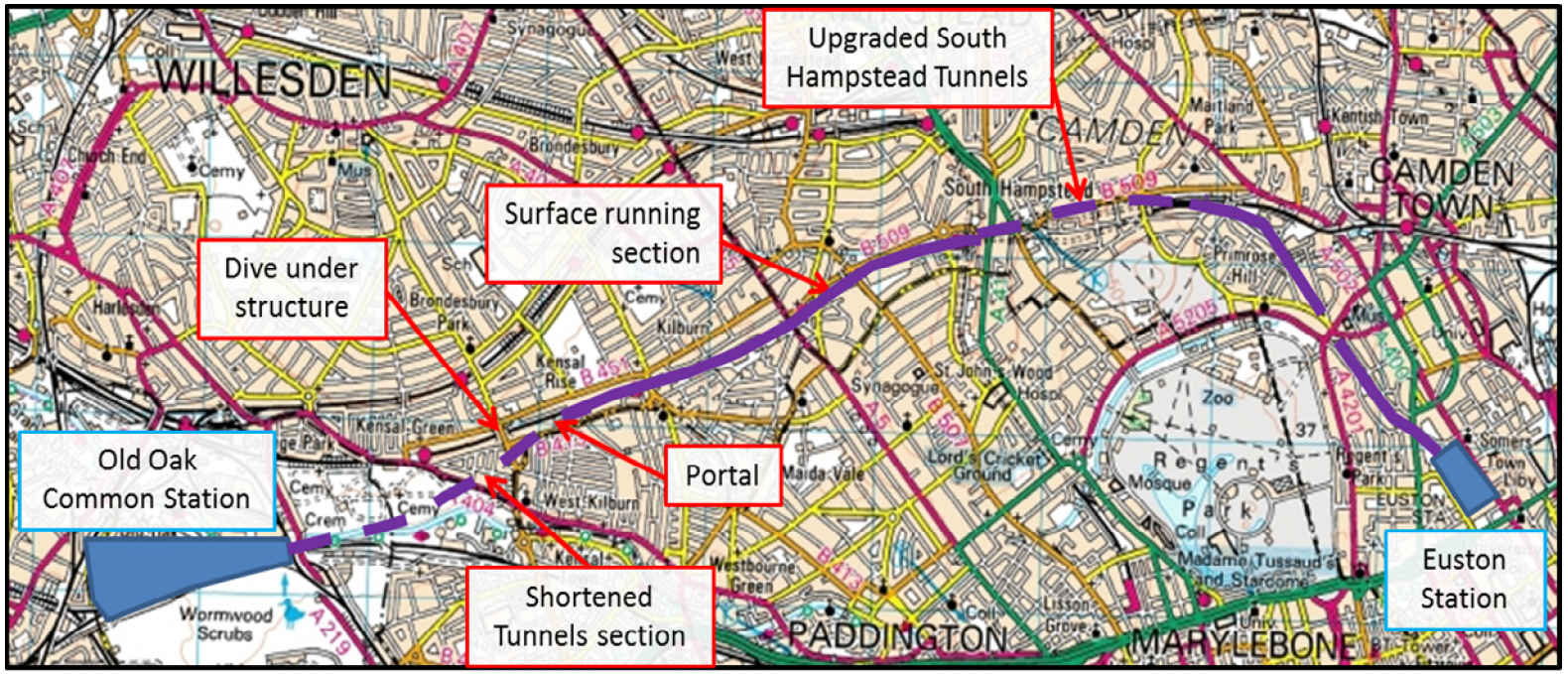
# Euston Express

Euston Express (EE) proposal comprises:

- A route between Old Oak Common and Euston via the West Coast Main Line (WCML) from Queens Park
- HS2 and WCML station at Euston – all, or almost all, within existing railway land
- Fleet of 'classic compatible' HS2 trains
- The EE proposal would require implementation of Crossrail-WCML Link to mitigate lost WCML capacity
- WCML capacity reinstatement and GC gauge at a later date if and when required

To date no layout plans have been provided by the promoters of Euston Express

# Euston Express route from Old Oak Common



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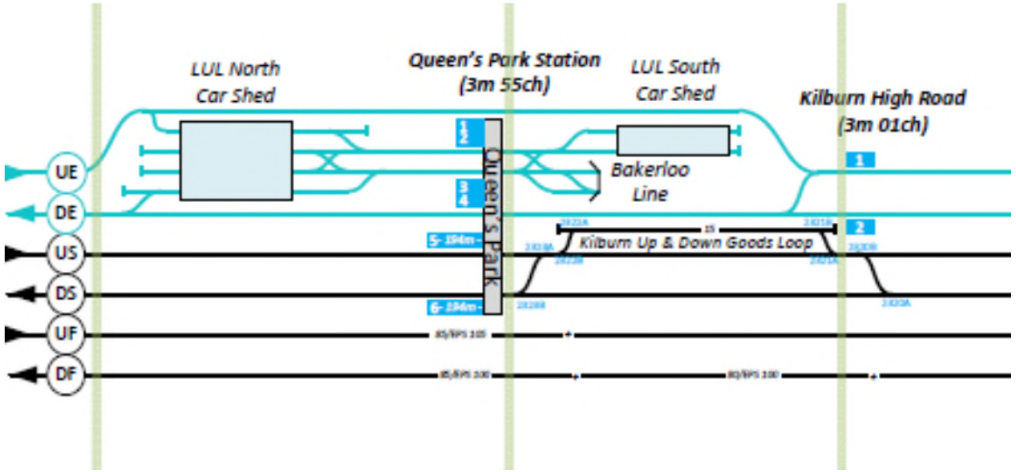
P2243 (3)

HOL/10018/0033

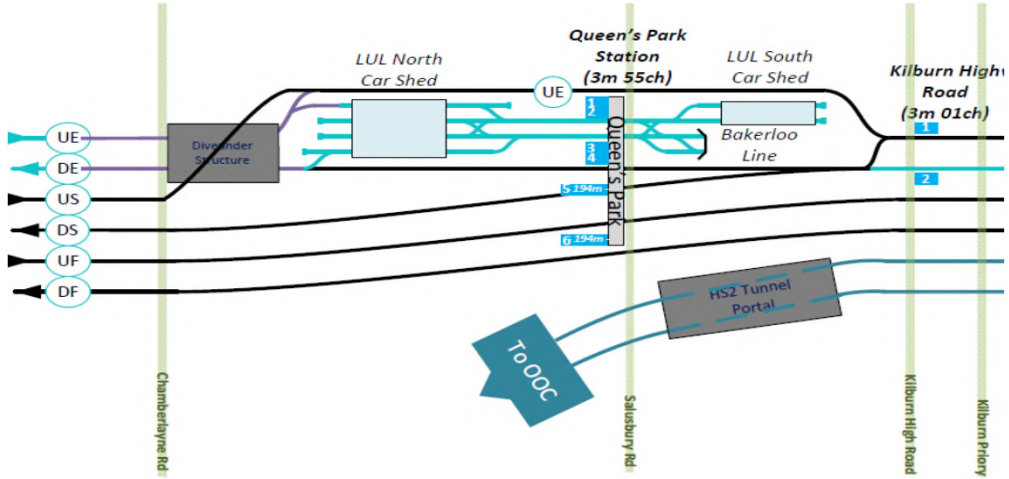
# EE proposal between Old Oak Common and Euston

- A tunnel from Old Oak Common to a portal at Queens Park
- New track layout around Queens Park Station so as to merge the slow and DC (Direct Current) lines to release fast lines for HS2
- Rebore the South Hampstead DC line tunnels for container trains
- Merge the fast and slow lines into one pair of tracks between Camden Junction and the Camden Carriage sidings
- No 'GC gauge' clearance, so all HS2 trains would have to be 'classic compatible'
- Reinstate lost WCML capacity and provide GC gauge clearance in late 2030s onwards

# Queens Park track layout




Existing track layout




EE 2026 track layout



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P2243 (5)

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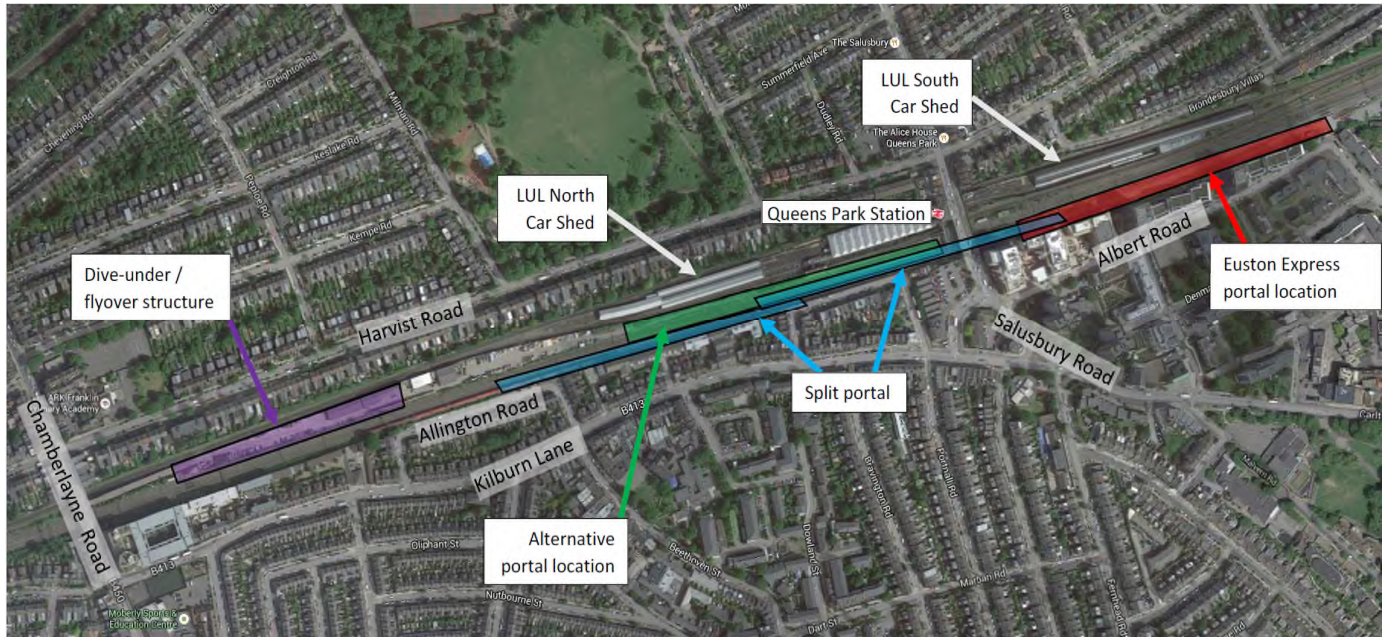
# Queens Park portal and dive-under locations




- EE proposed portal location east of station would require extensive residential demolition
- Promoter suggested location south of station
- EE now propose staggered portal (600m long, 10m wide)

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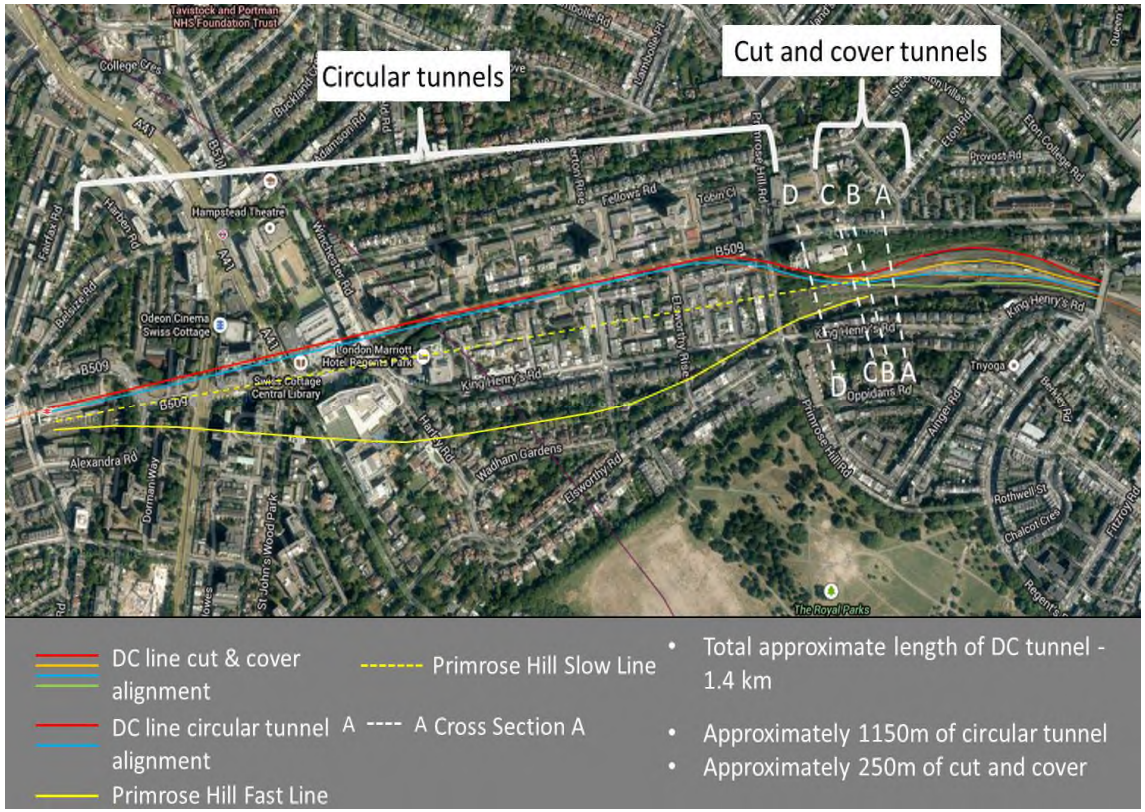
P2243 (6)

HOL/10018/0036

# Queens Park portal and dive-under Construction

- Structures would need to be built at night to avoid closing WCML
- Residential abuts railway all along this section
- Very high night time noise difficult to mitigate
- Severe disruption to Bakerloo line services for approximately 12 months
- Add two years to overall construction programme

# South Hampstead and Primrose Hill tunnels




Rebore South Hampstead DC Line tunnels for container trains

Steep gradient on DC line ramps to North London Line

Primrose Hill fast line tunnel not GC gauge

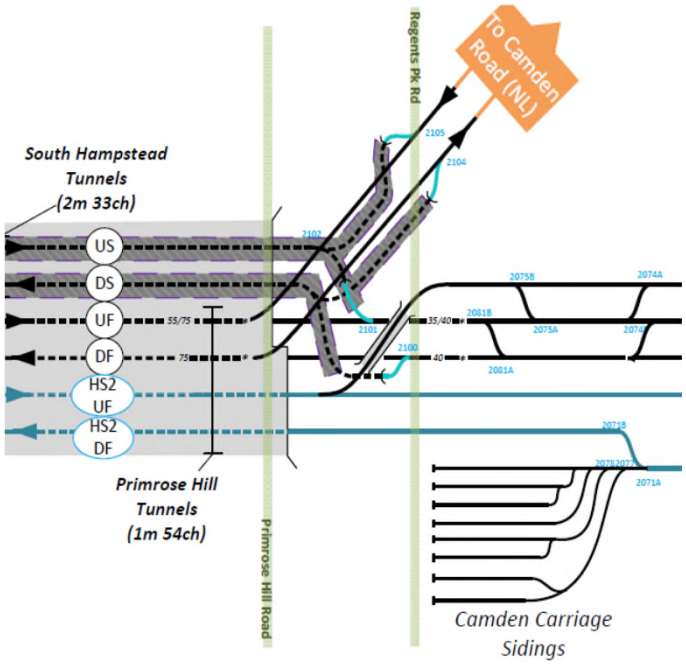


P2243 (8)

# South Hampstead tunnels

| Works | Disruption |
|---|---|
| Re-boring South Hampstead tunnels would take up to 3 years | Require closure of tunnels and terminating London Overground at Kilburn High Road |
| North London Line junction:<br>EITHER<br>Gradient of DC Line ramps may reduce length and viability of freight trains.<br>OR<br>Lengthening the ramps, if feasible, would take 12-18 months | North London (freight) Line closed during daytime and completely for several weeks |

# EE track proposal at Camden Junction




Reducing WCML to two tracks at Camden Junction would reduce WCML capacity into Euston by 25-35%

Would eliminate HS2 released train path capacity on WCML

EE proposal to reinstate WCML capacity in late 2030s impractical

Not consistent with strategic objectives for HS2 or specification in Strategic and Economic Case

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P2243 (10)

# Disadvantages of EE proposals from Old Oak Common to Euston

- Reduced capacity and capability for freight trains
- Loss of passenger train capacity on WCML released by HS2
- Lack of GC gauge capability inhibits flexibility to choose appropriate rolling stock both initially and in the longer term
- Severe disruption to passenger, freight and Bakerloo Line during construction
- Additional environmental effects to, and/or acquisition of, residential property in Queens Park.
- Additional cost and delay

# EE Euston station proposals

- HS2 and Classic services would share 22 platforms
- Relies on a link from the WCML to Crossrail at Old Oak Common to reduce requirement by 2 platforms
- HS2 and classic services Station rebuilt within, or almost within, existing railway land
- Not all HS2 platforms would be long enough for 400m trains. Long platforms to be provided by extending southwards through the concourse and Podium area
- Relies on narrow platforms which would reduce passenger flows
- New concourse above platforms
- Connection to the Underground via subway under all platforms

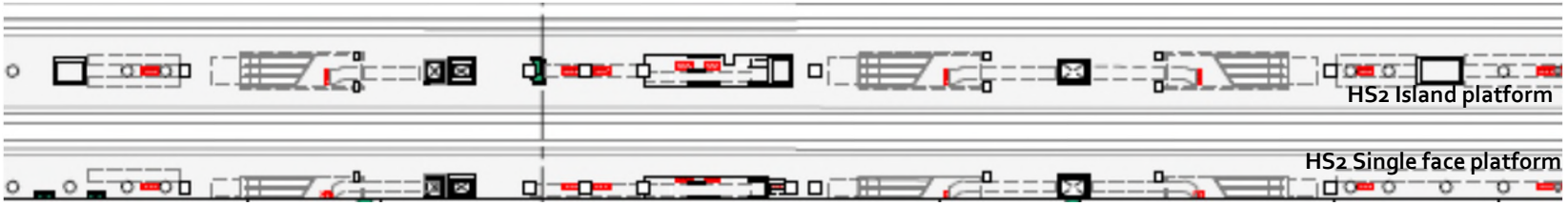
# Capacity and capability

- 11 HS2 and 13 WCML platforms are needed to serve maximum practicable route capacity.
- All 11 HS2 platforms will be in regular use for an 18tph standard service pattern, and all would be used by 400m trains
- Only 22 platforms implies a circa 20% reduction in maximum capacity on either HS2 or WCML
- There would be no space for WCML tracks without widening throat at Hampstead Road Bridge

# Platform length

- HS2 requires 11 platforms long enough for 400m trains
- Even if they were extended into Euston Square Gardens a maximum of only three platforms on the east side would be long enough
- On the west side the number of long platforms depends on how far west the station and throat are extended.

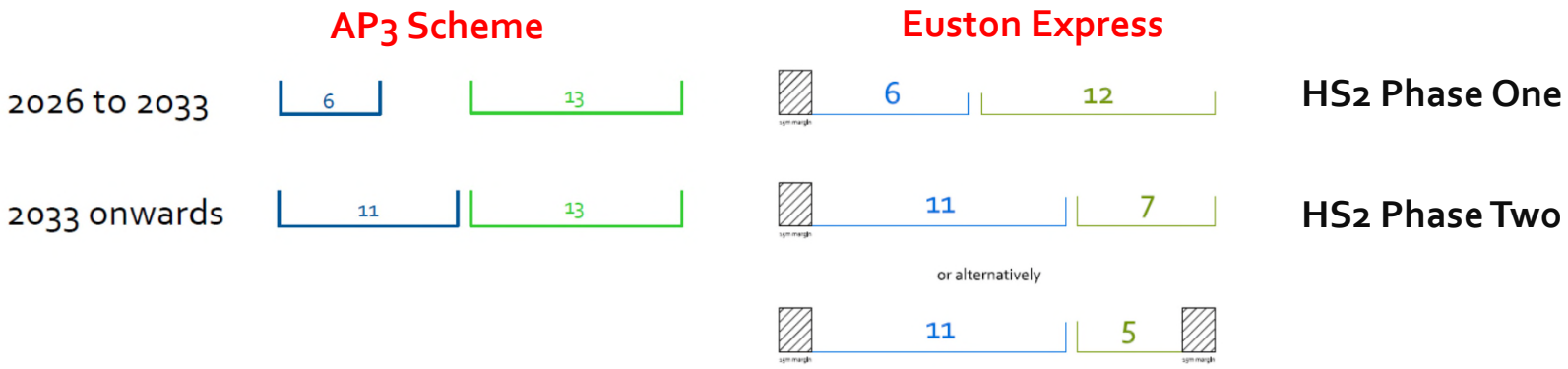
# Platform width analysis




| Platform width | | | | |
|---|---|---|---|---|
| | Platform | Escalator | Platform | Total |
| **HS2 Single face** | | 2 escalators 4.1m | 3m | 7.1m |
| **HS2 Island** | 3m | 3 escalators 5.4m | 3m | 11.4m |
| **Euston Express Island** | 3m | 4.1m | 3m | 10.1m |

- Banks of two escalators reduce total platform width by 1.3m per island platform
- Total reduction in HS2 platform width = 6.5m. 10.1m platforms would reduce OSD potential due to reduced width of support structures
- Banks of three escalators provide twice the peak direction capacity of two escalators

# Insufficient platforms



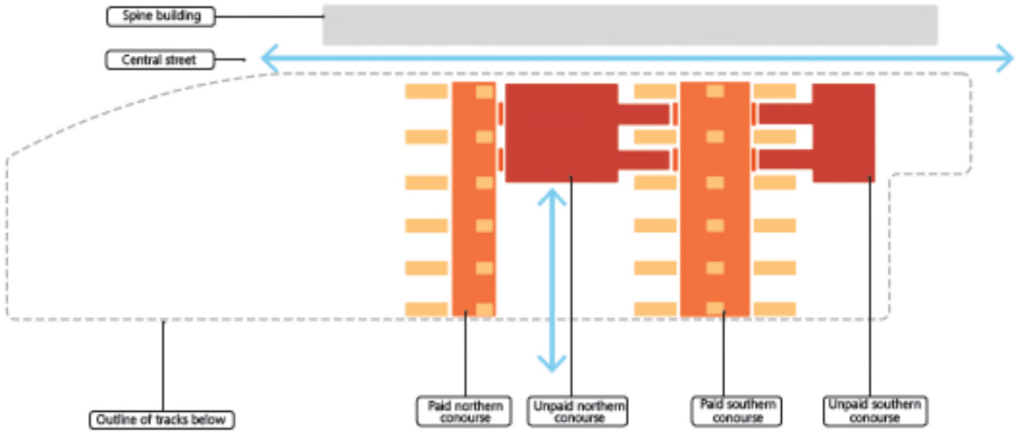

13 WCML platforms are needed after 2026

Between 2026 and 2033 the Euston Express proposal within the existing station footprint would leave space for only 12 WCML platforms

After 2033 there would be space for only 5-7 WCML platforms (depending on the extent of the edge zones)

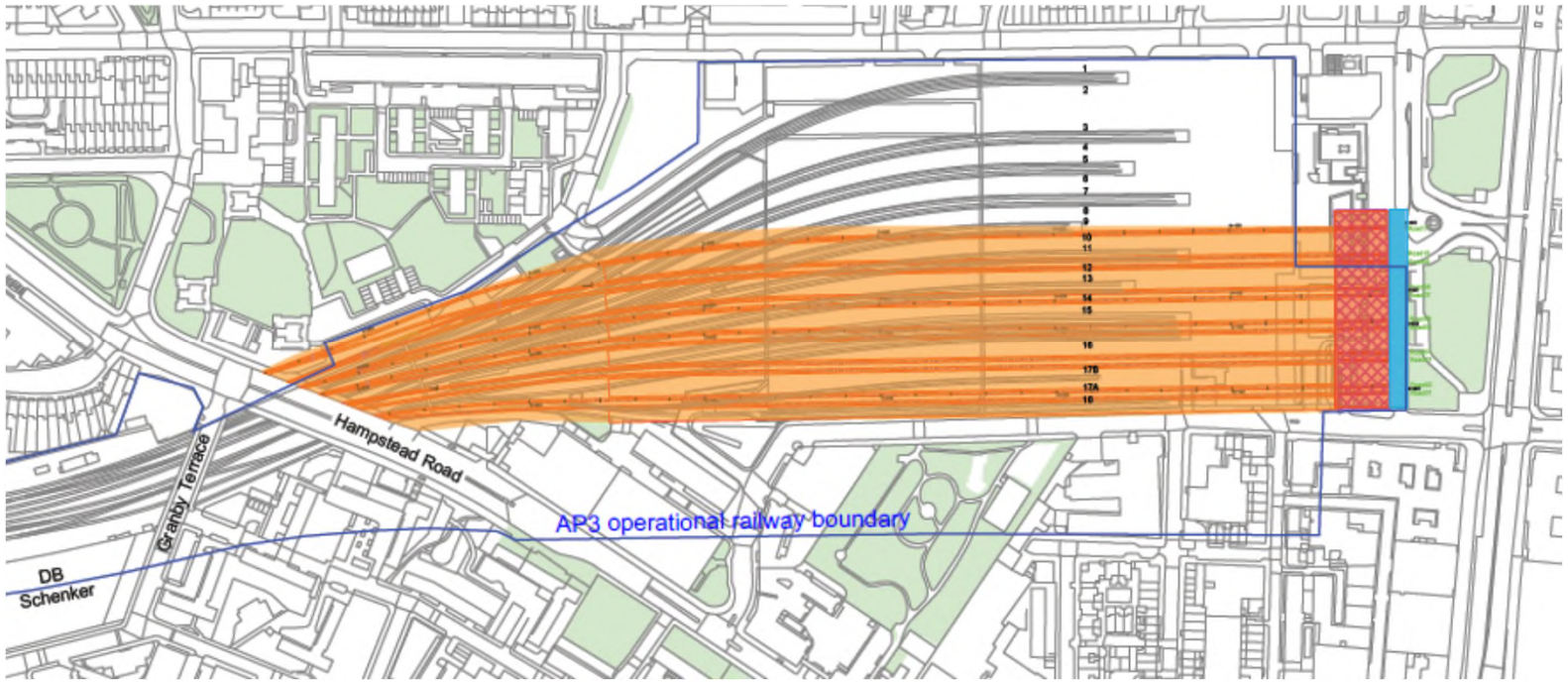
hs2 engine for growth

# Concourses



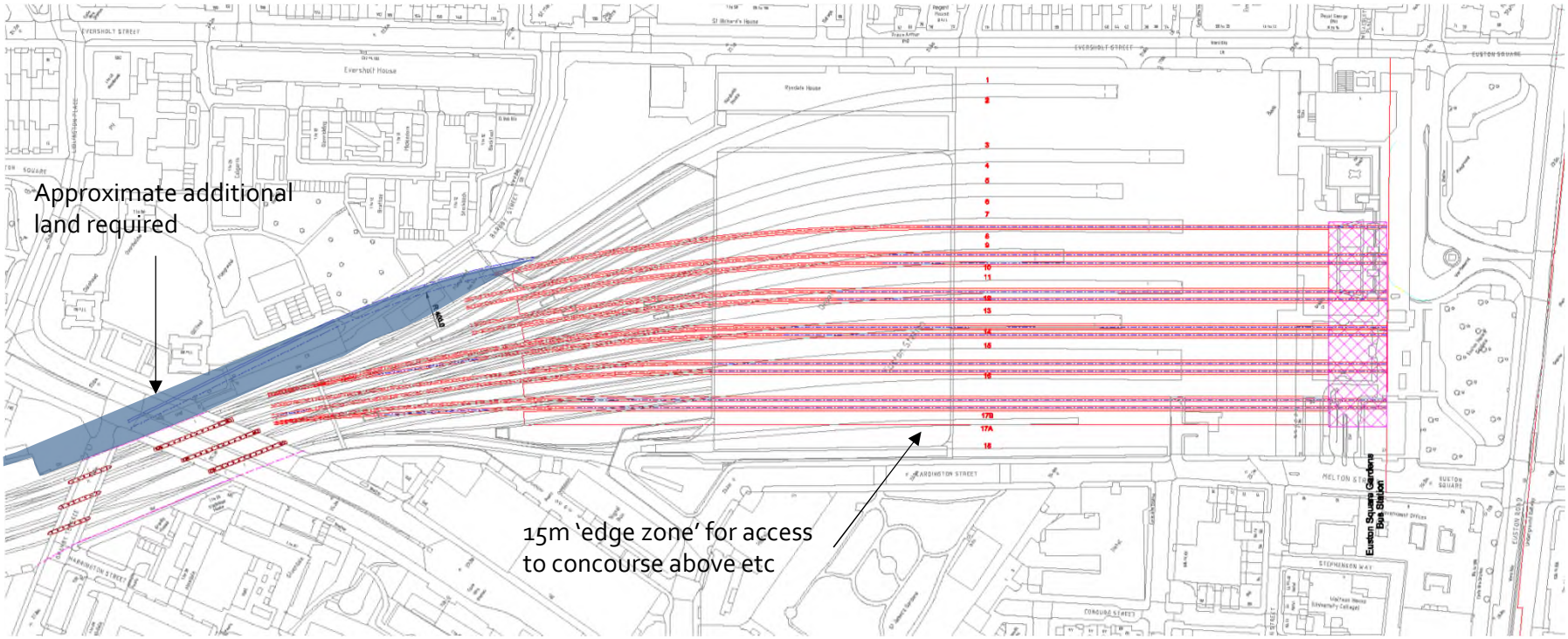

- Three banks of three HS2 escalators necessary to meet NR passenger circulation standards. They also provide resilience during maintenance, breakdown or perturbation
- HS2 escalators accessed by two 'paid side' concourses over the platforms
- Additional banks of escalators would require additional paid side concourses at an additional cost

# EE Euston Station and land requirement




- HS2 platforms and track within existing railway land not feasible
- Main site limitation is between station and DB Schenker site
- HS2 would leave insufficient space for WCML tracks without widening through Regents Park Estate

# HS2 within existing station footprint




Without encroaching into Euston Square Gardens there is insufficient space under the existing Hampstead Road Bridge for the track fan at 400m radius

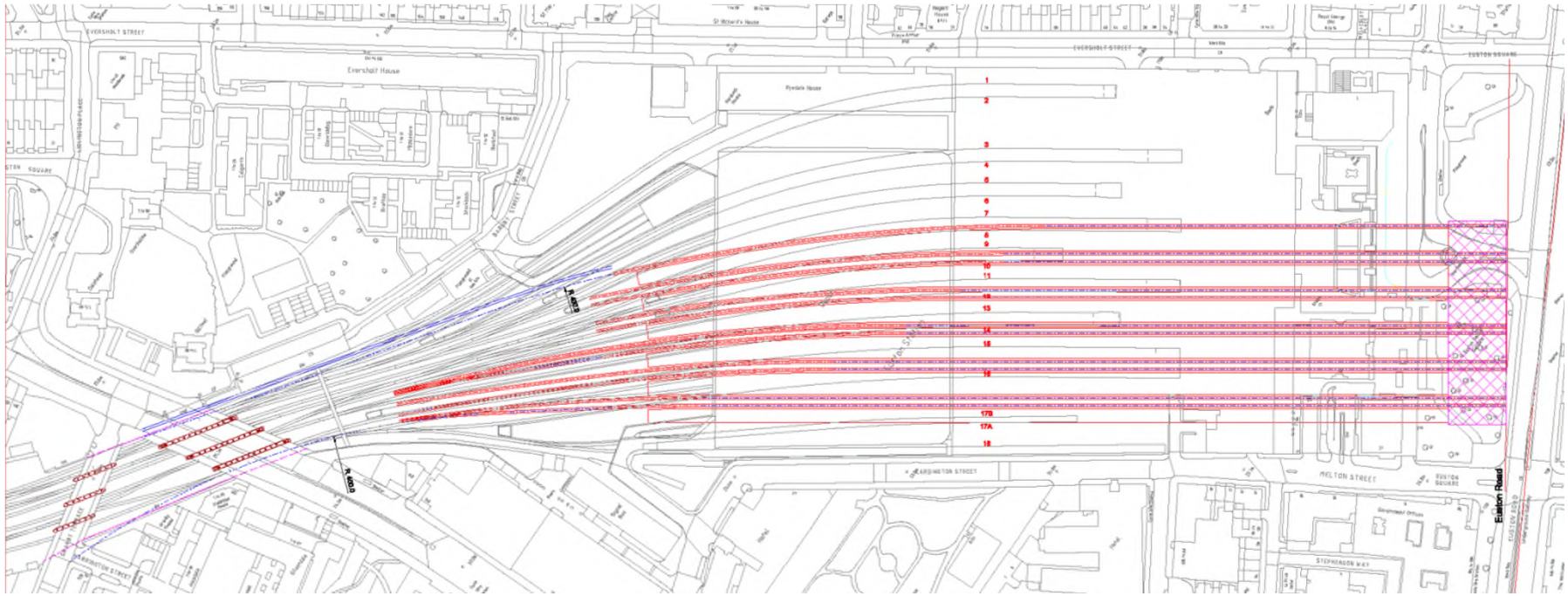


hs2 engine for growth

P2243 (19)

HOL/10018/0049

# HS2 within existing station footprint




- If HS2 platforms were extended to Euston Road there would still be no space under Hampstead Road Bridge for WCML tracks at 400m radius

# Land acquisition

- The EE proposal would still require widening the railway under the roadway in Park Village East for HS2 by 2033.
- Any scheme for an HS2 terminus at Euston would require land acquisition north of Cardington Street and on the Regents Park Estate
- At Melton St., providing even 22 platforms within the existing station would entail so many compromises on operational effectiveness and passenger space that it would not be feasible.
- Any extension west of Melton St. would entail acquisition of most of the properties between Melton St. and Cobourg St.

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**E** david.golding@networkrail.co.uk

25 November 2015

Dear Michael

**Euston Express proposal**

As you know, over the last couple of years Network Rail has been involved in several meetings with Lord Berkeley and his advisor, Jonathan Roberts, regarding the emerging ideas for Euston Express as an alternative for HS2 between Old Oak Common and Euston. During this time the Euston Express scheme has been progressed, partly in response to feedback, to form the proposal which was launched in September 2015.

Network Rail has four main concerns about this proposal:

- **Future capacity constraint**: The rail capacity between Queens Park and Euston is already constrained. HS2 is a once in a generation opportunity to increase it, by moving long distance passengers onto services on the new line. The Euston Express proposal doesn't give the step change in capacity that is needed at this critical point on the network, and we do not believe the proposed track layout will be able to cope with forecast growth on the line at 2026. Whilst ETCS has the potential to provide some relief it would require significant interventions at junctions and Euston station to make a material increase in capacity, and even then the mixed traffic nature of this part of WCML may preclude the level of benefit needed. The situation becomes worse given future expectations on capacity requirements post 2033.

- **Rebuild of Euston station**: In our view the Euston Express proposal would require a partial rebuild of Euston station because it assumes longer, conventional gauge, trains will use the existing platforms. To accommodate this many of the Euston platforms would need to be extended southwards, into the current service void, which would need to be relocated. Whilst this is possible, it results in a need to completely reconfigure the station including the parcels deck. These platform extensions may also make it necessary to change the concourse location and layout, and the way in which passengers access trains.

continued...

- **Unacceptable level of disruption:** The work needed to deliver Euston Express, especially at Queens Park and to make the changes at Euston, is likely to be highly disruptive to deliver, potentially more disruptive than the current HS2 proposals at Euston, because Euston Express doesn't create additional capacity at the station. The proposed grade separation and portal infrastructure at Queens Park would almost certainly require a reduction in the number of tracks during delivery, and probably multiple blockades. The work to re-bore the tunnels closer to Euston would also reduce the capability of the route over an extended period.

- **Does not facilitate Euston Vision:** The Euston Express proposal does not facilitate or give the opportunity for access across the site, or enable the level of development envisaged in Camden Council's planning guidance and supported by the Euston Area Plan Strategic Board.

In addition to these points we would observe that the Euston Express proposal assumes the delivery of the West Coast to Crossrail link, to reduce disruption mentioned above.

Yours sincerely

pp David Golding
Principal Strategic Planner
**Network Rail**

*cc* Roger Hargreaves – HS2 Ltd

# The Promoter's response to *Re-visioning Euston: the Euston Express Project*

25 November 2015

## Executive Summary

**The key points are:**

***Old Oak Common to Euston***

- **The EE proposal would reduce WCML (West Coast Main Line) capacity by 25-35%, effectively eliminating the released capacity created by HS2. It would be impractical to reinstate this capacity once HS2 becomes operational.**
- **Capacity for, and viability of, freight services would be compromised unless the Kilburn Goods Loop can be replaced and gradients reduced on the DC (Direct Current) Lines.**
- **The infrastructure proposed on the WCML would be very challenging to build with severe disruption to WCML passenger and freight services and the Bakerloo Line, and it would entail unacceptable night time noise to adjacent residents in Queens Park.**
- **The EE proposal would cost £100-200m more than the Euston tunnel without GC gauge clearance (£680m with GC gauge), excluding additional risk and uncosted items.**

***Euston Station***

- **The EE platform proposals would be substandard and would compromise both passenger convenience and efficient train service operation. It is unlikely that a viable scheme could be prepared that would not require acquisition of properties between Melton/Cardington Street and Cobourg Street.**
- **Most of the property to be acquired in the Regents Park Estate and on the west side of the station would be still be needed to widen the station throat. As with the Proposed Scheme, Hampstead Road and Granby Terrace bridges would need to be rebuilt. More extensive demolition in the Podium area to the south of the station would probably also be necessary.**
- **It is not clear that there are any features inherent in the EE approach that would make it less costly than the Proposed Scheme.**

Having investigated and reviewed the EE proposals, the Promoter has concluded that a scheme of this kind on the West Coast Main Line (WCML) via a portal at Queens Park could not deliver the necessary capacity and specification for HS2 as set out in the Strategic and Economic Case. Nor could any such scheme be built without unacceptable disruption to both passenger and freight services, environmental effects, and either extensive demolition of residential properties or rehousing of adjacent occupiers. Under any circumstances the EE route would cost considerably more than the Euston tunnel.

At Euston the proposals would not avoid the need to widen the railway in the throat and it would not be possible to fit the station in the existing footprint. Nor would it be likely to lead to the cost savings claimed.

*Route from Old Oak Common to Park Street*

At Queens Park, a new portal would be needed as well as a fly-over/dive-under and track work to release the fast lines for EE. Without extensive residential demolition, these works would entail either complete closure for the WCML for at least 18 months, or else the piling would need to be undertaken at night which would entail unacceptable noise to residents and would extend construction of HS2 by two years. There would be extensive disruption to the Bakerloo Line and WCML services in either event.

*Capacity*

The EE proposals entail merging all WCML lines into two tracks at Camden Junction to the east of Primrose Hill. This would reduce the capacity of the route by 25-35%, effectively eliminating the train path capacity into Euston that would be released by implementation of HS2.

It is suggested that this lost capacity could be reinstated in the late 2030s but this would not be practicable, because it would entail closure of HS2 services for an extended period as well as severe disruption to WCML services. It would also entail removing the existing fly-over at Camden Junction and providing an additional track in the Line X dive-under in Camden Cutting instead. It does not appear practicable to construct the EE Stage 3, as the vertical alignment needed to emerge from Park St tunnel and achieve headroom above Line X as proposed is unrealistic.

*Construction disruption*

Re-boring the South Hampstead tunnels to allow freight trains to access the North London Line would take approximately three years. The effects of the EE proposals on WCML freight would also be very significant. The Kilburn Goods loop would need to be replaced to maintain the capacity of the route for freight but no location for a loop of equivalent length connecting to the present Direct Current (DC) lines has been identified. The ramps from the South Hampstead tunnels to the North London Line at Primrose Hill would need to be lengthened at a shallower gradient. This work on the ramps, if it is feasible, would be likely to take 12-18 months during which time the line would be closed during the day or night. Full closure of the line for several weeks would also be necessary for final realignment of the tracks.

*Cost and GC gauge*

The EE proposal does not envisage providing the European GC gauge which is a legal requirement. Even without GC gauge the EE route from Old Oak Common would be more expensive than the Euston tunnel – estimated at £100-200m but this does not include uncosted items such as re-providing the Kilburn freight loop, reducing gradients from the South Hampstead tunnels to the North London Line or modification to the LUL car sheds at Queens Park. Nor does it include any provision for the higher risk of a surface route whose implications have been less thoroughly explored than the Proposed Scheme.

Clearing the WCML fast lines east of Queens Park to GC gauge would, amongst other things, require rebuilding ten bridges and the Primrose Hill fast line tunnel. The works would

cost in the order of £500m and if implemented at a later date as proposed, would require suspension of HS2 services to Euston for approximately 18 months.

**Euston Station proposals**

It is not possible to terminate HS2 at Euston without extending the railway footprint on the west side:

- It would still be necessary to widen Camden Cutting under the roadway in Park Village East.
- Any scheme for an HS2 terminus at Euston would require most, if not all, of the properties that the Promoter proposes to acquire north of Cardington Street and on the Regents Park Estate for the tracks in the throat.
- In practice, all the HS2 platforms need to be 400 metres long in order to operate a viable train service and it would not be possible to provide any 400m long platforms on the east side of the station without extending the platforms into Euston Square Gardens. This would entail either raising the gardens by approximately 5 metres or lowering the tracks.
- At Melton Street, providing 22 platforms would entail so many compromises on standards and operational efficiency that it is not considered feasible. Any extension west of Melton Street would entail acquisition of most of the properties between Melton Street and Cobourg Street, as partial demolition is rarely possible.

In addition the EE proposal makes no provision to accommodate future growth in demand, but assumes implementation of the Crossrail – WCML Link. In contrast, the Revised AP3 Scheme allows for more platforms to be provided as demand increases as well as sufficient space for circulation of increasing numbers of passengers within the station and a greatly enhanced interchange to London Underground.

The works could not be implemented without closure of up to half the station for an extended period during construction. St. James's Gardens, the National Temperance Hospital and Euston Square Gardens would still be needed for worksites and compounds.

Finally, it is not clear how any of the cost savings claimed could be achieved. The proposals would require a comprehensive rebuild of the station with all concourse, circulation and service areas above the platforms and extension of the station to the south. Most of the property on the west side of the station would be needed, as well as demolition of all the commercial buildings on the podium to the south. Works to the London Underground stations and interchange facilities would be at least as extensive.

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## I. Introduction

1. The Euston Express (EE) scheme is being promoted as an alternative to the Promoter's Euston tunnel and station proposals. It is argued that a reduced specification and a different design could very significantly reduce the cost and adverse effects of HS2 whilst still accruing most of the benefits. Further enhancements could be implemented in the late 2030s if they were justified by the demand.

2. In March 2014 Sam Price submitted a Petition against the HS2 Bill proposing a Euston Express scheme. No designs or details were included, so the Promoter met with Lord Berkeley and commissioned a technical report on the cost and feasibility of the scheme. Lord Berkeley was provided with a copy of this report[1] in May 2015 and it was submitted to the HS2 Select Committee on 17 July 2015. Since May, the Euston Express proposal has been revised in some respects.

3. The latest EE proposal is described in *Re-visioning Euston: the Euston Express Project*[2]. It presents an approach rather than a fully worked up scheme. In order to assess the feasibility and implications of the concept, the Promoter has had to develop it in more detail and where an element would not be practicable, the availability of a better alternative has been considered.

*4.* Re-visioning Euston proposes a single scheme to replace all the Promoter's proposals for HS2 east of Old Oak Common, including Euston Station. However, in essence it is in two parts – the alternative route between Old Oak Common and Camden Cutting, and the proposals for Euston station – either or both of which could in principle be incorporated into the Proposed Scheme if it could be demonstrated that they would offer a viable scheme that is better than the Promoter's proposals.

5. The EE proposal is presented as an incremental approach in three stages:
    - Stage 1 – during construction
    - Stage 2 – early years of operation of HS2 from the late 2020s
    - Stage 3 – later enhancements envisaged for the late 2030s and 2040s

6. This response to the Euston Express proposal is set out as follows:

| | |
|---|---|
| Section II | Summary of the Euston Express proposal |
| Section III | Meeting passenger and train service demand |
| Section IV | Analysis of the cost and implications of the proposals for the EE route between Old Oak Common and Euston. |
| Section V | Project specification and longer term enhancement (Euston Express Stage 3) |
| Section VI | The feasibility of the EE proposals for Euston Station |

[1] Euston Express Petition, Parsons Brinckerhoff and Mott MacDonald, May 2015 (PB/Mott)
[2] Re-visioning Euston: the Euston Express Project, Lord Berkeley and Jonathan Roberts, September 2015.

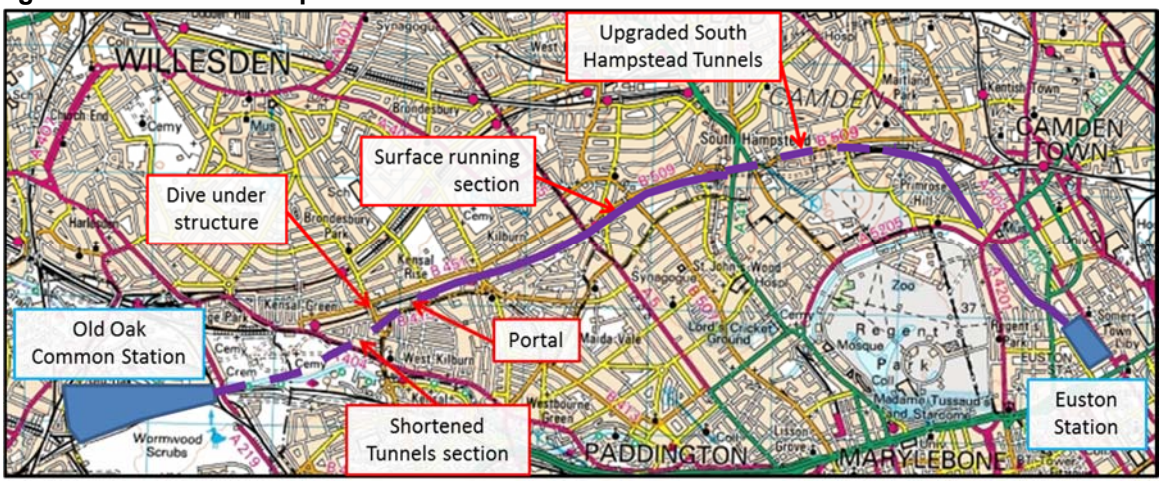
## II. The Euston Express proposal

7. The essential features of the EE proposal are summarised as follows.

8. For EE Stages 1 and 2 the route between Old Oak Common and Euston comprises:

- A tunnel from Old Oak Common to Queens Park so that HS2 can continue on the WCML to Euston
- Revision of the track layout around Queens Park Station so as to merge the slow and DC[3] lines. The existing fast lines would then be connected to the slow line tracks in order to release the existing fast line tracks for HS2.
- East of Primrose Hill tunnel, the fast and slow lines would be merged into one pair of tracks between the fast line to Line A fly-over at Camden Junction and the Camden Carriage sidings.
- Reboring the South Hampstead DC line tunnels so that freight trains can access the North London Line.
- No additional gauge clearance on existing fast and slow lines would be provided.
- The Crossrail-WCML Link would be implemented to reduce the demand for train paths on the WCML and the requirement for platforms at Euston

**Figure 1: The Euston Express route**




9. The effect of this proposal would be that all WCML slow and DC line services into Euston would run on a single pair of tracks between Queens Park and the Line A flyover. From there for approximately 400m, all WCML services would share two tracks. Thereafter, HS2 and WCML services would share five tracks into Euston.

10. The main characteristics of the proposals for Euston station and throat are:

- Rebuild Euston Station and approach tracks within the existing railway footprint to provide:
  - A total of 22 platforms to be shared between HS2 and WCML trains

[3] 'Direct Current' Lines currently used by the London Overground 3tph service between Watford Junction and Euston and the Bakerloo Line between Harrow & Wealdstone and Queens Park.

- Only some of the HS2 platforms to be 400m long, achieved by extension southwards.

11. The EE proposal includes a Stage 3 to reinstate the lost WCML capacity and build up to the necessary capability specification incrementally, the enhancements to be implemented in the late 2030s onwards if and when demand builds up. Stage 3 comprises:
    - double-tracking the single track Line X underpass in Camden Cutting and six-tracking[4] the section of route between Primrose Hill and Chalk Farm. The Line X double-tracking would need to be implemented first as adding two more tracks in the Chalk Farm area would entail demolition of the fast line fly-over to Line A at Camden Junction[5];
    - Postponement of a decision on introducing European GC gauge until the 2040s.

## III. Meeting passenger and train service demand

12. The Promoter's future baseline demand and the forecasts for Euston with HS2 are set out in the main ES Vol.5 Transport Assessment Part 4 Tables 6-116 and 6-117 for 2026 (p.6-380) and Tables 6-123 and 6-124 for 2041 (p. 6-410-411). However, since 2013, TfL has updated its transport models with new base data and input forecasts, and long distance rail demand has been added from the DfT's PLANET Modelling Framework. As a consequence the forecast rail passenger demand at Euston has substantially increased. It is currently predicted that without HS2, inbound a.m. peak period rail patronage at Euston will increase by 52% between 2012 and 2026 and 78% 2012-2041. With HS2 the forecast increases are 71% (Phase 1) and 148% (Phase 2) respectively[6]. The additional interchange and circulation capacity to be provided in the Promoter's Revised AP3 Scheme is essential both for growth in underlying passenger demand as well as for additional HS2 passengers at Euston.

13. The number of trains that are intended to be run reflects not only the number of passengers wishing to travel, but also on origins and destinations. A key feature of the strategy for HS2 is to re-use the released capacity created to provide for flows that are currently not well served in the current timetable. If the number of trains that can be run is limited, then a tension arises between catering for demand on the busiest flows and providing reasonably for other flows not currently served.

14. The EE proposal to reduce the capacity of the WCML at Camden Junction and provide a maximum of only 22 platforms at Euston would inhibit the scope for increasing the number and frequency of direct services to London and for serving growing demand.

[4] 2 X HS2, 2 X fast, 2 X slow
[5] Figure 7 below shows the existing WCML track layout
[6] AP3 2026 SES2 and AP3 ES Vol.5 Transport Assessment Part 2 Table 162 p.464 and Table 178 p.524

## IV. Old Oak Common to Euston

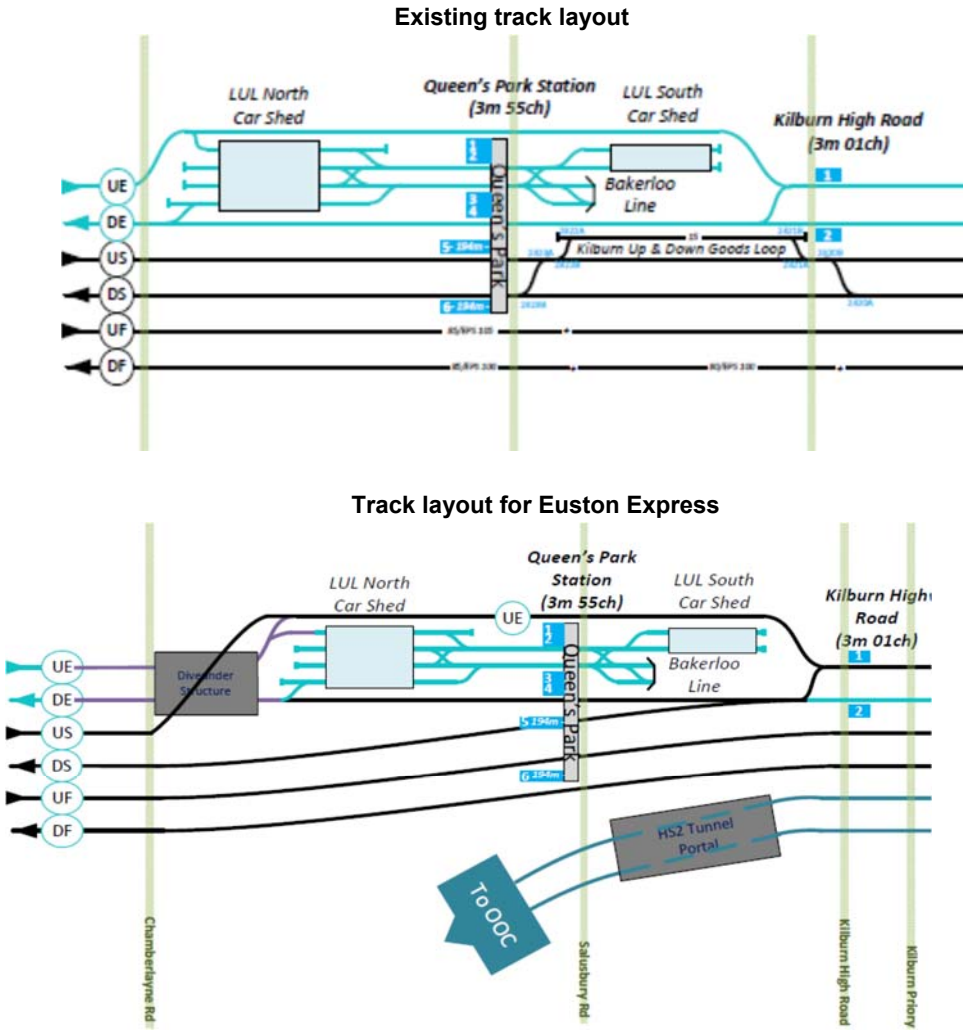
15. The EE proposal would necessitate works on the West Coast Main Line (WCML) in two main locations – Queens Park and Primrose Hill, though extensive works would also be necessary elsewhere along the route to raise bridges, realign tracks etc.

**Queens Park**

16. Figure 2 shows the track layout around Queens Park station where the Bakerloo Line diverges from the DC lines. The Bakerloo Line leaves the WCML just west of the London Underground North Car Shed and continues through the station and eastwards in tunnel, while the DC line tracks run north and south of the station and the LUL carriage sheds and on to Primrose Hill.

17. The EE proposal would release the fast line corridor on the south side of the WCML by slewing the existing fast lines onto the slow line tracks, and the slow lines would be connected into the DC lines. Figure 2 also shows EE's proposed layout.

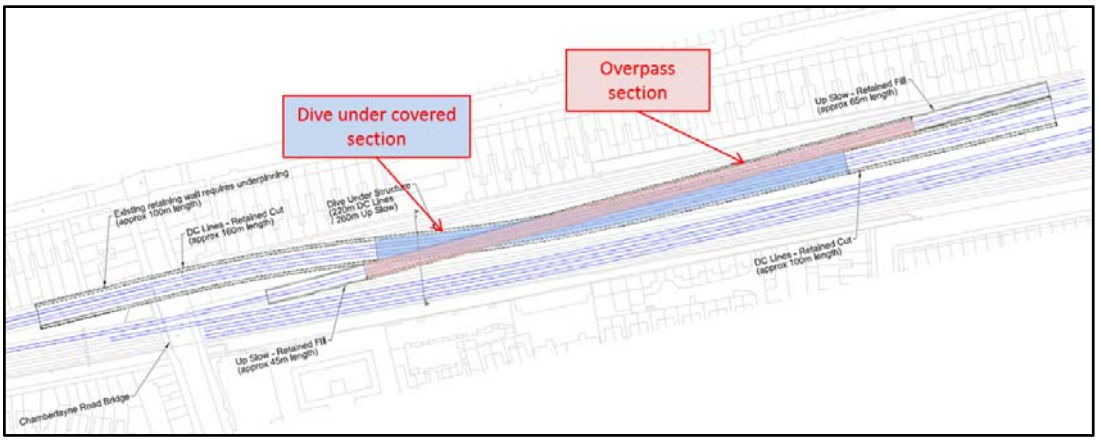
**Figure 2 Track layout at Queens Park**



*Fly-over/dive under structure to merge the slow and DC lines*

18. In order to merge the slow lines with the DC lines the 'Up Slow' (towards Euston) track must cross the DC lines. To maintain the necessary capacity, a fly-over/dive-under structure west of the station would be necessary (See Figure 3). This structure must be located in the vicinity of Chamberlayne Road. The site is currently occupied by Travis Perkins. The track alignment would probably entail some modification to the London Underground North Car Shed, which should be feasible, but this would add to the cost and disruption during construction. With the dive under in place, the Down Slow line could be connected into the Down DC line to the east of the station on the surface.

**Figure 2 Slow/DC Line dive-under**

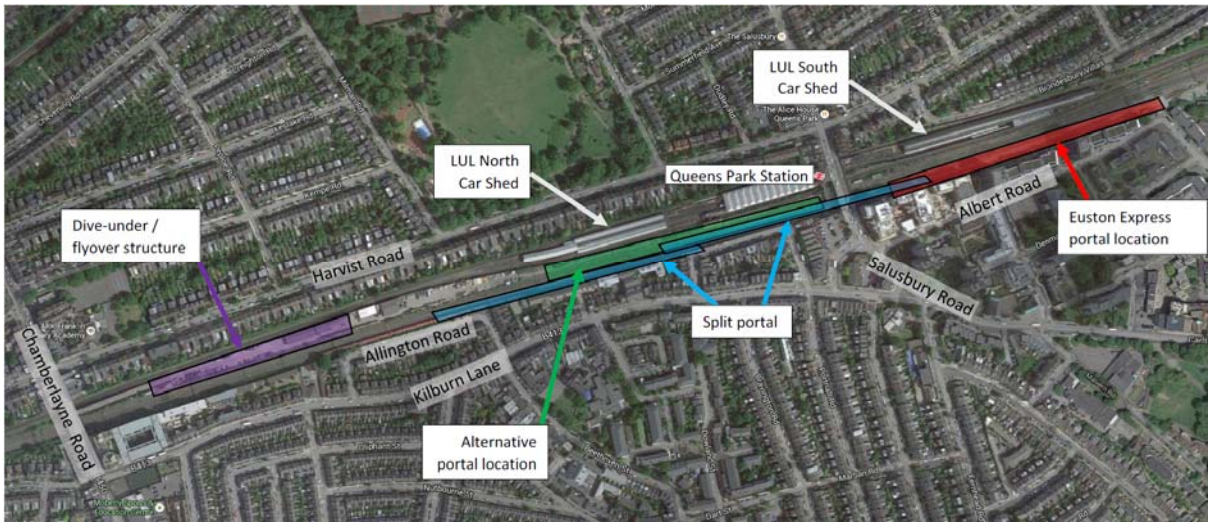



19. In order to build the fly-over/dive-under structure, even at maximum gradients the Up Slow line would need to be raised in the vicinity of Chamberlayne Road to ensure sufficient headroom clearance to the Down DC line. This would entail raising Chamberlayne Road bridge by approximately 2 metres. The civil engineering works for the fly-over/dive-under would extend over approximately 1 km in a location where existing housing abuts the railway on both sides of the WCML, and would take just over two years to complete. The works would also cause severe disruption to Bakerloo line services for approximately 12 months.

*HS2 Queens Park portal*

20. Euston Express originally proposed a portal at Queens Park for the HS2 tunnels that would be located to the east of the station and Salusbury Road. The Promoter considered seven options for this portal before concluding that none could be built without extensive demolition of residential property (See PB/Mott Section 6.3 and Appendix D). Accordingly, a location immediately to the south of the station was suggested as it is the only location where the WCML is wide enough for the portal to be built within existing railway land. Figure 4 shows these locations shaded red and green respectively.

**Figure 4: Portal and fly-over/dive-under locations**




21. Two options for an HS2 portal south of Queens Park station were considered, only one of which would be feasible (See PB/Mott Section 6.4). The portal and ramp would be over 520m long and would need to be built in two stages. It would take approximately 2½ years to build. Compared with the Promoter's Euston tunnel proposal, construction work for the EE proposals at Queens Park would add two years to the overall construction programme.

22. In *Re-visioning Euston* (p.24), the promoters of EE criticise this analysis and instead propose that the HS2 portal should be staggered to reduce the width of the land required. Though in principle this arrangement could be fitted more or less within the railway boundary, it would present other problems. The structures would extend over 600m with almost continuous residential property adjoining the railway on the south side. The location is shaded blue on Figure 4.

*Construction and environmental impact*

23. The fly-over/dive-under would be a major structure on a very constrained site between and across operational railway lines. Access would be difficult and there would be little or no space on railway land for a construction compound. The railway is at approximately ground level and for the whole length of the site it runs along the gardens of the houses in Harvist Road.

24. Construction of the HS2 portal at Queens Park would be at least as challenging as the DC Line fly-over/dive-under. The fast lines at Queens Park occupy a strip of land only 10-11m wide with houses and flats on the south side close to the railway along the whole length. There would be no available space for construction compounds without encroaching on adjacent land and on such a narrow strip construction work would be too close to the operational railway to be undertaken during the daytime while the trains are running.

25. It would be much more difficult and disruptive to build the portal at Queens Park than at Park St. because at Queens Park the railway is at ground level and most of the housing

is not set back by the width of a road. Erecting effective noise barriers during construction would not be possible. This is very different from Camden Cutting where the HS2 construction site would be 24m at its narrowest part and it is generally much wider. Also the WCML is approximately10m below street level at the HS2 portal in Camden Cutting.

26. A staggered portal would avoid demolition of adjoining residential, community and commercial properties, but it would be very difficult to install contiguous wall piles to provide the retaining walls for the ramps on a site over 600m long and 10-11m wide. Network Rail (NR) requirements for piling adjacent to running lines[7] states that piling rigs must be orientated perpendicular to the running lines when installing piles. Progress would be slow as it would not be possible to deploy more than three piling rigs & crews at a time due to access restrictions for materials both into and out of the work area.

27. The NR requirement for safe operating distance for construction machinery from live overhead lines (OHL) is 3.00m assuming a suitable physical barrier is in place such as a timber hoarding. Consequently, OHL's will need to be isolated whenever the piling works are carried out. Night-time (and possibly weekend) rail possessions of the two closest adjacent lines would be necessary as otherwise all fast line train services would have to be suspended. Such night-time possessions would in reality amount to around 4 hours of working allowing for OHL to be de-energised before and re-energised following the works.

28. Piles for the retaining structures are likely to be up to 1.5m diameter and it would take two nights to complete a pile, so a maximum output of only nine piles per week is likely, based on three rigs working six night-shifts per week. Piling works would therefore take in the order of 24 months to complete, including completion of the pile trimming and capping beam works. Excavation works would then follow on after this, so overall the civil engineering works would be likely to take around 2½ years to complete. This excludes any periods when the Tunnel Boring Machines are received and removed at the portals and rail systems are installed.

29. The work would take place as little as 4m from residential facades, so noise levels would be very high and could not be mitigated without rehousing the worst affected residents during construction.

30. The night-time construction noise levels at Queens Park would be considerably higher than the predicted levels for the HS2 portal works in Camden Cutting which are in a wide and deep cutting between high retaining walls structures that would help to screen the noise and allow for the erection of effective noise barriers.

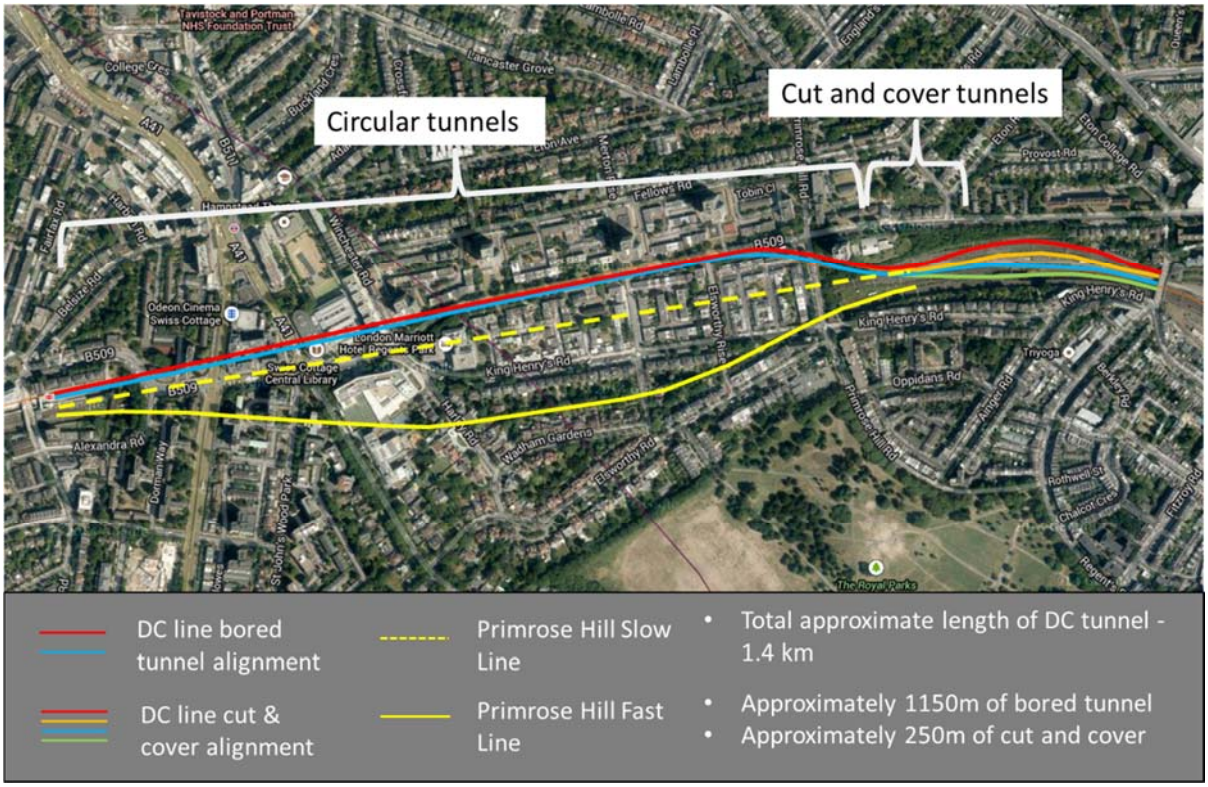
**Primrose Hill**

31. All six WCML tracks are in tunnel under Primrose Hill (see Figure 5). The DC Line tracks are in are in two separate tunnels (the 1.4 km South Hampstead tunnels) and the fast and slow tracks are in two two-track tunnels (the Primrose Hill tunnels, approximately

[7] See NR document Ref: NR/L3/INI/CP0063

1km long). Both the DC and slow lines connect to the North London Line (NLL) east of the tunnels at Camden Junction. At this junction there is also a fly-over from the fast lines to Line A on the north side of the WCML so that long distance trains can access the low number platforms on the Eversholt Street side of the station.

**Figure 5: South Hampstead and Primrose Hill tunnels**



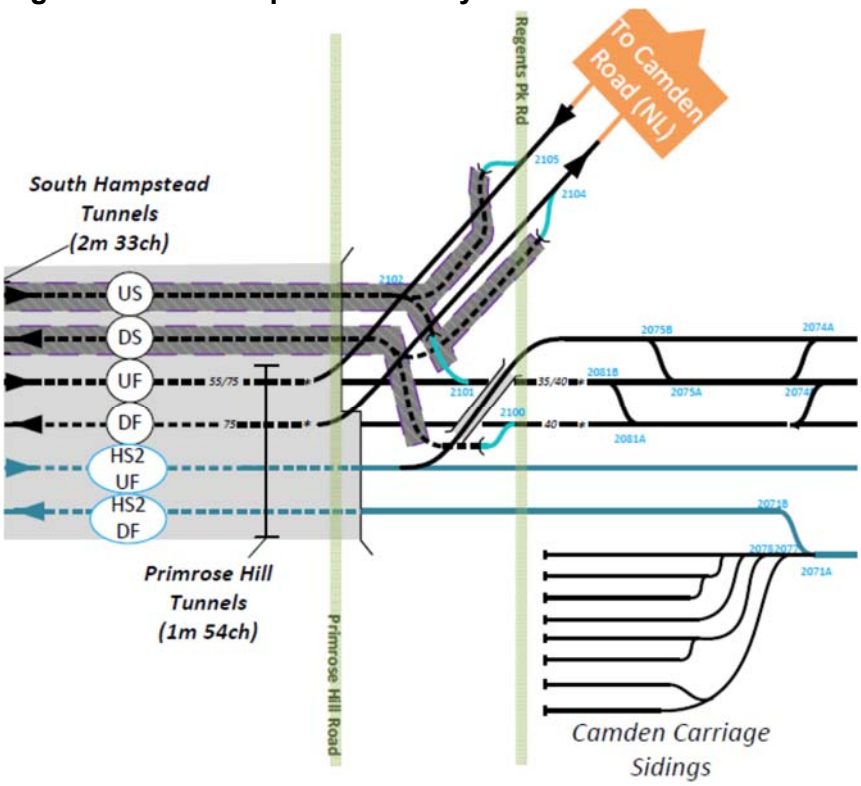

*Passenger service capacity*

32. Between Queens Park, where the EE proposal would merge the DC and slow lines, and Camden Junction, the London Overground passenger service would have to share the line with slow line passenger services as well as with freight trains. Capacity would be limited by the difference in speed between London Overground trains calling at Queens Park, Kilburn and South Hampstead and other services not calling at those stations. A peak passenger service of up to 12 trains per hour (tph) might be accommodated on this section of the route, on the assumption that, as now, freight services do not run in the peak direction during the height of the peak. Off-peak, freight pathing opportunities would also be limited (unless it is assumed that most suburban trains are diverted from the WCML to Crossrail.

33. Between Camden Junction and Chalk Farm, the EE proposal would merge the DC/slow lines with the fast lines so that for a distance of approximately 400m all WCML passenger trains to and from Euston would share a single pair of tracks. (see Figure 6) In the busiest 60 minutes during the a.m. peak in the current WCML timetable, 27 passenger trains run over this section of track into Euston and 25tph in the busiest p.m. hour.

34. After implementation of HS2, the current working assumption is that up to 25 trains per hour would operate in and out of the classic platforms at Euston, as long distance trains are replaced by medium- and short-distance services. On the current planning rules requiring a 3-minute headway, only 20tph would be possible and that would assume no spare capacity to ensure reliability of train service operations. Though instances of shorter headways are cited in *Re-visioning Euston* (p.23), these are not comparable with the Euston approaches, for instance in relation to signal sighting.

**Figure 6 Euston Express track layout at Camden Junction**




35. In order to relieve the demand for train paths on this section of the WCML, the EE proposal assumes implementation of the Crossrail-WCML (CRL-WCML) Link, as it would divert 6tph Euston slow line trains onto Crossrail at Old Oak Common.

36. The CRL-WCML Link is an independent project that must be justified on its own merits and amongst other things will have to demonstrate a viable business case before it becomes a committed scheme. At this stage no decision has been taken on whether the Link scheme should be taken forward. It cannot therefore be assumed that it will relieve track capacity constraints at Chalk farm or reduce the number of platforms required at Euston.

37. On a like for like comparison, reducing the WCML at Chalk Farm to two tracks would result in a 25-35% reduction of the passenger train capacity on the route into Euston. This would effectively eliminate all the train path capacity on the WCML that would be released by HS2 for additional inner and outer suburban train services. This would severely limit the ability of the WCML to release capacity for growth in suburban and medium-distance demand. In addition, reducing the number of trains is likely to be to the

detriment of the areas in the WCML catchment where there is an aspiration for a direct connection to Euston but no service in the current timetable.

38. It is also likely that the Euston station throat would need to be significantly altered if the present multiple track approach feeding largely separate groups of platforms is replaced by a single, intensively-used, pair of tracks. The feasibility and cost of this work has not been assessed.

**Rail freight**

39. The WCML slow lines carry freight trains to and from the North London Line through the Primrose Hill tunnel and Camden Junction, including container trains requiring 'W12 gauge' clearance. This is a key transport artery as, amongst other things, it connects the Thames Estuary and Haven ports to the Midlands and the north. The EE proposal to run slow line services on the DC lines from Queens Park would require clearing the line to W12 gauge including four bridges, and re-boring the two South Hampstead tunnels. It is estimated that reboring the tunnels would take three years, during which time they would be closed to London Overground passenger trains[8], though they might still be able to run between Watford and Kilburn High Road.

40. The gradient between the South Hampstead tunnels and the North London Line is currently 1:35 to 1:40. Though this is feasible for most passenger trains, it is not realistic for long freight trains, as "good practice" identified in Network Rail's Group Standards is to allow no more severe gradient than 1 in 100 for freight trains. Unless the ramps are extended to reduce the gradients, train loads and therefore the capacity of the North London Line would be reduced on a line where there is growing demand and a limited supply of freight paths. The additional cost to freight operators of reducing train loads could also affect the viability of some rail freight services, whilst lengthening the ramps would increase the cost of the EE proposal and might not be practicable depending on how far they would need to be extended.

41. A further implication of the EE proposal for freight is that the Kilburn Goods Loop would be eliminated by the track work to merge the Slow and DC lines between Queens Park and Kilburn High Road. The loop is necessary to hold freight trains on the WCML slow lines until a matching path becomes available on the North London Line, and vice versa. The current loop is approximately 550m long. Due to space constraints the loop would be reduced to 200-225m. This would severely reduce the length of freight trains (or utilisation of freight paths) unless a new loop of equivalent length can be provided elsewhere between Queens Park and Camden Junction. This may not be possible as no site has been identified.

[8] Overground passenger services might still be able to run between Watford and Kilburn High Road.

**Euston Express Link or Euston tunnel?**

42. The Promoter's proposed Euston tunnel would provide a full HS2 train service in tunnel to Euston for an estimated £564m[9].

43. The Promoter's analysis of the Euston Express proposal showed that it would be more expensive than the Euston Tunnel, more difficult to build and would have a far inferior operational capability. They estimated that the cost of the Euston Express proposed link to Queens Park and the associated works on the WCML would be £1,245m. This would be £681m more expensive than the Promoter's Euston tunnel proposal[10].

44. The Euston Express scheme that The Promoter costed was for a full HS2 service to Euston. If, as the Petitioner proposes, only classic compatible trains continue to Euston, it would not be necessary to clear the existing WCML fast line tunnels and bridges between Queens Park and Euston to GC gauge for the larger HS2 trains. As a consequence the additional cost of the Euston Express scheme would be reduced. But it would still be approximately £100-200m more than the Proposed Scheme.

45. The Euston Express scheme would also entail substantial shortcomings, including:

- Severe disruption to passenger, freight and Bakerloo Line during construction
- Lack of capability to run 200m and 400m 'captive' HS2 trains
- Loss of released capacity
- Additional environmental effects to, and/or acquisition of, residential property in Queens Park.
- Significantly reduced capacity and capability for freight trains.

## V. Project specification and Euston Express Stage 3

46. Even if Stages 1 and 2 of the EE proposal could be implemented without unacceptable disruption to train services or environmental effects on adjacent areas, it would not deliver the released capacity benefits on the WCML or the GC gauge capability. The EE proposal includes a Stage 3 to implement these enhancements in the late 2030s or 2040s if they can be justified at that time. The Promoter considers this approach impractical.

*Chalk Farm capacity and Line X*

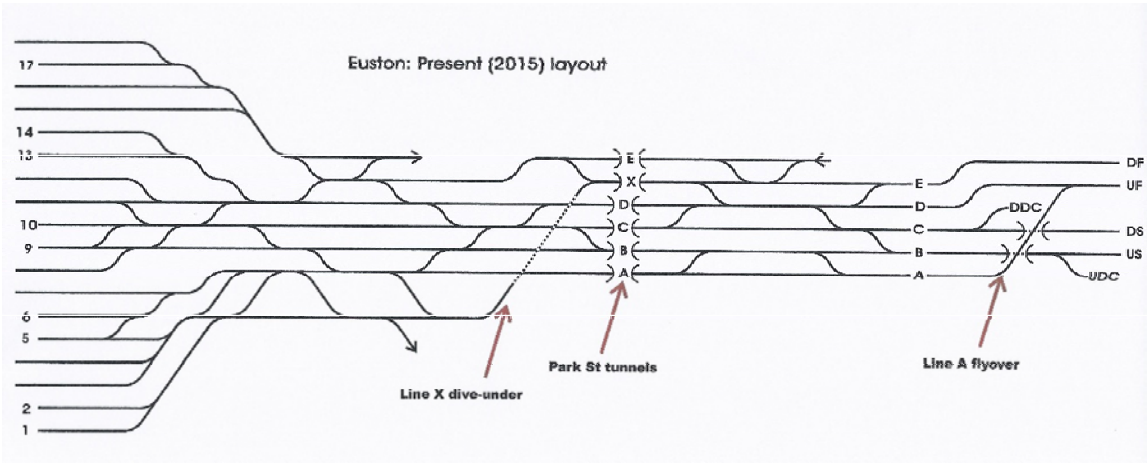
47. Having reduced the WCML to two tracks at Camden Junction in Stage 2, EE proposes that four fast and slow line tracks be reinstated in Stage 3. This cannot be achieved without demolishing the Line A fly-over. EE proposes to remove the fly-over and instead to provide two tracks through the dive-under currently occupied by Line X in Camden Cutting, which was originally a two track tunnel. The existing track layout between Camden Junction and Euston is shown in Figure 7.

[9] PB/Mott p.104. All estimates excluding escalation, risk, contingency, land and property and client costs.
[10] These figures do not include the cost of any proposals south of the portal.

48. In order to connect both HS2 tracks to the dive-under tracks, the two HS2 tracks would pass through the existing Park Street Lower Tunnel and then split to form a 4 track approach to the station. One pair of tracks would pass beneath the existing WCML in the dive-under to serve the east side of the station. The other would continue south to serve the west side of the station. For the level of service required by HS2 (18tph) this would need to incorporate a 'grade separated' junction (one set of tracks passing over the other). Initial studies suggest there is insufficient distance between the existing Park Street Tunnel portal and dive-under structures to provide for the grade separation without major reconstruction of the dive-under.

49. In addition, there would be considerable disruption to WCML train services while the Line A fly-over is demolished and the additional tracks provided. As it would be so expensive and disruptive to implement these works after HS2 is operational and when demand pressures on Camden Junction would be acute, the Promoter has concluded that any EE Stage 3 capacity enhancement would need to be implemented before 2026, not after. No practicable solution has been advanced to reinstate the lost capacity and the Promoter concludes that this aspect of the EE proposal would not be consistent with the strategic objectives for HS2, nor deliver the specification or benefits set out in the HS2 Strategic and Economic cases.

**Figure 7: Track layout Chalk Farm to Euston**




*GC Gauge*

50. It is a European legal requirement that high speed lines be built to GC gauge and this will allow HS2 to operate the larger European size high-speed trains between cities on the high speed network. The Euston Express proposal could not provide GC gauge to Euston except for an additional cost in the order of £500m, though it does propose passive provision for GC gauge on some platforms in the station. In any event, the Promoter is not considering seeking a derogation from the European GC gauge requirement as it is important to retain the flexibility to choose the appropriate rolling stock, both now and in the future, without being constrained by infrastructure limitations.

51. The advantages of providing dedicated high-speed infrastructure and GC gauge capability include:

- Enabling use of standard European train design (for captive trains) and railway systems design
- Significantly simplified train design, eliminating the need for dedicated HS2 “Captive” trains to provide compatibility with classic railway signalling, track and electrification.
- It sets a new standard for a future wider UK high speed rail network (i.e. not perpetuating legacy limitations)
- It allows for increased train internal space, providing improved passenger experience and (potentially) increased seating capacity
- It allows for potential future adoption of double deck trains
- Ability to use standard European designs for ‘on track machinery’ and not require bespoke equipment for the UK structural gauge

52. The implications of providing the infrastructure to GC gauge are relatively small if included in the design from the start. But it would be extremely expensive and disruptive to build all or part of HS2 to a smaller gauge and then clear the route to GC gauge a few years afterwards.

## VI. Euston station

### The EE proposal for Euston Station

53. Pages 41-45 of *Revisioning Euston* describe the EE proposal for an HS2 terminus at Euston within existing railway land. It is proposed to reduce the specification in order to minimise the need to acquire land to the west of the station, rather than to provide capacity, operability or passenger experience for the longer term. The promoters of the EE proposal maintain that ‘Euston need not expand much or at all beyond its existing width footprint at any foreseeable period in the future’, though to date no drawings have been provided to substantiate this claim.

54. In addition to implementing the Crossrail to WCML Link in order to reduce the specification by 2 platforms, the EE proposal also entails either modifying WCML platforms 1-18 to provide four additional platforms or else a comprehensive reconfiguration to provide a total of 22 platforms. It also proposes extending the platforms southwards under the podium.

55. In summary, the EE proposal for Euston station comprises the following:

- 11 HS2 and 11 Classic platforms plus Crossrail-WCML Link
- HS2 and classic services share platforms
- Only some HS2 platforms need to be long enough for 400m trains
- All HS2 trains to Euston should be classic compatible
- Platform escalators should be in banks of two instead of three
- Long platforms can be provided by extending southwards.

56. At various stages in the evolution of the Proposed Scheme, the Promoter has considered the elements of the EE proposal, but nevertheless has now reviewed them as a

complete package as proposed in *Revisioning Euston*. However, the analysis indicates that little reduction in land acquisition would result from the EE proposal even if the reduced specification were accepted, because the throat would still need to be widened in the Granby terrace area and a viable scheme would extend west of Melton St./Cardington St.

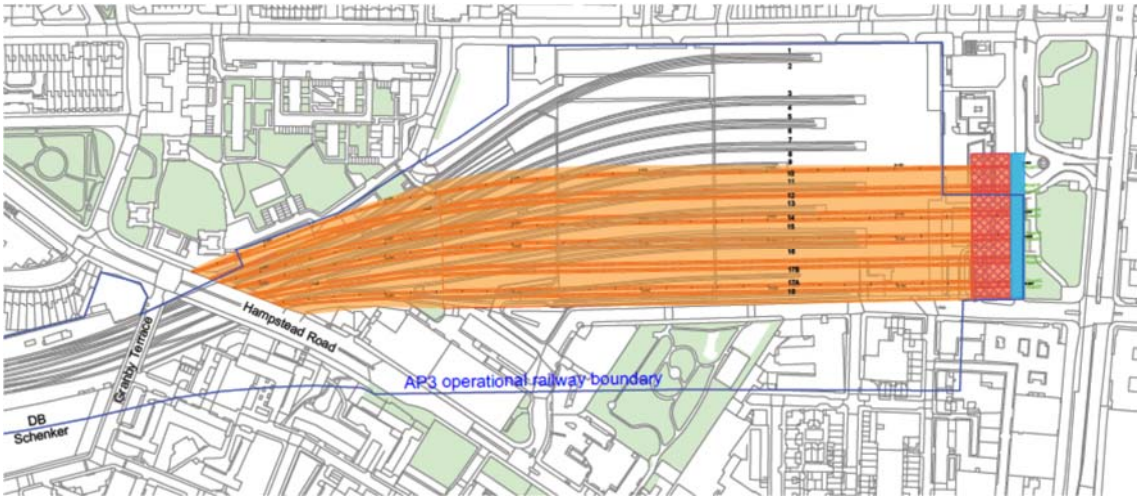
*Track layout in the station throat*

57. The WCML approaches Euston Station on a curve and passes through a narrow throat between Granby Terrace and the station where the tracks fan out into the platforms. This configuration affects both the length and curvature of the Euston platforms and has to be addressed in any scheme to extend the station.

58. North of Granby Terrace the DB Schenker site provides sufficient space for the HS2 tracks and the only widening necessary is under the Park Village East roadway in order to create space for the HS2 dive-under. If HS2 approached Euston through Park St. tunnel as in the EE proposal, it would be still be necessary to widen the railway at Park Village East.

59. At Granby Terrace, the existing WCML tracks are 40m wide and fill the available space. The width of the railway at this point needs to be extended by a minimum of 35m for the HS2 tracks just south of the cross-overs, irrespective of the length, width or number of platforms at Euston. Figure 8 illustrates the effect on the WCML of building the HS2 tracks within existing railway land at Hampstead Road Bridge.

**Figure 8 Effect of building HS2 platforms within existing station**




60. By Hampstead Road bridge the minimum width required for HS2 has increased to 75m as the tracks start to fan out into the platforms. At this point the land required for the HS2 tracks could not be reduced by much even if the HS2 platforms could be fitted into the existing station footprint and extended southwards. Hampstead Road Bridge would still need to be rebuilt and almost all the blocks of flats on the Regents Park Estate that would be acquired for the Proposed Scheme would also be needed for the EE proposal.

*HS2 platform length*

61. The Promoter does not accept the Euston Express contention that not all the HS2 platforms need to be capable of accepting 400 metre trains. In any realistic HS2 Phase 2 timetable it is likely that all the 11 HS2 platforms at Euston would be used by 400m trains in the standard service pattern. It is thus necessary that all platforms should be able to accept them. Even if the timetable could be rearranged to concentrate 400m trains into a selection of platforms only, operational requirements and flexibility would be compromised because:

    - Platform allocation could alter in response to minor changes to the planned timetable or rolling stock cycles;
    - In the event of disruption to the train service, the platforms for arriving trains may need to be reallocated;
    - At start-up and close-down the standard platform workings need to be able to alter so as to promote circulation of units through the depots;
    - Platform allocations at start-up and close-down will also alter routinely as there is a requirement to take some platforms out of use for maintenance each night; and
    - Ability to combine 200 metre units into 400 metre trains at close-down and start-up minimises the number of early and late train movements between Curzon Street (for Washwood Heath depot) and Euston.

*Extending the platforms southwards*

62. Extending the platforms southwards would take up the whole of the existing concourse as well as the podium area, and the London Underground ticket Hall would need to be rebuilt. Even so, there would be limited opportunity for providing platforms long enough for 400m trains:

    - If, as the EE proposal implies, two additional platforms are built between existing platforms 2 and 3, at most only three long platforms could be provided on the east side of the station without encroaching into Euston Square Gardens. Any platform extension into the gardens would entail raising the level of the affected area by approximately 5 metres or track lowering;

    - The number of long platforms that can be provided on the west side depends on how far west the station and throat are extended.

*Station and platform width*

63. Euston Station is 200m wide between Melton Street and Eversholt Street. During the evolution of the Proposed Scheme, the Promoter has considered numerous track and platform layout options. Whilst it is true that the existing station is wider than is necessary to provide sufficient platforms to serve the WCML, it is not wide enough for all the HS2 platforms even if there were sufficient space in the throat for the approach tracks. In broad terms, and depending on design details, there is space for 5-7 HS2 platforms designed to railway standards and with sufficient space for passenger circulation and

access to the Underground. Indeed this was one reason for selecting it as the London terminus.

64. Even if all the EE proposals for reducing specifications and extending southwards were accepted, the station would still need to be widened on the west side. The western boundary of the station would need to be west of Melton/Cardington St. This would not be enough to avoid most of the land acquisition.

*Land acquisition, construction and cost*

65. It is not possible to terminate HS2 at Euston without extending the railway footprint on the west side:

- It would still be necessary to widen Camden Cutting under the roadway in Park Village East as there is no viable scheme for HS2 to approach Euston via Park St. tunnel or for providing access for HS2 trains to low number platforms in the station.
- Any scheme for an HS2 terminus at Euston would require most if not all of the properties that the Promoter proposes to acquire north of Cardington Street and on the Regents Park Estate for the tracks in the throat.
- In practice, all the HS2 platforms need to be 400 metres long in order to operate a viable train service and it would not be possible to provide any 400m long platforms on the east side of the station without extending the platforms into Euston Square Gardens. This would entail either raising the gardens by approximately 5 metres or lowering the tracks.
- At Melton Street., providing 22 platforms would entail so many compromises on standards and operational efficiency that it is not considered feasible. Any extension west of Melton Street would entail acquisition of most of the properties between Melton Street and Cobourg Street, as partial demolition is rarely possible.

66. In addition the EE proposal makes no provision to accommodate future growth in demand, but relies for capacity on implementation of the Crossrail – WCML Link. In contrast, the Revised AP3 Scheme allows for more platforms to be provided as demand increases as well as sufficient space for circulation of increasing numbers of passengers within the station and greatly enhanced interchange to London Underground.

67. The works could not be implemented without closure of up to half the station for an extended period during construction. St. James's Gardens, the National Temperance Hospital and Euston Square Gardens would still be needed for worksites and compounds.

68. Without a more specific proposal it is not possible to compare the cost of the EE proposal with the Promoter's Revised AP3 Scheme. However, it is not clear that there are any features inherent in the EE approach that would make it significantly less expensive. The existing platforms would need to be substantially reconfigured, a concourse built over all the platforms and improved interchange with the Underground would be required to provide for the additional passengers. There would be a modest

reduction in land acquisition on the west side of the station but there would probably be more demolition in the Podium area to the south.

69. It is therefore not clear how any of the cost savings claimed could be achieved. The proposals would require a comprehensive rebuild of the station with all concourse, circulation and service areas above the platforms and extension of the station to the south. Most of the property on the west side of the station would be needed, as well as demolition of all the commercial buildings on the podium to the south. Works to the London Underground stations and interchange facilities would be at least as extensive.

Robbie Owen
Pinsent Masons LLP
30 Crown Place
Earl Street
London
EC2A 4ES

24.11.2015

Dear Mr Owen,

As you know, High Speed Two Ltd. and the Department for Transport met with Sam Price and his advisors Lord Berkeley and Jonathan Roberts on 3 November to discuss his petitions (1794 and AP3: 84) and the processes around his upcoming Select Committee hearing. During the meeting we explained that HS2 Ltd. was preparing a paper setting out the Promoter's position on the revised Euston Express (EE) proposals (September 2015).

This paper will be issued in accordance with the timetable for exhibit exchange (i.e. by 5pm, two clear working days before the Select Committee appearance on 30 November). In advance of the issue of this paper, I would like to summarise our main conclusions on the EE proposals.

**Conclusions following investigation and review of the Euston Express proposals**

Having investigated and reviewed the EE proposals, the Promoter has concluded that a scheme of this kind on the West Coast Main Line (WCML) via a portal at Queens Park could not deliver the necessary capacity and specification for HS2 as set out in the Strategic and Economic Case. Nor could any such scheme be built without unacceptable disruption to both passenger and freight services, environmental effects, and either extensive demolition of residential properties or rehousing of adjacent occupiers. Under any circumstances the EE route would cost considerably more than the Euston tunnel.

At Euston the proposals would not avoid the need to widen the railway in the throat and it would not be possible to fit the station in the existing footprint. Nor would it be likely to lead to the cost savings claimed.

*Route from Old Oak Common to Park Street*

At Queens Park, a new portal would be needed as well as a fly-over/dive-under and track work to release the fast lines for EE. Without extensive residential demolition, these works would entail either complete closure for the WCML for at least 18 months, or else the piling would need to be undertaken at night which would entail unacceptable noise to residents and would extend construction of HS2 by two years. There would be extensive disruption to the Bakerloo Line and WCML services in either event.

*Capacity*

The EE proposals entail merging all WCML lines into two tracks at Camden Junction to the east of Primrose Hill. This would reduce the capacity of the route by 25-35%, effectively eliminating the train path capacity into Euston that would be released by implementation of HS2.

It is suggested that this lost capacity could be reinstated in the late 2030s but this would not be practicable, because it would it entail closure of HS2 services for an extended period as well as severe disruption to WCML services. It would also entail removing the existing fly-over at Camden Junction and providing an additional track in the Line X dive-under in Camden Cutting instead. It does not appear practicable to construct the EE Stage 3, as the vertical alignment needed to emerge from Park St tunnel and achieve headroom above Line X as proposed is unrealistic.

*Construction disruption*

Re-boring the South Hampstead tunnels to allow freight trains to access the North London Line would take approximately three years. The effects of the EE proposals on WCML freight would also be very significant. The Kilburn Goods loop would need to be replaced to maintain the capacity of the route for freight but no location for a loop of equivalent length connecting to the present Direct Current (DC) lines has been identified. The ramps from the South Hampstead tunnels to the North London Line at Primrose Hill would need to be lengthened at a shallower gradient. This work on the ramps, if it is feasible, would be likely to take 12-18 months during which time the line would be closed during the day or night. Full closure of the line for several weeks would also be necessary for final realignment of the tracks.

*Cost and GC gauge*

The EE proposal does not envisage providing the European GC gauge which is a legal requirement. Even without GC gauge the EE route from Old Oak Common would be more expensive than the Euston tunnel – estimated at £100-200m but this does not include uncosted items such as re-providing the Kilburn freight loop, reducing gradients from the South Hampstead tunnels to the North London Line or modification to the LUL car sheds at Queens Park. Nor does it include any provision for the higher risk of a surface route whose implications have been less thoroughly explored than the Proposed Scheme.

Clearing the WCML fast lines east of Queens Park to GC gauge would amongst other things require rebuilding ten bridges and the Primrose Hill fast line tunnel. The works would cost in the order of £500m and if implemented at a later date as proposed, would require suspension of HS2 services to Euston for approximately 18 months.

**Euston Station proposals**

It is not possible to terminate HS2 at Euston without extending the railway footprint on the west side:

- It would still be necessary to widen Camden Cutting under the roadway in Park Village East.

- Any scheme for an HS2 terminus at Euston would require most if not all of the properties that the Promoter proposes to acquire north of Cardington Street and on the Regents Park Estate for the tracks in the throat.

- In practice, all the HS2 platforms need to be 400 metres long in order to operate a viable train service and it would not be possible to provide any 400m long platforms on the east side of the station without extending the platforms into Euston Square Gardens. This would entail either raising the gardens by approximately 5m or lowering the tracks.

- At Melton Street., providing 22 platforms would entail many compromises on standards and operational efficiency that it is not considered feasible. Any extension west of Melton Street would entail acquisition of most of the properties between Melton Street and Cobourg Street, as partial demolition is rarely possible.

In addition the EE proposal makes no provision to accommodate future growth in demand, but assumes implementation of the Crossrail – WCML Link. In contrast, the Revised AP3 Scheme allows for more platforms to be provided as demand increases as well as sufficient space for circulation of increasing numbers of passengers within the station and greatly enhanced interchange to London Underground..

The works could not be implemented without closure of up to half the station for an extended period during construction. St. James's Gardens, the National Temperance Hospital and Euston Square Gardens would still be needed for worksites and compounds.

Finally, it is not clear how any of the cost savings claimed could be achieved. The proposals would require a comprehensive rebuild of the station with all concourse, circulation and service areas above the platforms and extension of the station to the south. Most of the property on the west side of the station would be needed, as well as demolition of all the commercial buildings on the podium to the south. Works to the London Underground stations and interchange facilities would be at least as extensive.

I am copying this letter to Neil Caulfield, clerk of the Select Committee.

Yours sincerely

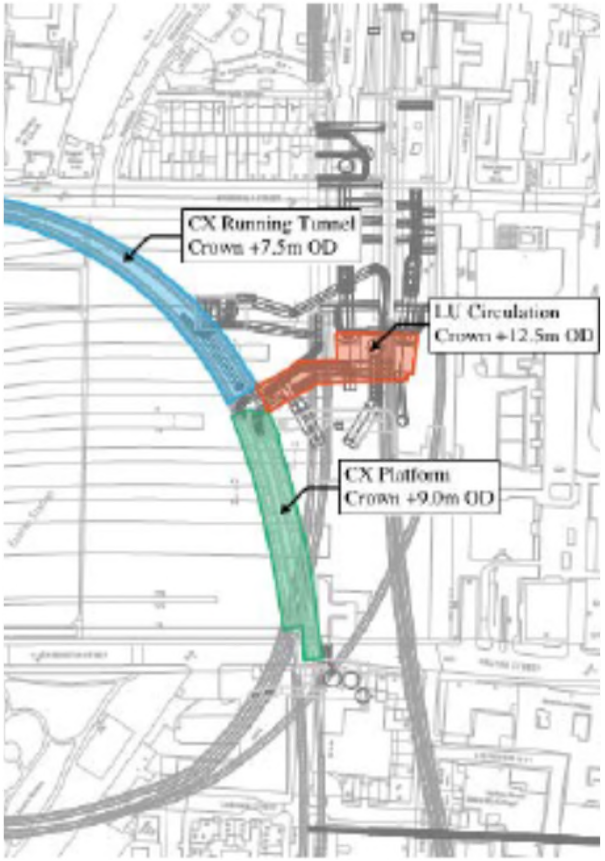
**Roger Hargreaves**
Hybrid Bill Delivery Director
High Speed Two (HS2) Limited

# Double deck options

# Double deck options

- Double deck options considered in initial option analysis in 2009-10 and reviewed in 2011-12 and 2013
- Concluded in 2014 that no further examination of options would be justified
- Main problems are depth, width of throat, maintaining trains services during construction, complexity and cost.

# Limit to depth of the platforms



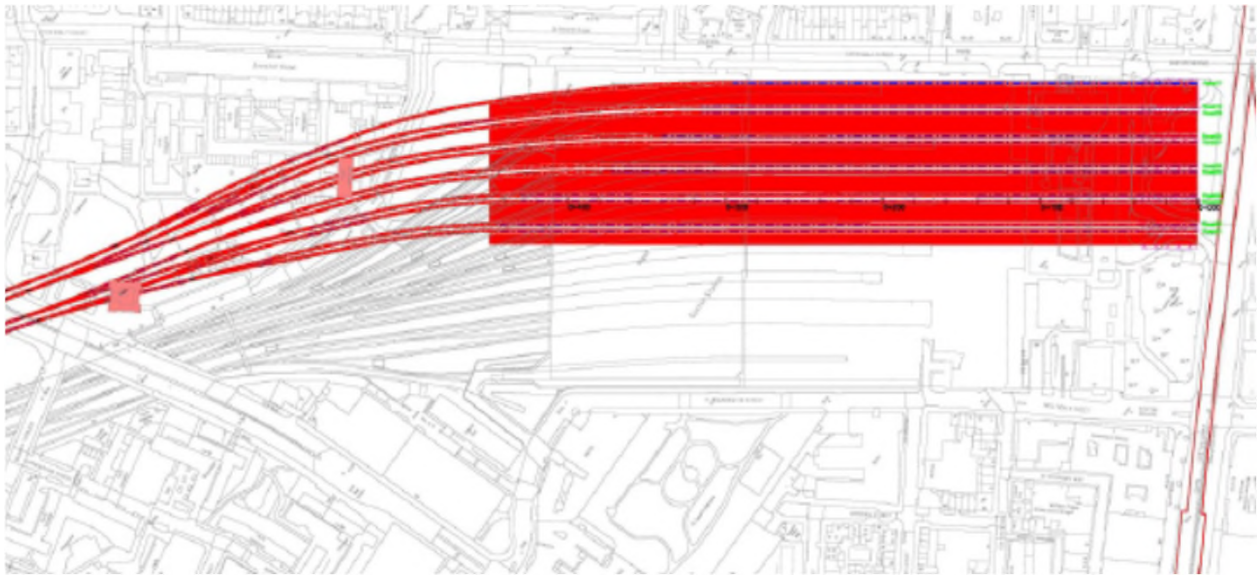

Northern Line Charing Cross Branch:

- Tunnels 13m below existing tracks
- Platforms 11.5m below existing tracks

LU concourse 8m below existing tracks

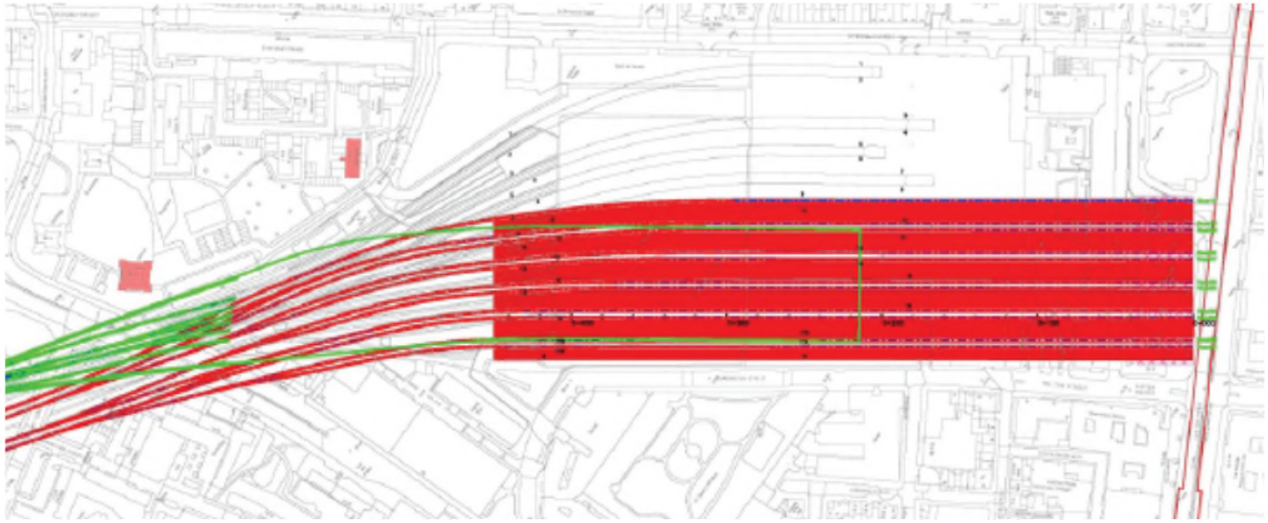
- Lower deck tracks no deeper than 7.5m below current track level
- Upper deck tracks no deeper than 0.3m below current track level

# Double deck on east side of the station



- Double deck on east side would entail extensive demolition in Ampthill Estate and Mornington Crescent
- Only half the WCML platforms available during construction

# Double deck on west side of the station



- Double deck on west side would still require most of the property acquisition north of Cardington St
- Only half the WCML platforms available during construction unless station built partly on land between Melton St and Cobourg St

# 'Double deck up' options

Upper deck above Hampstead Road Bridge, Lower deck underneath, with concourse in between:

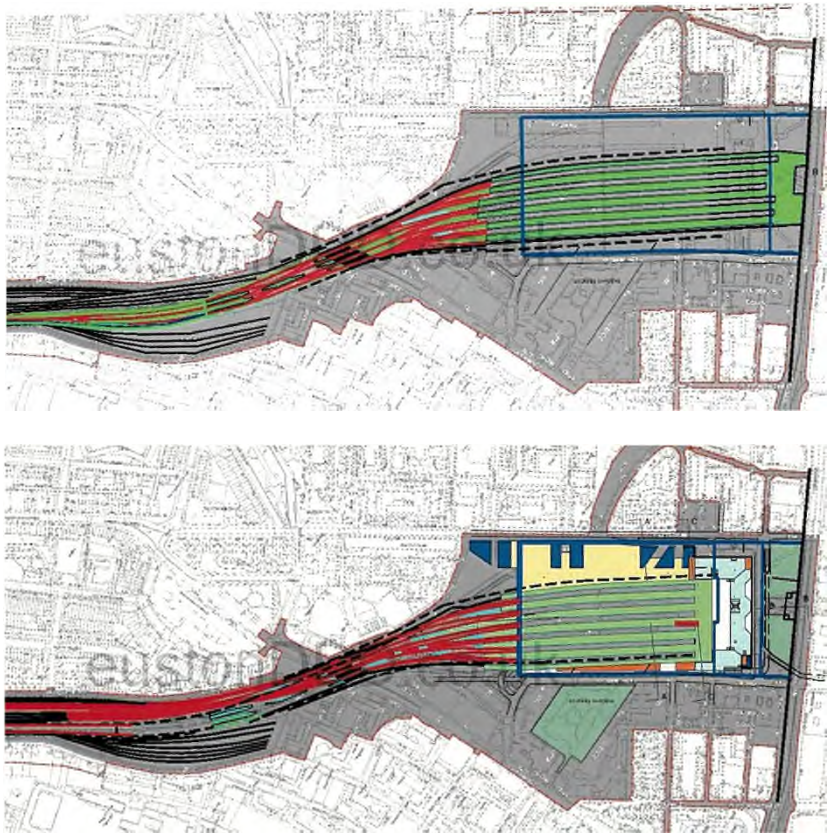
- Extremely complex to build while maintaining train services
- Residential areas affected by high level tracks
- Rejected because of complexity, cost and duration of works.

# 'Double deck down' proposals

Two decks below Hampstead Road Bridge, with concourse above upper deck:

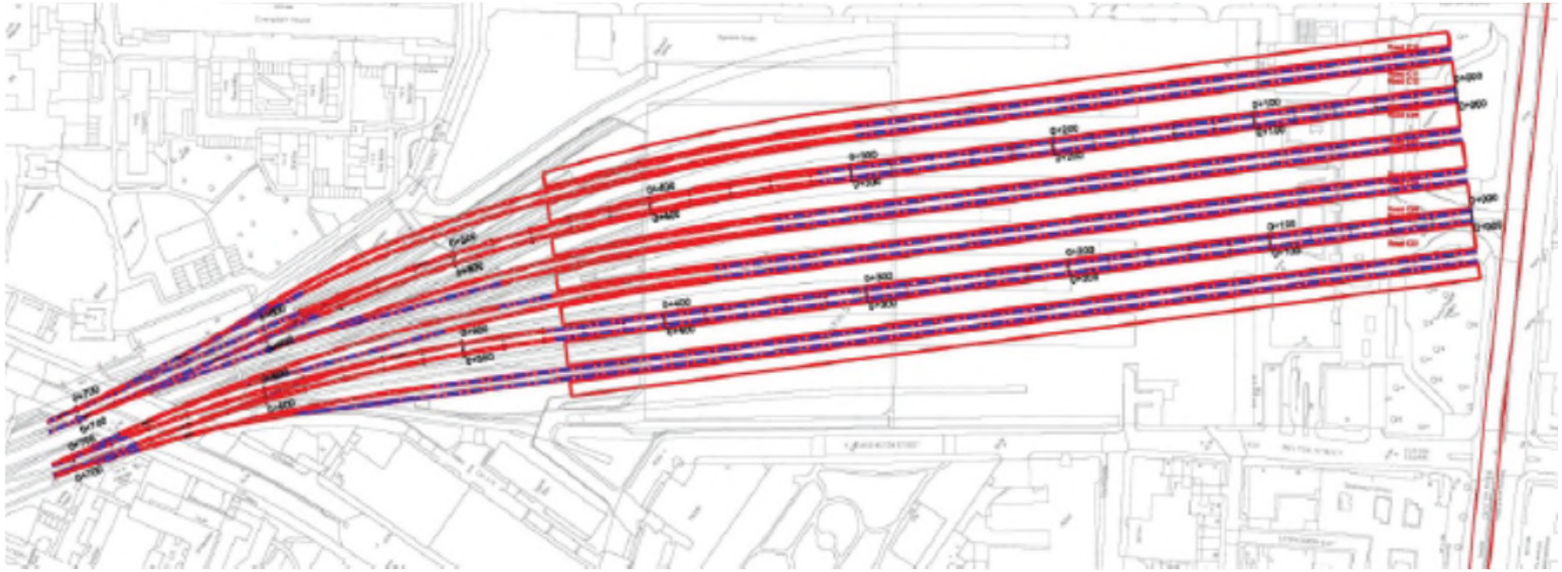
- Extremely complex to build while maintaining train services
- Concourse 4m above Eversholt St.
- Requires acquisition of two Regents Park Estate blocks
- Rejected because of complexity, cost and duration of works.

# DDD2+ option



- Seeks to show that a double deck scheme can be built on existing railway land.
- Throat not feasible without demolition
- Suspends most of WCML during construction
- Cost

# Compliant DDD2 layout



- Platforms encroach into Euston Square Gardens
- Station closed during construction



P2247 (9)

# DDD3+ option

- This is a proposed successor to DDD2+ which is still to be unveiled by the petitioner

# Option Appraisal Matrix (Summary with AP3)

| | AP3 | Double Deck Up | Double Deck Down |
|---|---|---|---|
| **Strategic Fit** | Meets Specification, aligns with EAP | Does not meet completion date or ability to connect to Euston Square | Does not meet completion date or ability to connect to Euston Square |
| **Construction Feasibility** | Straightforward staging | More complex staging | Highly complex staging |
| **Disruption to classic services** | 16 platforms available in Stage A construction 13 in B2 | Major – up to 8 platforms available | Major – 7 platforms available |
| **Cost (£b) 2015 cost basis** | 2.25 | 4.05 | 4.95 |

# DfT response to LB Camden on Double Deck Proposals

In July 2014 the Secretary of State for Transport informed the London Borough of Camden that on the basis of the advice received the Promoter intended to do no further work on the Double Deck Down proposal.

In summary, the DDD2 proposal was rejected because of:

- Insufficient rail capacity during construction
- Double Decked infrastructure unbuildable in the throat
- Passenger Management impractical
- Further concerns relating to concourses on different levels, a completed site that would not be level, and constrained opportunities for over site development.

Department for Transport

From the Secretary of State
**The Rt. Hon. Patrick McLoughlin**

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14 JUL 2014

Councillor Sarah Hayward
Leader of the Council
London Borough of Camden
Camden Town Hall
Judd Street
London
WC1H 9JE

Dear Cllr Hayward,

**Euston Double Deck Down proposal**

As part of our plans for a new HS2 station at Euston there have been numerous discussions at official level and between you and the Chairman of HS2 Ltd. These discussions have helped inform significant changes in our proposals and have enabled us to reach better solutions on a number of key issues associated with the building of the new high speed rail line. I hope these contacts between you and the Company and Department can continue and that we can continue to make good progress towards meeting the concerns of local residents.

There is one particular issue, however, on which you have made strong representations but where we have failed to reach agreement. That is the proposal made by local residents for a 'double deck down' solution at Euston Station. Experts from HS2 Ltd and Network Rail have looked at this in detail and have provided strong and definitive advice that the 'double deck down' solution is not viable.

I attach a copy of a letter setting out the reasons for this from the Head of High Speed Rail Development at Network Rail to the Director General for HS2 in the Department. On the basis of this advice I wanted to let you know that the Department intends to do no further work on the 'double deck down' solution.

Yours sincerely

Patrick McLoughlin

**THE RT. HON. PATRICK McLOUGHLIN**

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*Letter sent by email*

09 July 2014

Dear David

**Euston Double Deck Down (DDD2) proposal**

As requested this letter is to provide you with our views on the merits of conducting further development work on the Euston double deck down concept.

Having considered the limitations of redeveloping the station and increasing its capacity within the existing footprint, and taking account of continued growth in demand at Euston, we do not consider a double deck down solution to be viable.

In April, at the request of the Euston Station Working Group chaired by Sir Edward Lister, Network Rail undertook a high level review of the Euston DDD2 concept as proposed by the eustonDDD group and supported by a number of Camden residents' groups. The aim of the review was to assess the rail engineering and operability aspects sufficiently to draw high level conclusions to advise the working group.

The review considered material made available by the eustonDDD group, and was undertaken by a team of Network Rail engineering and operations experts. The review report was circulated to the working group and discussed at the April meeting.

In our view the main issues during the construction phase are:

1. **Insufficient rail capacity during construction** – this impact would occur on commencement of construction and the constraints imposed by working within the existing station footprint offer no ability to rephase
2. **Double decked infrastructure unbuildable in the throat** – construction of a double deck throat to the station, whilst keeping railway lines and the road bridge above in operation, is not feasible
3. **Passenger management impractical** – construction of a new station within the existing footprint would significantly reduce concourse and passenger circulation space (compared with today) during key stages of the build.

Mitigation of the issues identified above would be likely to involve either very significant disruption to train services before HS2 Phase 1 train services begin and/or an extended construction period, potentially delaying the commencement of HS2 Phase 1 services as currently planned in 2026. We have not investigated how the restricted waiting and circulation space for passengers could be managed (if at all).

We also have the following concerns with the proposal once completed:

4. **Two concourses on different levels** – a redeveloped station with concourses on separate levels brings passenger flow and evacuation complexities which we have not assessed. These would likely add unacceptable additional capital and operational costs.
5. **Not a level site on completion** – because of the limited space above the underground lines a double deck solution cannot deliver a level and fully permeable space above, and it is likely that the ramped access in this proposal (up to 6m above road level) would be unacceptable.
6. **Opportunities for over site development are constrained** – access to any development would be well above street level, thus limiting the potential for regeneration benefits in the Euston area.

On the basis of these concerns we do not intend to examine this option any further, although we are committed to working with Camden Council to meet the aspirations of the Euston Area Plan.

Yours sincerely

Rupert Walker
*Head of High Speed Rail Development*
**Network Rail**

cc Alison Munro, HS2 Ltd