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Surface Access: Heathrow Hub Station Analysis
Compendium

AIRPORTS COMMISSION

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ORIGINAL	Originated by	Checked by	Reviewed by
	NAME	NAME	NAME
	Richard Hibbert Rajat Bose	Stephen Rutherford	Stephen Rutherford
Approved by	NAME Stephen Rutherford	As Project Manager I confirm that the above document(s) have been subjected to Jacobs' Check and Review procedure and that I approve them for issue	
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Revision 1	Originated by	Checked by	Reviewed by
	NAME	NAME	NAME
	Jon Hale	Stephen Rutherford	Stephen Rutherford
Approved by	NAME Stephen Rutherford	As Project Manager I confirm that the above document(s) have been subjected to Jacobs' Check and Review procedure and that I approve them for issue	
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Revision 2	Originated by	Checked by	Reviewed by
	NAME	NAME	NAME
	Jon Hale	Stephen Rutherford	Stephen Rutherford
Approved by	NAME Stephen Rutherford	As Project Manager I confirm that the above document(s) have been subjected to Jacobs' Check and Review procedure and that I approve them for issue	
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1. Introduction

1.1 Background

- 1.1.1 The Airports Commission (AC) was established in 2012 by the UK Government to examine the need for additional UK airport capacity and to recommend how any additional capacity requirements can be met in the short, medium and long-term. The AC is due to submit a Final Report to the UK Government by summer 2015 assessing the environmental, economic and social costs and benefits of various solutions to increase airport capacity, considering operational, commercial and technical viability.
- 1.1.2 The AC published an Interim Report in December 2013 that short-listed three options to address the UK's long-term aviation connectivity and capacity needs, two focussed on expanding Heathrow Airport and one on expanding Gatwick through the provision of a second runway – the work leading up to the publication of the Interim Report is described as Phase 1. The short-listed options were to be further developed and appraised during Phase 2, with further phases of work programmed in the run-up to the submission of the Final Report in the summer of 2015.
- 1.1.3 One of the three shortlisted options is the provision of additional runway capacity at Heathrow through the extension of the existing northern runway to the west to create two separate in-line runways: one for landing and one for take-off during normal operations. This option is referred to as the 'Heathrow Northern Runway Extension' scheme.
- 1.1.4 The proposal to extend the northern runway was initially developed with an associated surface access package focussed on the provision of a new transport gateway (described as 'Heathrow Hub'), consisting of a new railway station on the Great Western Main Line (GWML) with extensive parking provision, connected with the airport terminals via an Automated People Mover (APM).

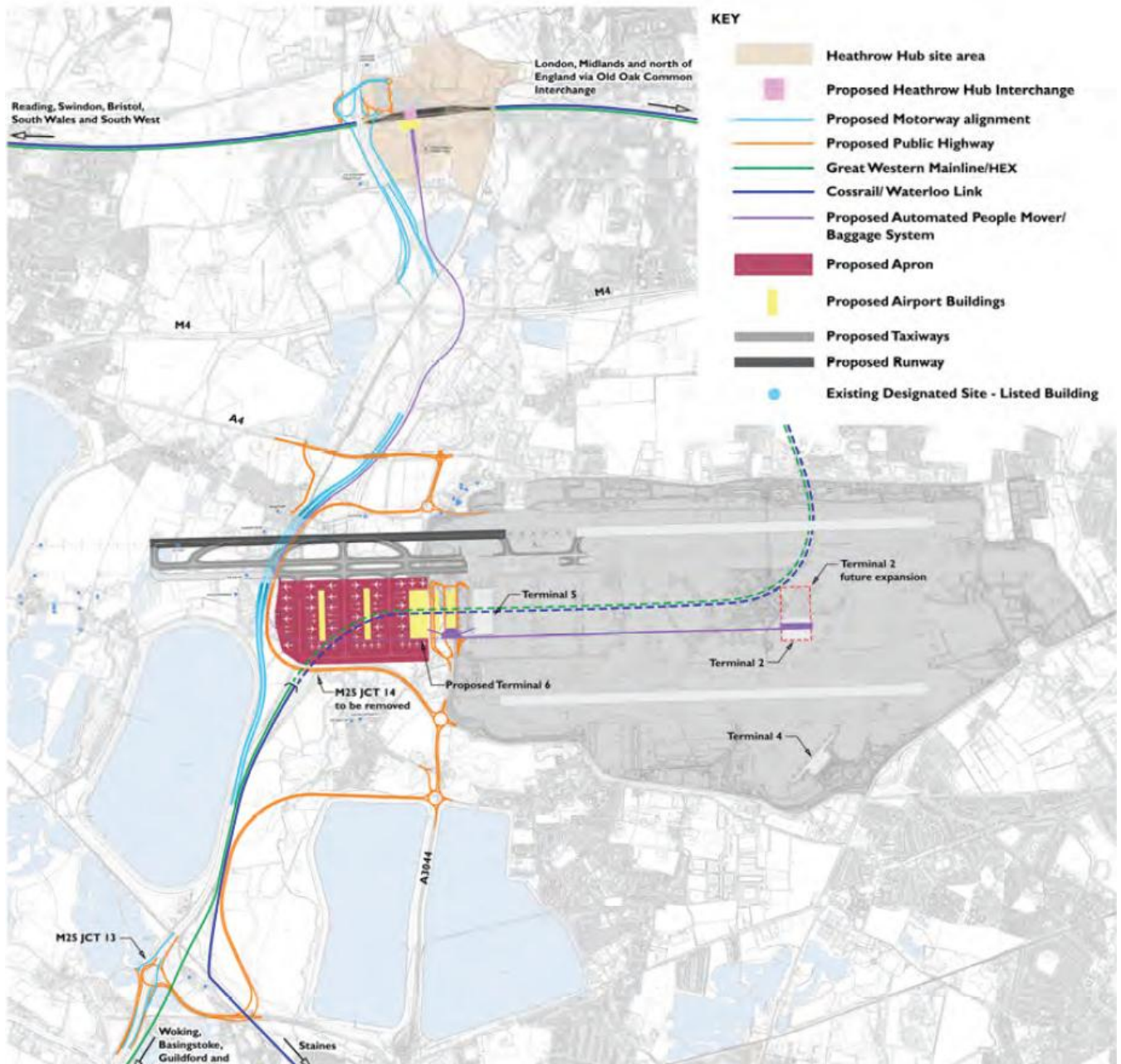
Purpose of this report

- 1.1.5 This report summarises Jacobs' review of the aforementioned surface access proposals, submitted to the AC by Heathrow Hub Ltd (HH). These proposals are outlined in the following documents:
- ***'Heathrow Expansion – Updated Scheme Design'*** – submitted to the AC in May 2014; and
 - ***'Heathrow Expansion – Updated Scheme Design – Surface Access Development Strategy'*** – submitted in June 2014.
 - ***'Heathrow Expansion – Hub Interchange – Summary of Benefits and Response to Jacobs Draft Reports (Part 1)'*** – submitted in September 2014;
 - ***'Heathrow Expansion – Hub Interchange – Summary of Benefits and Response to Jacobs Draft Reports (Part 2)'*** – submitted in September 2014;
- 1.1.6 The purpose of this report is to highlight any areas of particular concern, weakness or omission that were identified by Jacobs during the review. The scope of the review was by necessity determined by the content of the aforementioned submission documents prepared by HH. Aspects of the proposals unrelated to the emerging Surface Access Strategy were excluded.

1.2 The Heathrow Hub surface access proposal

- 1.2.1 The Heathrow Hub surface access proposal is illustrated in Figure 1-1, which indicates the location of the new transport gateway to the north of the airport; an indicative alignment for the APM; and proposed new vehicular accesses from the A4 and the M25 (via junction 13). HH indicate that the provision of parking at the Hub site and the alternative vehicular access arrangements to the terminals would lead to a greater dispersal of traffic, bringing relief to the M25 and M4 in the vicinity of Heathrow.

Figure 1-1: Heathrow Hub scheme overview



Source: HH, May 2014, page 1

1.2.2 Key proposed components of the Heathrow Hub transport gateway include the following:

- high quality interchange facilities between surface access modes;
- traveller and lift access directly from platform level to interchange level;
- kiss and ride facilities and up to 10,000 car parking spaces, with direct enclosed access via travellers to the interchange level;
- bus and coach facilities – HH has not proposed to relocate the Central Terminal Area (CTA) bus/coach station to the hub but independent facilities have been proposed so that bus and coach companies, particularly long-distance coaches, can use the motorway access and the single drop-off/pick-up location for the airport;
- multi-airline self-service check-in machines for airport passengers;

- secure baggage drop facilities connecting directly with airside baggage facilities at the airport;
- a high quality, fast, landside APM to transport passengers, free of their baggage, to the main terminals every 90 seconds at peak, with a journey time of around 5 minutes to the Terminal 5 (western) campus and 7 minutes to the Terminal 2 (eastern) campus;
- the potential for commercial development including hotel(s) providing a range of price points for overnight accommodation for passengers.

1.2.3 HH indicate that the Heathrow Hub transport gateway would be facilitated by a range of surface transport proposals, as follows:

- Rail schemes – a rail service frequency of up to 15 trains per hour (tph) would be provided as indicated in Figure 1-2, and would consist of the following:
 - Crossrail and Heathrow Express enhancements;
 - Crossrail/ West Coast Main Line connection;
 - Piccadilly Line upgrade and extension to Heathrow Hub;
 - HS2 connectivity;
 - Southampton via Reading to Paddington new train service (GWML);
 - Southern Rail Access (SRA), which would allow connections to south west London and Waterloo, and to Woking;
- Highway schemes:
 - tunnelling of the M25 under the runway extension;
 - the removal of junctions 14 and 14A on the M25;
 - the provision of new link roads from junction 13 on the M25;
 - direct access/egress from the M4 (West) and M25 (North);
- Various other incentives to use public transport.

1.2.4 These schemes are assessed in more detail in Chapter 2 of this report.

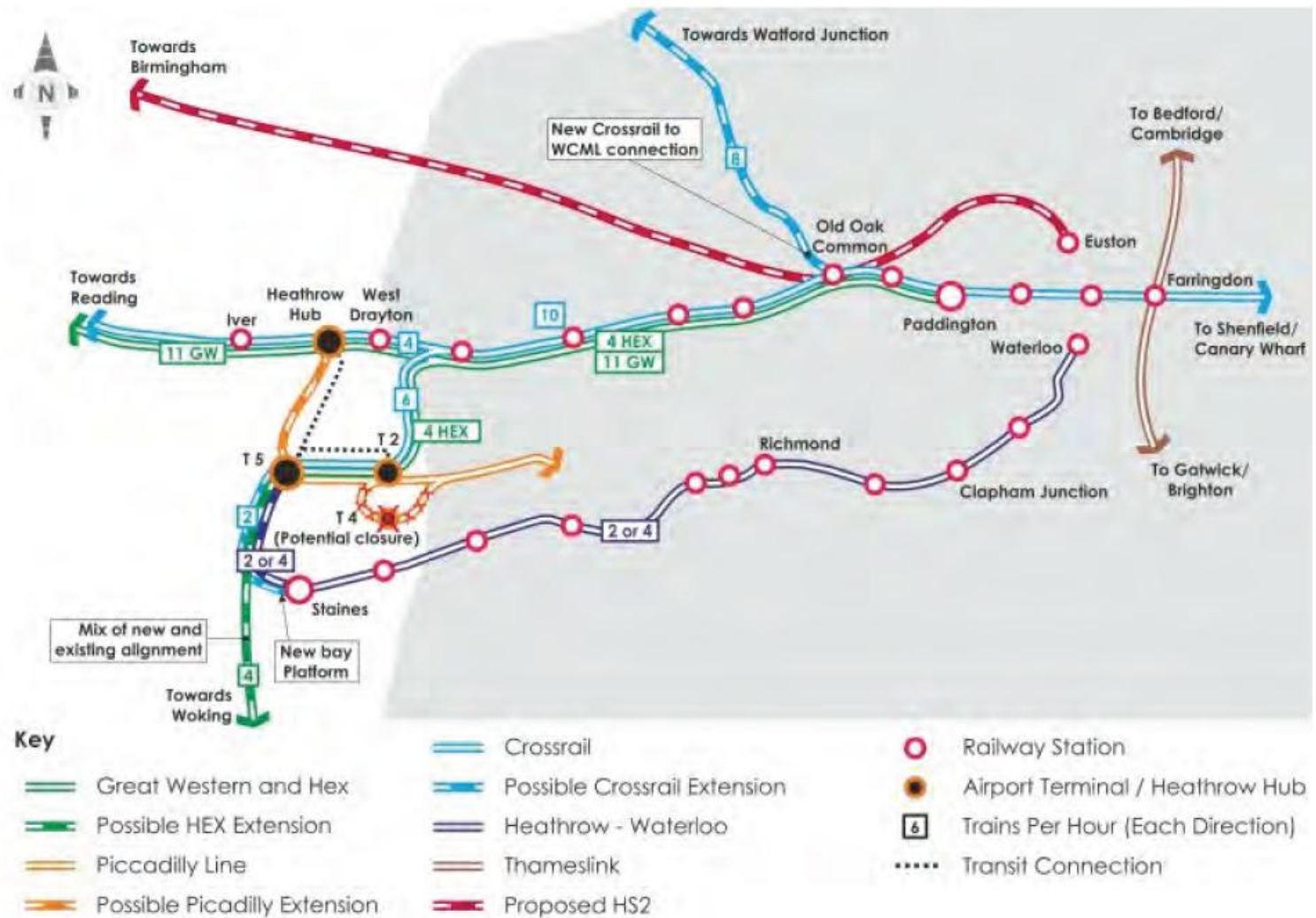
1.3 Core and Extended Baselines

1.3.1 Jacobs' review of the Heathrow Hub surface access proposals was undertaken with reference to a Core Transport Baseline and an Extended Transport Baseline, which together listed transport infrastructure and services expected or likely to be in place by 2030 regardless of any airport expansion that may be delivered in the UK. The definition for the two baselines is as follows:

- the Core Baseline consists of existing infrastructure and services, combined with enhancements whose delivery the AC considers to be inevitable or close to inevitable;
- the Extended Baseline consists of infrastructure and service improvements that are not firmly committed, but which the AC considers (having taken advice from Network Rail, the Highways Agency, Transport for London and the Department for Transport (DfT)) are likely to be required to support background demand absent any airport expansion.

1.3.2 The primary focus of all the analysis was on the Extended Baseline as by 2030 it was judged very likely that further enhancements to the UK transport network would have been delivered above and beyond works that were fully committed at the beginning of Phase 2 when the baselines were defined.

Figure 1-2: Proposed rail connectivity for the Heathrow Hub scheme



Source: HH, May 2014, page 54

- 1.3.3 Rail schemes included in the Core Baseline include the following:
- The 'main' HS2 line (excluding spurs);
 - The entirety of the Control Period 4 (CP4) infrastructure plan for the railway;
 - Almost all of the Control Period 5 (CP5) infrastructure plan for the railway (excluding Western Rail Access to Heathrow, for which funding is not yet fully committed); and
 - Those rail and underground schemes for which there are firm policy and funding support.
- 1.3.4 A key scheme of relevance to the Hub surface access proposal is Western Rail Access to Heathrow (WRAtH), which is included in the Extended Baseline and is currently being developed by Network Rail. Delivery of the scheme is subject to Network Rail developing a satisfactory business case and agreeing acceptable terms with the Heathrow aviation industry. Construction could commence towards the end of CP5 subject to Network Rail agreeing the final business case with the Office for Rail Regulation (ORR) and the DfT, and securing a Development Consent Order (DCO).
- 1.3.5 The current working assumption is that the scheme would involve the provision of a direct rail link from Reading via Slough to Heathrow via a new junction between Langley and Iver stations linked to a 5km tunnel into the airport. There are a range of timetable scenarios being investigated but our understanding is that the current expectation is that 4 trains per hour would be provided between Reading and Heathrow, serving both Terminal 5 and the CTA.
- 1.3.6 If the Hub was delivered it is assumed that WRAtH would not be required due to the improved connectivity and accessibility to the Thames Valley and the West/South West of the UK associated with the Hub scheme.
- 1.3.7 In terms of highway schemes, the following are included in the core baseline:
- M25 junctions 23 to 27 'smart motorway' (all lanes running) – complete by 2015;
 - M25 junctions 5 to 6/7 'smart motorway' (all lanes running) – complete by 2014;
 - M3 junctions 2 to 4a 'smart motorway' (all lanes running) – complete by 2016; and
 - M23 junctions 8 to 10 'smart motorway' (all lanes running) – subject to value for money and deliverability assessment.
- 1.3.8 The following highway schemes are included in the extended baseline:
- M4 junctions 3 to 12 'smart motorway' (all lanes running) – subject to value for money and deliverability assessment; and
 - Lower Thames Crossing – although there is no decision yet as to the option that may proceed.

1.4 Report structure

- 1.4.1 The remainder of this report is structured as follows:
- Chapter 2 provides more details of the transport infrastructure proposals associated with the HH submission;
 - Chapter 3 details the delivery and operational considerations highlighted during Jacobs' review of the promoters' documentation;
 - Chapter 4 details the relative costs of the Hub scheme and summarises the impacts on rail access and mode share for airport users and wider impacts for users on the GWML;
 - Chapter 5 summarises Jacobs' conclusions on the positive and negative impacts of the scheme.

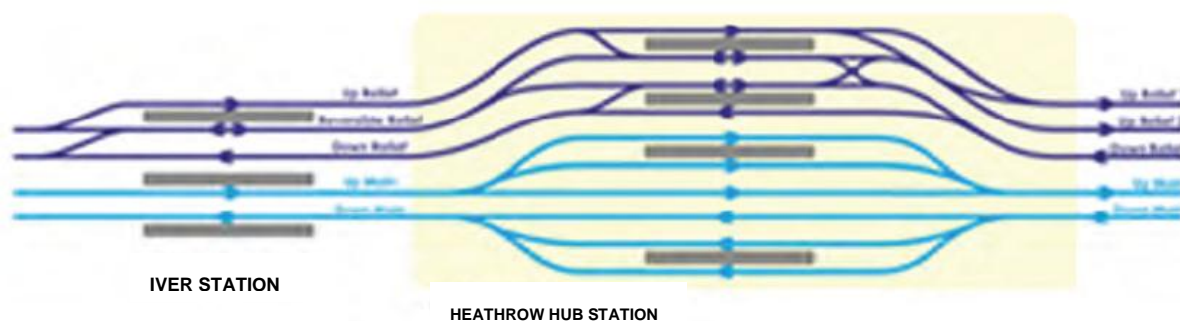
2. Scheme details

2.1 Public Transport schemes

Great Western Main Line (GWML) connections

- 2.1.1 The proposed configuration of Heathrow Hub station is designed to provide flexibility and operational resilience. The GWML between Paddington and Reading is a four-track route, with two tracks primarily used by Inter City services (the 'main lines'), and two primarily used by Commuter services (principally Crossrail services from 2019) and freight (the 'relief lines'). For the main lines, it is proposed to have two platforms in each direction, which would allow successive trains to stop without reducing route capacity. It is also proposed to have a high speed through-line in each direction without a platform. For the relief lines, the proposal is to have four platforms in total, to allow Crossrail trains to terminate there if required. The proposal also includes loops, useable in either direction, to allow maximum length (750 metres) freight trains to be overtaken if required, as shown in Figure 2-1.

Figure 2-1 Heathrow Hub Schematic Track & Platform Layout



Source; HH, May 2014, page 69

- 2.1.2 It is estimated that there would be fifteen trains an hour in each direction calling at Heathrow Hub. The Inter City services (11 trains an hour each way) would provide fast, direct and regular services on routes to Exeter, Plymouth and Cornwall; Swindon, Bath and Bristol; Bristol Parkway, Cardiff and Swansea; Cheltenham and Gloucester; and Oxford and Worcester.
- 2.1.3 Almost all of these trains would also call at Reading, providing a frequent service with a journey time of around 16 minutes (compared with the current scheduled coach journey time of 40 to 60 minutes depending on the time of day) and interchange opportunities for other routes. Crossrail services would serve intermediate stations between Reading and Paddington, providing a vital link for airport employees as well as air passengers.

Crossrail and Heathrow Express enhancements

- 2.1.4 This scheme involves increasing the number of Crossrail trains to CTA/Terminal 5/Terminal 4 from central London to 6tph (potentially up to 8tph) from the currently planned 4tph. The proposal is also to end the current premium fare and lack of fare integration on the 4tph Heathrow Express service, thus maximising the use of available capacity.
- 2.1.5 Crossrail will provide connectivity for travel from Heathrow via Paddington. It will also provide direct services to the West End, the City, Docklands and the eastern suburbs to Shenfield. Through 'single interchange' connections, it will also connect London Underground lines and the National Rail network (via Farringdon and Liverpool Street) to cities and towns in the East of England such as Cambridge, Peterborough, Bedford, Colchester, Ipswich and Norwich. The attraction of the Paddington route will

therefore be expected to increase, potentially mitigating the risk of growth in air passenger numbers putting unsustainable pressure on the Piccadilly Line.

- 2.1.6 It is envisaged that two Crossrail trains would be extended to terminate at a new bay platform at Staines, further improving connectivity and reducing operational congestion at the Terminal 5 station.

Crossrail/West Coast Main Line (WCML) connection

- 2.1.7 Studies are taking place into the provision of a link between Crossrail and the WCML, to allow medium distance services to be diverted away from Euston into Crossrail. This is expected to significantly improve accessibility in the WCML corridor, and provide stations like Watford Junction and Hemel Hempstead with a single change connection to Heathrow via Old Oak Common (OOC).

Piccadilly Line upgrade and potential extension to Heathrow Hub

- 2.1.8 TfL has committed plans for new trains and re-signalling that will increase the capacity of the Piccadilly Line by up to 60%. The upgrade is due to be implemented in the next 10 years.
- 2.1.9 HH has also proposed that Piccadilly Line services are extended to serve Heathrow Hub. While there are no details for this scheme, if implemented, this would add to the options for accessing the Hub.

Southern Rail Access (SRA)

- 2.1.10 A connection is proposed between Terminal 5 and the rail network to the south via a new route adjacent to the M25 thus avoiding the problems with the former Airtrack scheme. This would allow a direct connection via Staines from the airport to Waterloo, running at 2tph in the peak and 4tph in the off peak. This would provide access to/from South London and connections to the broader rail network at Clapham Junction. It would also provide a real alternative to the Piccadilly line for some journeys.
- 2.1.11 The same link is also proposed to facilitate a rail connection between Terminal 5 and Woking. 4tph would run from Woking/Basingstoke/Guildford to Heathrow. Grade separation works at Woking would also relieve a major bottleneck on the South West Main Line (SWML).

HS2 connectivity

- 2.1.12 This option would provide 6tph from OOC to Heathrow and 6tph between OOC and Heathrow Hub, and the Hub layout safeguards the route for the HS2 spur. If built, the spur could terminate at the Hub.

2.2 Highway schemes

M25 tunnelling option

- 2.2.1 The extension of the northern runway crosses a number of existing highways including the M25. A number of options for relocating the M25 have been considered during the development of the scheme. One was to divert the M25 around the end of the extended runway, and another involved carrying the runway over the M25 creating a tunnel on the motorway.
- 2.2.2 The M25 diversion option has been rejected for the following reasons:
- The extent of land required and the disruption to communities and overall environmental impact;
 - The limitation on the runway length that can be achieved given the constraints of the existing junctions 13 and 15 on the potential for realignment of the M25;

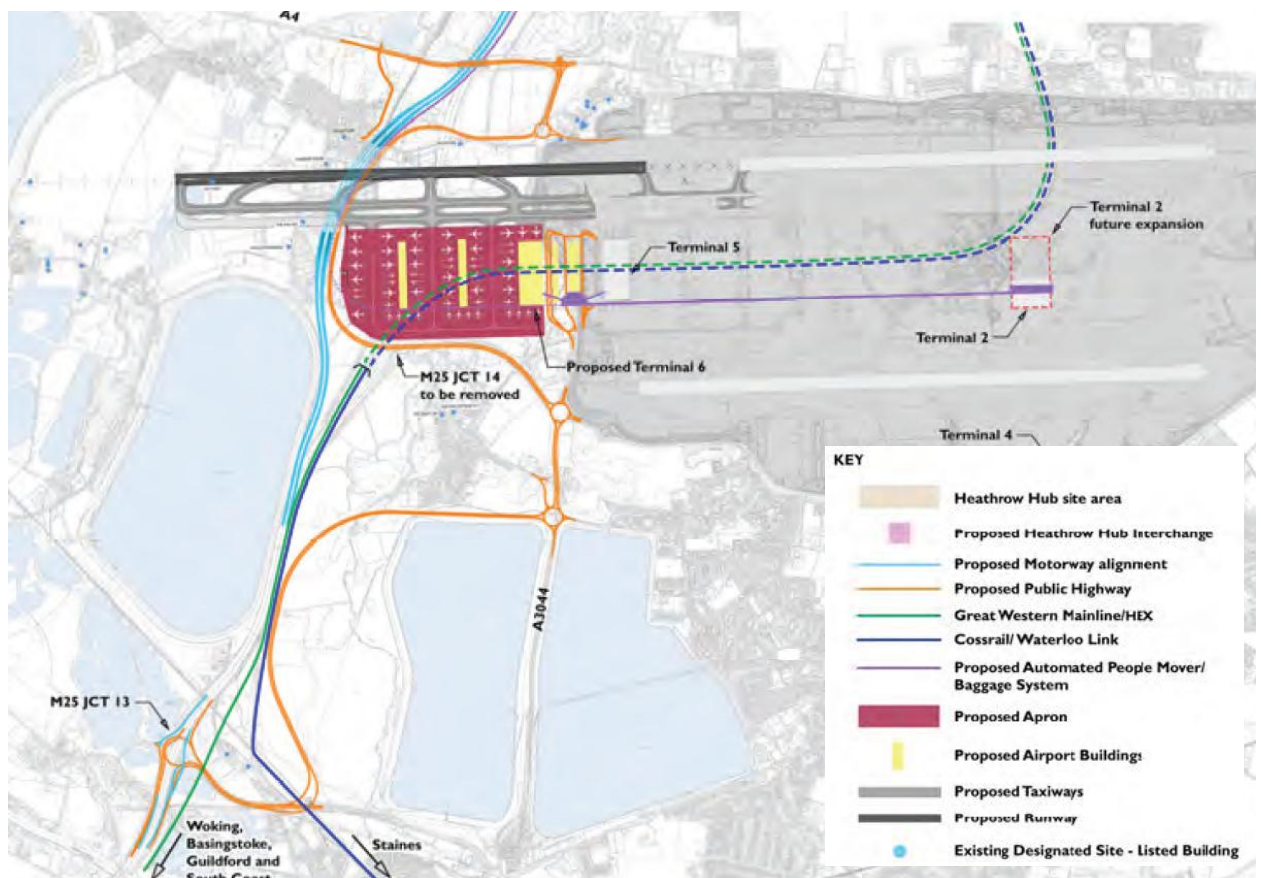
- The possible impact on the Wraysbury Reservoir if junction 13 is retained – the reservoir is understood to be a constraint that cannot be overcome within the timescales contemplated by the AC and which led to southern extension options at Heathrow not being short-listed;
- The impact on junction 13 if a route to avoid the Wraysbury Reservoir is adopted;
- Discussions with Transec/CPNI and the Highways Agency that indicated that there is no objection in principle to a solution that creates a tunnel on the highway.

2.2.3 Tunnel options have therefore been considered. To maximise the area available for airfield and hence the long-term capacity and flexibility of the airport, alignments as far west as possible have been considered. Following testing of options it was concluded that:

- junctions 14 and 14A of the M25 need to be removed;
- two tunnel cells need to be provided in each direction to provide resilience for maintenance and emergency and assist in the management of the motorway in the event that standing traffic occurs; and
- a link road from junction 13 of the M25 has to be provided to replace the routes currently provided from junctions 14 and 14A, with traffic from the north being encouraged to use the Hub as a gateway to Heathrow.

2.2.4 The Hub roads proposal is summarised in Figure 2-2.

Figure 2-2: Heathrow Hub roads proposal



Source; HH, May 2014, page 1

2.3 Other schemes

Automated People Mover (APM)

- 2.3.1 An APM system is proposed to link Heathrow Hub with Terminal 5/6 (5 minutes journey time) and Terminal 2a (7 minutes). APMs are systems with fully-automated driverless vehicles operating on fixed guideways along an exclusive right of way. At this stage, the preferred technology (rubber-tired, monorail, steel-wheeled etc) is yet to be defined.
- 2.3.2 Using data from a range of supplier products and existing systems, HH has estimated journey times, capacity ranges and fleet sizes for the preferred alignment option, as indicated in Table 2-1.

Table 2-1 APM Technology Options

		TECHNOLOGY		
		Rubber-Tired APM	Monorail	Steel Wheeled APM
Journey Times, mins	Hub-T5/6	6-7		4-5
	Hub-T2a	8-9		6-7
Capacity, pphpd	Initial	2,000	3,000	3,000
	Ultimate	13,000	26,000	19,000
Typical Operating Configuration	Initial	12no. – 1 car Trains	12no. – 1 car trains	9no. – 1 car trains
	Ultimate	12no. – 6 car Trains	12no. – 6 car trains	9no. – 6 car trains
Fleet Size (including hot standby and spares), cars.	Initial	15	15	11
	Ultimate	90	120	70

Source: HH, May 2014

Bus and coach enhancements

- 2.3.3 Heathrow Hub provides a potential alternative hub for bus and, particularly, for coach services. The time penalty for serving the airport for services operating on both the M4 and M25 is significantly reduced, resulting in lower journey times and higher passenger numbers and revenues as a result, and reduced operating costs. Furthermore, Heathrow Hub provides a single drop-off/pick-up point for all terminals, whereas current coach services either have to call at more than one terminal, or do not directly serve all terminals.
- 2.3.4 It is also envisaged that there is potential for development of regular coach links to significant centres where there is no possibility of justifying a direct rail link. For example, it is proposed to have a half hourly coach link to High Wycombe, connecting with Chiltern rail services.
- 2.3.5 Local bus operation to Heathrow Hub would also provide an alternative to serving the CTA and contribute to the development of Heathrow Hub as a railhead for the West of England and South Wales, although there would be less benefits for bus services than long-distance coach services.

3. Delivery and operational considerations

3.1 Overview

3.1.1 This section of the report provides commentary on the key considerations regarding the delivery and operation of the Hub surface access proposal outlined in the following HH documentation:

- **'Heathrow Expansion – Updated Scheme Design'** – as submitted to the AC by HH in May 2014; and
- **'Heathrow Expansion – Updated Scheme Design – Surface Access Development Strategy'** – as submitted in June 2014.
- **'Heathrow Expansion - Hub Interchange - Summary of Benefits and Response to Jacobs Draft Reports (Part 1)'** - submitted in September 2014;
- **'Heathrow Expansion - Hub Interchange - Summary of Benefits and Response to Jacobs Draft Reports (Part 2)'** - submitted in September 2014;

3.1.2 The purpose of this and the subsequent chapter is to highlight any areas of particular concern, weakness or omission that were identified by Jacobs during the review. The scope of the review was by necessity determined by the content of the aforementioned submission documents prepared by HH. Aspects of the proposals unrelated to the emerging Surface Access Strategy were excluded.

3.2 Public Transport

Implications for Iver Station and other stations on the GWML

3.2.1 The first issue identified relates to the provision for trains serving the existing Iver rail station, and stations on the remainder of the GWML. In general terms the service levels and stopping patterns of trains that form the timetable is dependent on the achievable capacity of a line. Railway infrastructure, train speed profiles, station layouts and train control systems all constrain the hypothetical capacity of a route, and making significant alterations to any of these elements will influence train service patterns and the timetable.

3.2.2 In 2012/13, National Rail statistics indicate that Iver station was used by 186,132 boarders and alighters with a balanced flow reflecting the predominance of commuting traffic originating at the station. Currently, Iver is served by 4 departures to London Paddington in the peak hours. The addition of Heathrow Hub in close proximity of Iver, along with the associated infrastructure and timetable proposals, may influence Iver stopping patterns, which cannot be assumed to remain at current levels. This may make rail usage for passengers at Iver Station less convenient either through a reduced service pattern or a requirement to utilise new Park & Ride facilities.

3.2.3 Although HH indicate in their September submission that their timetable assumptions for the Hub include maintaining the proposed Crossrail service pattern at Iver, our view is that the close proximity of the two stations – Iver and Heathrow Hub – gives reasonable cause for this assumption to be called into question.

Express coaches

3.2.4 The current arrangements, where the Central Bus Station is placed at the busiest point of demand for air passengers and staff travel, will not apply in the expanded Heathrow. With the significant increase in air passenger processing capacity to be provided around Terminal 5, the centre of gravity of demand will shift westwards. While the Terminal 2 campus will remain very busy, it will no longer be the obvious principal location for coach and bus termination.

- 3.2.5 HH envisage that the APM will be of sufficient capacity, convenience and quality that it will be possible for the majority of express coaches to serve only the Hub coach interchange. For routes serving destinations to the south west, and west of London, this could be an operational benefit to express coaches as it offers the possibility of keeping services closer to the M25 / M4 / M40 corridors and avoiding the more severely congested access roads approaching the CTA.
- 3.2.6 Further assessment is required on how to provide for express coach services for destinations to the east, south east and central London. Jacobs identified three initial potentially competing options as follows – each with significantly different levels of operational efficiency and operator appeal:
- the Hub as the single coach interchange serving Heathrow;
 - develop a second – south facing interchange – in the central area that is aligned to access via M25 junction 13;
 - enable multiple express coach pick-up points around Heathrow to serve both Terminal 5 and Terminal 2 campuses plus the Hub.
- 3.2.7 In June 2014, HH highlighted the potential of a Heathrow Hub coach interchange as a replacement facility for Victoria Coach Station in central London. Passengers for London would alight at the Hub and transfer to mainline rail services, including Crossrail, to access central London. However, this approach may not be favourable for coach operators, budget travellers or rail operators, primarily due to the location of Heathrow increasing journey times and costs for passengers travelling to destinations in central London that are currently well connected to the facility at Victoria.
- 3.2.8 This adaptation of the Hub facilities is not a core objective for provision of the Hub and should, if promoted further, be subject to its own demand and capacity appraisals independent of the Surface Access Strategy for Heathrow.

Local buses

- 3.2.9 HH acknowledge the success of partnership working between TfL, local authorities and operators in planning local bus services to meet the needs of workers and passengers seeking to access/egress Heathrow airport. They express commitment to continue these partnership approaches in deriving enhanced local bus provision to meet the needs of growing demands at Heathrow, including servicing Heathrow Hub as an interchange and employment location in the future.
- 3.2.10 Further assessment on the likely level of demand for local buses and the resource/operation requirements for servicing the Hub is required to determine the impact on local bus services with the Hub in place.

Heathrow Hub Interchange experience

- 3.2.11 A key aspect of the success of Heathrow Hub would be linked to how passengers respond to the concept of the Hub as the northern gateway to the airport. In their submission, HH provide a number of assurances on seamless passenger interchange at the Hub, as follows:
- the provision of a high quality, innovative APM as a landmark aspect of travel;
 - a very high frequency APM service with short wait times to minimise the risk of crowding;
 - a secure baggage drop facility linking directly to airside baggage handling systems; and
 - onward escalator/elevator connections to rail platforms and check-in areas.
- 3.2.12 HH has also provided benchmark data on the resilience of comparator APM systems, proving that such systems have a high degree of reliability and would provide a robust method of transferring passengers between the Hub station and the terminals.

- 3.2.13 However, the HH appraisal of the Hub assumes that the interchange experience using the APM should not incur an interchange penalty. Jacobs adopted this assumption for modelling purposes but it is by definition at the lower end of the range and it may overstate the benefits of the HH scheme.
- 3.2.14 In addition, HH indicated that passengers travelling to the airport would be able to use the baggage drop-off facilities at the Hub, but those leaving would have to collect their baggage in the terminal. This could result in a perception among passengers of having left the airport before boarding the APM, increasing the likelihood of the Hub being regarded as an additional interchange. In general terms, the separation of baggage drop and reclaim facilities may also lead to a less efficient baggage system that would be more expensive to operate than having all the facilities in one location.
- 3.2.15 These issues suggest that assumed generalised cost advantages for Heathrow Hub may be eroded to some degree. Should passengers perceive the interchange experience in the same manner as a standard rail station interchange, comparable treatment in forecasting would incur an interchange penalty of up to 20 minutes for passengers travelling through the Hub.
- 3.2.16 Investigation of the perceived interchange penalty arising at the Hub requires further assessment using Stated Preference techniques to provide insight into the responses and values perceived by users. At present, the promoters may be underestimating this constraint on the attractiveness and performance of the Hub.

3.3 Highways

Access

- 3.3.1 The highway enhancements to facilitate the Heathrow Hub and associated runway extension have been developed in consultation with the Highways Agency and HH indicate that, in principal, agreement has been reached on the proposed highway configuration.
- 3.3.2 It is noted that the new M25 junction 13 is likely to be spatially constrained, necessitating departures from Design Manual for Roads and Bridges (DMRB) standards. Any departure from DMRB standards should be highlighted as a potential network performance, capacity and safety issue given that the revised M25 junction 13 is intended to be the main southern gateway to Heathrow for road traffic. Further assessment is required on achievable design standards and resultant network performance at this junction.
- 3.3.3 In addition, HH envisage that medium-term development of proposals for a Heathrow central area cordon access charge would be advantageous to manage mode choices and infrastructure utilisation as part of the Surface Access Strategy, although it does not form part of their central case.
- 3.3.4 The potential for further demand management measures at Heathrow, including congestion charging, is considered by Jacobs in a separate report for the AC. This report indicates that while congestion charging is likely to be technically and commercially viable, there are significant issues that may limit its impact on passenger and employee mode share, depending on the nature of the scheme taken forward. These issues can be summarised as follows:
- A charging scheme focussed purely on airport access roads would have no impact in terms of encouraging a reduction in background non-airport traffic around Heathrow, nor would airport users who park remotely from the site be affected;
 - A scheme controlled by the airport operator would mean that the public sector would have limited control over the rates and exemptions applied, and evidence from the protocols on charging for other facilities, such as staff parking, at Heathrow at present suggests that the airport's tenants, led by the airlines, could strongly resist the introduction of a charge;
 - A public sector-led access scheme would be complicated in terms of the regulatory framework, with no framework currently in place governing charging exclusively on the trunk road network –

also. Secretary of State permission would be required to incorporate the motorway accesses as part of a general access charging scheme introduced by TfL for example;

- A wider area public sector-led scheme may encounter significant local opposition from residents and businesses unless significant exemptions are granted, as well as wider political opposition to the concept, similar to the opposition to national road pricing witnessed in 2007.

Car parking

- 3.3.5 The Heathrow Hub proposal includes the provision of a 10,000 space car park adjacent to the rail station on the GWML, reinforcing the role of the Hub as the northern gateway to Heathrow and enabling car-borne trips to terminate at the Hub and continue to the airport via the APM. The strategic location of this car park, adjacent to the M25 and accessible via the new junction 13 would allow drivers to avoid the more congested M25/M4 links closer to the airport and the approach roads to the CTA.
- 3.3.6 Hub car parking is likely to be used by the following groups:
- Air passengers, arriving by car, using the Hub as a gateway to Heathrow;
 - Airport employees seeking workplace parking spaces;
 - Hub employees (including at associated developments) seeking workplace parking, and
 - Rail users/commuters using the Hub as a Park & Ride facility.
- 3.3.7 The balance between these different user groups will be determined principally by the parking management regime applied at the Hub, including for example tariff levels and security arrangements. Alternative parking options, including parking availability within the central airport area and its environs will be a key factor.
- 3.3.8 Jacobs used a number of parameters from the HH submission documents to develop a parking accumulation estimate for the Hub station, indicated in Table 3-1.

Table 3-1: Estimate of parking accumulation at Heathrow Hub

Parameter	Value
Car borne arrivals at the Hub	100 pphpd ⁽¹⁾
Persons per vehicle	1.5 ⁽¹⁾
Vehicles per hour	67 ⁽²⁾
Vehicles per day (18 hours)	1,206 ⁽²⁾
Average dwell time per car	9 days ⁽¹⁾
Total parking required	10,854 ⁽²⁾

Notes: ⁽¹⁾ from HH document, June 2014; ⁽²⁾ estimated based on source data.

- 3.3.9 This approach supports the proposed car parking capacity provided at the Hub. Two key assumptions underpin this analysis, as follows:
- that arrivals at the Hub incorporate all users identified above;
 - that the average dwell time is valid, at 9 days.
- 3.3.10 Jacobs also assessed the aggregate demand for car parking from air travellers arriving at Heathrow, which yielded a much lower estimate of Hub parking capacity, at approximately 3,000 spaces. With further allowance for other car park user-groups, including 3,000 spaces for Heathrow employees, this approach suggests that, if this level of utilisation is realised, the proposed car park may be over-specified.
- 3.3.11 HH acknowledge the recent success in reducing single car occupancy travel-to-work by airport workers over past 10 years, and Heathrow Airport Ltd plan to reduce this further to approximately 25%

by 2030. A coherent approach to parking provision for all users, especially airport workers, is needed to successfully pursue this target. Integration of Hub parking into a holistic airport parking strategy would be necessary to ensure that available capacity is planned and managed effectively through coordinated provision, charging and enforcement.

Taxis

- 3.3.12 In 2013, taxis carried 25% of total demand for travel to/from Heathrow Airport. HH state that the inefficient use of taxis, especially low occupancy rates on return trips, are a significant contribution to road congestion within the CTA and on key approaches.
- 3.3.13 HH also indicate that more intense use of taxis can be achieved through enhanced taxi fleet and boarding management, thereby reducing levels of taxi mileage and empty running within the airport road networks and its approaches.
- 3.3.14 As mentioned earlier, the potential for further demand management measures at Heathrow is considered by Jacobs in a separate report for the AC. This report indicates that there are some key issues with improving taxi efficiency at the airport, which can be summarised as follows:
- The 2012 CAA passenger survey data indicates that, when Olympic-related trips are excluded, 96% of taxi trips made to the airport in that year were by Private Hire Vehicles (PHVs), with Black Cabs carrying only 4% of taxi passengers;
 - The PHV industry is heavily fragmented in general, and is made up to a significant extent of large numbers of small operators that focus on a local catchment – this is likely to be particularly the case at Heathrow, which has a wide catchment covering a large geographic area;
 - Many small operators must out of necessity be highly demand-responsive, maximising ‘on-call’ driving hours and minimising dead time with a relatively small number of drivers on-call at any one time – this suggests there may be limits to the length of time that many drivers could afford to spend ranking at the airport waiting to collect a fare, particularly where the majority of an operators’ business is generated in a specific geographic area;
 - The market is also very competitive among larger operators such as Uber and Addison Lee – many of these operators already use GPS technology to minimise dead mileage but there may be limited potential for co-operation over a Heathrow-wide matching service covering multiple operators, which is likely to deliver the biggest impact;
 - Any move to improve waiting facilities or reduce the cost for PHVs ranking at the airport would likely be opposed by the Black Cab lobby, which has already made representations to TfL about the legality of PHVs ranking at the airport.

3.4 Strategic fit

National policy objectives

- 3.4.1 HH provide a high-level analysis of the rationale for growth at Heathrow in the context of projections for global growth in aviation and the likelihood that the long-term operational model will be based around international hub airports. Within this context, the HH analysis is based on the AC’s defined Core Baseline and Extended Baseline forecasts.
- 3.4.2 Key elements of the strategic fit of Heathrow Hub in this context are as follows:
- Heathrow Hub further enhances the case for Heathrow in terms of regional connectivity and extension of economic benefits;
 - Heathrow is set at the centre of comprehensive networks of road and rail links;

- The costs of developing a new hub elsewhere, covering both immediate airport and transport-related infrastructure and costs of relocations of businesses and workforce, are likely to be significantly greater than expansion at Heathrow;
- The inclusion of Heathrow Hub as part of the offer increases the likelihood of the (demand) forecasts and/or could result in higher growth forecasts;
- The benefits to UK Gross Value Added (GVA) in the form of productivity gains, employment effects and gains from trade for airport expansion, and benefits of Heathrow Hub, are likely to be (potentially significantly) over £45bn in Present Value (PV) terms;
- The proposed scheme could be expected to improve accessibility to the airport resulting in an overall reduction in travel times – analysis of adding Heathrow Hub suggests a benefit of £2.2bn in the form of travel time savings from this infrastructure, and
- National agglomeration and efficiency benefits of Heathrow Hub transport interchange could be in the region of £5bn to £10bn.

3.4.3 These benefits are presented in the HH submissions as preliminary benchmarked estimates and modelling of economic impacts and travel choices has not been completed in sufficient depth to verify them at the time of reporting.

3.4.4 Strategically, Heathrow Hub aims to provide a northern gateway to the existing Heathrow site through a surface access strategy that effectively extends the airport campus northwards by approximately 5km to interface with the GWML and the M25.

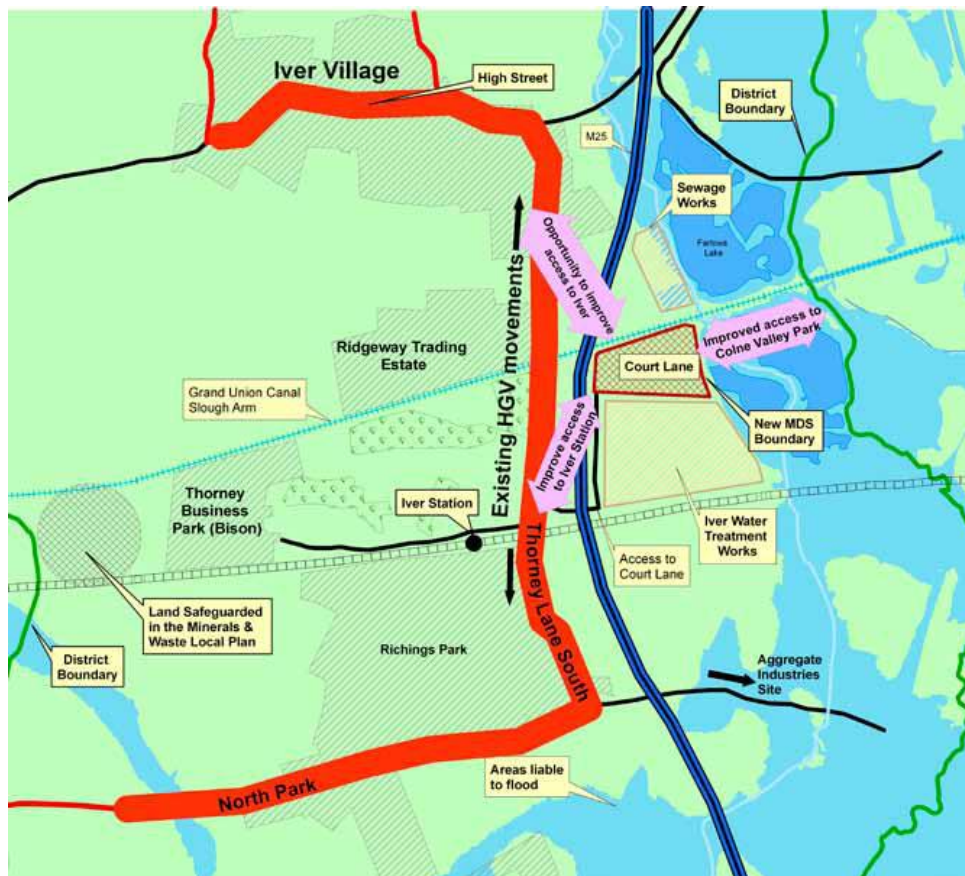
Local policy objectives

3.4.5 Jacobs reviewed how this site selection relates to adopted local spatial planning policy frameworks. The relevant spatial strategy is the adopted South Bucks Local Plan (adopted 2011), which makes specific provisions for development in the vicinity of Iver. The relevant adopted policies are summarised below.

Core Policy 16 – South of Iver (Opportunity Area)

- 3.4.6 The Court Lane industrial area has been identified as a Major Developed Site in the Green Belt, and is indicated on the plan in Figure 3-1. The related sections of the Local Plan indicate that in considering any planning application for redevelopment of the Court Lane area, the Council will take into account the current impact of the significant areas of open storage on the openness of the Green Belt.

Figure 3-1: Land South of Iver Opportunity area



Source: South Bucks Local Plan, 2011

- 3.4.7 The Local Plan states that “residential development on the Court Lane site is considered wholly inappropriate, in view of the surrounding land uses”.¹ The Court Lane site is identified on the Proposals Map as a Major Developed Site in the Green Belt and comprehensive redevelopment proposals should result in a significant reduction in HGV movements. It is stipulated that any scheme should:

- Result in no greater impact on the openness of the Green Belt;
- Provide for habitat improvements and improved access to the open space and water areas in the Colne Valley Park;
- Provide improved pedestrian and cyclist access routes to Iver High Street and Iver Station, to enhance the sustainability of the site;
- Safeguard and improve the setting of the Grade II Listed Iver Court Farmhouse;
- Recognise the context of the site, and address issues including possible land contamination and the odour and air quality issues associated with the nearby water treatment works and M25;

¹ <http://www.southbucks.gov.uk/CHttpHandler.ashx?id=4196&p=0> – page 57

- Incorporate decentralised and renewable or low carbon technologies (for example, combined heat and power), unless it is clearly demonstrated that this is not viable or feasible – this should ensure that at least 10% of the energy needs for the development are secured from these sources.

3.4.8 The document indicates that the District Council will generally support appropriate employment generating development or redevelopment on Court Lane, Thorney Business Park and the Ridgeway Trading Estate, with particular encouragement to be given to uses that would result in a reduction in HGV movements.

Core Policy 9 – Biodiversity

3.4.9 This policy indicates that new development that would harm landscape character or nature conservation interests will not be permitted unless the proposal meets a number of key criteria as follows:

- the importance of the development outweighs the harm caused;
- the Council is satisfied that the development cannot reasonably be located on an alternative site that would result in less or no harm;
- appropriate mitigation or compensation is provided, resulting in a net gain in Biodiversity.

3.4.10 The policy indicates that with regard to Biodiversity Opportunity Areas, other non-designated land, and rivers (and their associated habitats), development proposals should seek to conserve and enhance biodiversity and achieve a net gain in local biodiversity resources.

Summary

3.4.11 The scope and scale of the Heathrow Hub proposal is likely to exceed the level of development envisaged by the Local Plan, both in terms of the development footprint and local traffic generation, noise and emissions impacts.

3.4.12 Development of facilities associated with the Hub station, particularly with regard to the provision of a hotel(s) and a 10,000 space car park, would likely challenge the character and biodiversity policy objectives in the Local Plan. Strategic fit with the designated Green Belt is acknowledged by HH, who identify the need for Green Belt deletions in a way not current signalled by policy.

3.4.13 It is acknowledged that Local Plans by nature do not anticipate the scale of required infrastructure associated with a national expansion of airport capacity, and also that any proposal to expand aviation capacity at Heathrow will likely have some implications for local and national planning policy. However, when compared with a surface access proposal for Heathrow that incorporates the provision of WRAtH in lieu of the Hub, the Hub scheme is likely to present more challenges with regard to planning policy than the former option.

4. Costs and impacts

4.1 Overview

4.1.1 The previous chapter summarises the issues identified with the delivery and operation of the Hub station proposal during the Jacobs review. In this chapter, the focus is on the relative cost of the scheme when compared with alternative options, notably WRAtH, and the impacts of the Hub station proposal, notably focussed on the following elements:

- Airport passenger rail access and mode share from different regions;
- Non-airport rail user impacts;
- Other potential benefits and revenues.

4.2 Scheme costs

Total capital costs

4.2.1 In June 2014, HH presented the capital cost estimate for the Hub station infrastructure shown in Table 4-1.

Table 4-1: HH Hub station cost estimate

Element	Estimated Cost £m
Heathrow Hub	850
Associated Roadworks	180
APM	500
Baggage Transfer System	403
Phasing	40
Other development costs including land	excluded
Fees	295
Contingency (HH, Roadworks, APM, Baggage system)	552
Inflation	excluded
Optimism Bias	excluded
Estimated Total Cost (2nd Q 2014)	2,820

Source: Table 6.1 (page 51) – 'HH Updated Scheme Design – Surface Access'

4.2.2 As the table indicates, this cost estimate excluded inflation, optimism bias, and land costs, although HH confirmed independently that the latter is covered separately as a line item under airport masterplan costs. HH also indicated independently that a spot allowance of £143m has been allocated for relocating the Iver Water Treatment Works.

4.2.3 HH indicated that these costs could be partly mitigated by savings related to the following infrastructure schemes, which would no longer be necessary:

- OOC main line platforms and associated station concourse/ overtrack for interchange to HS2 – HH estimated the saving to be approximately £100m;
- WRAtH – HH estimated a capital cost saving of £700m;
- Woking Station grade separation – HH estimated savings of approximately £200m;
- Crossrail semi-fast services, requiring new infrastructure to optimise benefits of extension to Reading – HH estimate the cost-saving at approximately £200m.

4.2.4 The HH figures therefore indicate a lower net capital cost than the total stated in the table above, and the savings identified were embedded in the cost plan prepared by HH.

4.2.5 Jacobs' independent review indicated a number of key issues with these assumed savings, as follows:

- TfL expressed reservations over the suggestion that the OOC works would not be required, as they are currently investigating the potential for enhancing the interchange between HS2, GWML and Crossrail services in future and mainline platforms at OOC are likely to be a key element of this strategy – TfL views OOC as an opportunity to create a key interchange away from central termini providing the role of 'the Stratford of west London';
- Network Rail indicated that the Woking station grade-separation works are being considered to enhance mainline capacity irrespective of the Hub proposals and will continue to be developed regardless of whether the Hub is introduced or otherwise.

4.2.6 As a result, the only significant capital cost saving is likely to be derived from not proceeding with WRAtH. In October 2011, Network Rail identified a £500m capital cost for this scheme (based on 2011 prices) in a study undertaken at Stage 2 of their 'Governance for Railway Investment Projects' (GRIP) process. The Government has committed to provide capital funding for this scheme, subject to a satisfactory business case and the agreement of acceptable terms with the Heathrow aviation industry. The GRIP Stage 3 submission for the scheme is not expected to pass through the Enhancements Cost Adjustment Mechanism until November 2015 when an efficient cost will be determined.

4.2.7 This indicative cost estimate for WRAtH is significantly lower than the Hub station cost estimate provided in Table 4-1. The table also indicates that the HH costs for the Hub station include an assumption of 24% for contingency, which is lower than typical contingency assumptions made by Network Rail for a rail infrastructure scheme at a similar stage of development. In contrast, the WRAtH scheme has already passed through two stages of the GRIP process.

4.2.8 In their September submission, HH indicate costs for WRAtH related to transferring passengers and baggage to the "Northern airfield campus". However, discussions with Network Rail indicate that while the timetable for WRAtH is still in development, the current working assumption is that it will serve both Terminal 5 and the CTA. In addition, further assessment is required to verify the HH cost estimate assigned to parking associated with the WRAtH scheme in their September submission.

4.2.9 In conclusion, although there is currently some uncertainty surrounding the characteristics of both schemes, the available evidence indicates the following:

- the net capital cost of the Hub station is likely to be higher than assumed by HH in their cost plan, as schemes at Woking and OOC appear likely to proceed regardless of airport expansion; and
- the total capital cost of delivering the Hub scheme is likely to be significantly higher than the comparable capital cost of delivering WRAtH.

4.3 Rail access

4.3.1 According to CAA passenger survey data, 75% (32.5m) of passengers at Heathrow originated from London and the South East in 2012, with 46% (22.3m) originating from Greater London itself. For the majority of these passengers, HEX, Crossrail and Piccadilly Line rail options with direct connections to terminals (and in the case of Crossrail and Piccadilly Line penetration into Central London) are likely to

be more attractive than using the APM to get to the Hub station and then a GWML service to Paddington. As a result, for the largest current market sector, the Hub is likely to have little attraction. Further discussion on the mode share implications of the Hub are provided later in this chapter.

- 4.3.2 The Hub will offer a better connection to Heathrow for GWML passengers from the West Country, offering an interchange to the APM with a 5-7 minutes journey time to the terminals. This is likely to be significantly better than the current options of interchanging to a Railair coach at Reading or travelling into and out of Paddington.
- 4.3.3 However, as indicated in the previous section, WRAtH will provide many of the benefits of the Hub rail connection for passengers on the GWML, and it is likely that these benefits will be delivered at a lower cost. When fully completed, the Reading Redevelopment Programme (RSAR) will provide five extra platforms, a minimum of four additional train paths per hour and an anticipated reduction in delays in the general area of 38%. The modernised station will be an attractive interchange proposition to passengers as the introduction of lifts and escalators will ensure access to all platforms is step-free. Jacobs mode choice model predicted that the rail mode share of passengers from the Greater Western sector in 2030 would be 17% with WRAtH, compared to 30% with the Hub surface access proposal.
- 4.3.4 It is also a reasonable assumption that, with the completion of WRAtH, rail operators currently serving Reading may respond to the enhanced access to Heathrow with revisions to rail services that incorporate Heathrow directly from Reading. However, such services were not modelled.
- 4.3.5 In addition, the design for WRAtH includes gauge clearance for Inter City trains to Terminal 5, which is a requirement under interoperability regulations. There will therefore theoretically be the ability to run longer distance Inter City services to Terminal 5 from the west. This could, in due course, achieve many of the direct access benefits arising from the Hub proposals via the mainline rail network to/from Reading. It should be noted that such service options were not included in our analysis of WRAtH.

4.4 Mode choice

- 4.4.1 The HH submission to the AC included analysis of the impact of the Hub station on mode share from the following four market sectors: 'Greater London area', 'Great Western area', 'Southern Access area' and 'Rest of Country'. Jacobs interpretation of these market sectors is shown in Table 4-2.

Table 4-2: Jacobs interpretation of HH market sector definition

Market sector	UK geographic region
Greater London	Inner London
	Outer London
Great Western	South West
	Wales
Southern Access	South East (not London)
Rest of Country	East Midlands
	East of England
	North East
	North West
	Scotland
	West Midlands
	Yorkshire and the Humber

Observed mode share in 2012

- 4.4.2 CAA passenger survey data for Heathrow indicates that in 2012, 9% of all surface access trips to Heathrow originated from the Great Western market sector as defined above, consisting of the South West of England and Wales – this amounted to some 3.7m trips out of a total of 43.3m as indicated in Table 4-3. The table also indicates that just under 400,000 of the 3.7m trips from the Great Western sector were made by rail, amounting to 1% of all surface access trips to Heathrow.
- 4.4.3 Greater London was the main market sector in 2012, contributing 51% of all surface access trips (22.3m / 43.3m) and 83% of all rail trips (10m / 12.1m) to Heathrow.

Table 4-3: Heathrow 2012 annual surface access demand by mode and market section (2012 CAA survey data)

Market sector (Jacobs definition)	Bus/coach	Private vehicle	Rail	Total
Greater London	1,238,166	11,002,540	10,026,237	22,266,943
Great Western	1,181,532	2,146,076	397,197	3,724,805
Southern Access	2,036,261	7,745,950	487,573	10,269,784
Rest of Country	1,102,368	4,770,872	1,165,815	7,039,055
Total	5,558,327	25,665,438	12,076,822	43,300,587

Note: Olympic-related trips and trips by other modes (including walk and cycle) excluded from analysis

- 4.4.4 Table 4-4 also indicates that of all trips from the Great Western sector, 11% were made by rail with 32% of trips made by bus/coach and 58% made by private vehicle. Overall, 28% of all trips to Heathrow were made by rail, with 13% by bus/coach and 59% by private vehicle.

Table 4-4: Heathrow 2012 annual surface access mode share by market section (2012 CAA survey data)

Market sector (Jacobs definition)	Bus/coach	Private vehicle	Rail	Total
Greater London	6%	49%	45%	100%
Great Western	32%	58%	11%	100%
Southern Access	20%	75%	5%	100%
Rest of Country	16%	68%	17%	100%
Total	13%	59%	28%	100%

HH 2030 forecasts

- 4.4.5 The HH documents state that when compared to Heathrow Airport Ltd's forecast for public transport mode share (more than 50%), HH anticipate achieving a higher public transport mode share as they propose "significantly more effective public transport interventions".
- 4.4.6 This logic carries through to the presentation of the demand forecast as a result of Heathrow Hub shown in Table 4-5, in the context of planned growth in aviation services at Heathrow. The table indicates that HH expect the total Great Western market sector share of all trips to Heathrow to increase to 10% in 2030. They also expect Great Western rail demand to increase significantly to over 2.7m in 2030, increasing the Great Western rail share of all trips to 4% over the same period.

Table 4-5: Heathrow Hub 2030 annual surface access demand forecast by mode and market section (HH analysis)

HH 2030 with rail schemes (adjusted for Crossrail in GLA area)	Bus/coach	Private vehicle	Rail	TOTAL
Greater London area	1,588,185	12,191,870	19,172,355	32,952,410
Great Western area	1,428,457	3,022,011	2,727,706	7,178,174
Southern Access area	174,054	2,505,465	1,900,855	4,580,374
Rest of Country	3,781,030	17,778,724	4,972,522	26,532,276
Total	6,971,726	35,498,070	28,773,438	71,243,234

Source: HH, June 2014, page 42

- 4.4.7 This significant increase in Great Western rail demand is highlighted in Table 4-6, which indicates that the HH rail mode share forecast for the sector increases to 38% as a result of the improved connections provided by the Hub station. Overall, HH expect 40% of all air passenger trips to be made by rail in 2030 (increasing from 28% in 2012) with 50% by private vehicle and 10% by bus/coach.

Table 4-6: Heathrow Hub 2030 forecast mode share by market section (HH analysis)

Heathrow Hub 2030 with rail schemes (adjusted for Crossrail in GLA area)	Bus/coach	Private vehicle	Rail	Total
Greater London area	5%	37%	58%	100%
Great Western area	20%	42%	38%	100%
Southern Access area	4%	55%	41%	100%
Rest of Country	14%	67%	19%	100%
Total	10%	50%	40%	100%

Source: Heathrow Hub, June 2014, page 42.

Jacobs 2030 mode share forecasts

- 4.4.8 Jacobs developed a surface access model for the Heathrow Hub proposal that forecasts main mode share (car, bus/coach and rail) and rail sub-mode share. The model was calibrated using the 2012 CAA data, and elements of the HH surface access proposal were coded in to forecast the associated 2030 main mode share and rail sub-mode share.
- 4.4.9 It should be noted that for the purpose of this analysis, the Heathrow Hub station and assumed GWML service frequencies detailed in Chapter 2 were added to Extended Baseline schemes (with the exception of WRAtH). Other proposals associated with the Hub that were not included in the Extended Baseline, such as the extension of Piccadilly Line services to the Hub, the connection between the GWML and the WCML, and the provision of an HS2 spur, were not modelled. The absolute demand forecast resulting from the Jacobs 2030 model is indicated in Table 4-7.

Table 4-7: Heathrow Hub 2030 annual surface access demand by mode and market section (Jacobs model)

Market sector (Jacobs definition)	Bus Coach	Car Taxi Minicab	Rail	TOTAL
Greater London	1,771,349	17,047,291	20,329,541	39,148,181
Great Western	874,809	2,636,081	1,498,406	5,009,296
Southern Access	3,355,361	7,869,320	4,688,750	15,913,431

Rest of Country	946,878	2,972,049	3,350,582	7,269,509
Total	6,948,396	30,524,740	29,867,279	67,340,417

4.4.10 The mode share by market sector forecast produced by the Jacobs model is provided in Table 4-8. This table indicates that overall, the Jacobs model produces forecasts that are broadly similar to the HH analysis, predicting an overall rail mode share of 44% with the Hub scheme in place, compared with a figure of 40% assumed by HH. Rail mode share from the Great Western sector is forecast to increase to 30% compared with 38% indicated by HH.

4.4.11 The table indicates that trips from the Great Western sector account for 7% of all Heathrow departures in the 2030 Jacobs model, with Great Western area rail trips amounting to only 2% of all trips. This compares with the respective figures of 10% and 4% from the HH analysis described above. In both the Jacobs model and the HH analysis, Greater London is still the dominant market sector in 2030, accounting for 58% and 46% of all trips respectively.

Table 4-8: Heathrow Hub 2030 forecast mode share by market section (Jacobs model)

Market Sector	Bus Coach	Car Taxi Minicab	Rail	Total
Greater London	5%	44%	52%	100%
Great Western	17%	53%	30%	100%
Southern Access	21%	49%	29%	100%
Rest of Country	13%	41%	46%	100%
TOTAL	10%	45%	44%	100%

The model included the Heathrow Hub concept, the deletion of the WRAtH scheme and the inclusion of a station on the GWML at OOC.

Summary

4.4.12 Both the Jacobs 2030 model and the HH analysis indicate that the Hub surface access proposal will significantly increase rail mode share from the Great Western market sector. The rail mode share from this sector (based on the Jacobs definition) in 2012 was 11%, and the Jacobs model forecasts an increase to 30% as a result of the Hub proposal, while HH indicate an increase to 38%.

4.4.13 However, the analysis undertaken also indicates that the Great Western market sector share of all trips to Heathrow will remain low in 2030. According to the Jacobs definition of the sectors, only 9% of all trips to Heathrow in 2012 originated in the Great Western sector, and Great Western rail trips only accounted for 1% of all trips.

4.4.14 In 2030, the Jacobs model forecasts a slight reduction in the overall market share of the Great Western sector to 7% but an increase in the Great Western rail share to 2% as a result of the significant shift to rail forecast from the sector due to the impact of the Hub. The HH analysis indicates that the total Great Western market share is expected to be 10% by 2030 and that rail trips from that sector are expected to account for 4% with the Hub scheme in place.

4.4.15 Therefore although the rail mode share from the Great Western sector is predicted to increase with the Hub in place, these trips contribute a small proportion (between 2% and 4%) of total Heathrow surface transport demand.

4.5 Non-airport user impacts

4.5.1 Linked to the timetabling issues identified in the previous chapter, the introduction of a new station stop for services on the GWML for trains between London Paddington, Reading and South West England would incur a penalty for existing users of rail services, whose journeys are extended as a result of the new station stop.

4.5.2 Network Rail advised that the appropriate assumption for this penalty is 4 minutes, which leads to an annual monetised disbenefit to GWML rail users of £30,113,592 (2014 prices), taking account of

different (WebTAG) values of time by journey purpose. The following table illustrates the scale of the impact for different stop durations at Heathrow Hub.

Table 4-9: Non-user impacts of additional rail stops

Duration of Stop at Hub Station (mins)	Value of Additional Delay (2014 prices)	30 year impact (discounted at 3.5% pa)
1	£7,528,398	£141,229,495
2	£15,056,796	£282,458,990
3	£22,585,194	£423,688,485
4	£30,113,592	£564,917,980
5	£37,641,990	£706,147,475

4.5.3 A number of key assumptions were applied to derive these impacts as follows:

- Total annual patronage on the GWML was estimated at 62m in 2030 based on the following:
 - 2011/2 Paddington gateline entry and exit count of 34m according to ORR figures – this excludes HEX users;
 - Assumed annual demand growth factor of 3.4% – this was derived from NR's 2010 GWML RUS, which indicated an average expected increase in all-day demand of 44% over the period 2008-2019 (including different growth assumptions for Inter City and Suburban services through Reading);
- 88% of all passengers on the GWML are affected – this was derived based on the number of services expected to stop at the Hub (15tph from the HH submission divided by 17tph expected through Reading according to the GWML 2010 RUS long-term forecast);
- An average rail user Value of Time of £8.28 per hour – based on 2014 values from the Webtag databook (May 2014 v1.2) – the calculation of this value is shown in the table below.

Table 4-10: Value of Time estimate for GWML users (2014 prices)

Journey purpose	Heavy rail pax journey purpose split (all week average)	Rail passenger VOT 2014 (£/hr - perceived cost)
Work	7.6%	£27.67
Commuting	52.2%	£7.02
Other	40.3%	£6.23
Weighted average VOT (£/hr):		£8.28
Weighted average VOT (£/min):		£0.14

4.5.4 When considered over a 30-year period, the discounted value (at 3.5% per annum) of the non-user impacts of a 4 minute additional station stop at Heathrow Hub is estimated to be £565 million.

4.5.5 HH indicated that the additional stopping time at the Heathrow Hub station could be balanced by omitting the GWML platforms at OOC station, with GWML trains not stopping at OOC. However, as mentioned earlier in this chapter, TfL have expressed reservations over this proposal, indicating that OOC is expected to be a key interchange station for all Londoners and for HS2 users, and that full interchange options should be provided as a result.

4.6 Potential further benefits

4.6.1 While acknowledging the disbenefit indicated above for GWML users, HH also highlight in their September submission a number of counteracting benefits that outweigh the negative costs. In particular, significant benefits are quoted related to the decongestion of the road network as a result of remote parking provided at the Hub station, and the benefits of shorter journey times to Heathrow for airport passengers travelling on the GWML and transferring via the Hub station – respective annual figures of £130m and £58m are quoted.

- 4.6.2 With regard to the decongestion benefits, it is acknowledged that the location of remote parking is likely to remove some airport-related traffic from the final links of their journeys in the vicinity of the airport, particularly from trips approaching from the north and west. However, the Jacobs modelling of the HH scheme suggests that the vast majority of the traffic on the strategic road network serving Heathrow is not related to the airport, and that even without airport expansion these road links will be heavily congested by 2030, which could have significant knock-on impacts for congestion on the road network around the airport. In addition, the removal of junctions 14 and 14a from the M25 associated with the Hub scheme could result in some traffic travelling further distances to reach their destinations than they would with the Heathrow Airport Ltd plan in place.
- 4.6.3 As a result, further assessment would be required involving dynamic modelling to understand and quantify any decongestion benefits associated with the Hub station proposal. It should be noted that such an assessment was not within the scope of pre-consultation work for any of the short-listed expansion options considered by the AC.
- 4.6.4 With regard to airport passenger journey time savings, it is acknowledged that rail passengers from the Great Western market sector would benefit from savings when accessing the airport when compared with the equivalent rail journey via WRAtH. However, the volume of passengers benefitting from these savings is likely to be very low when compared with the non-airport volumes negatively impacted by the additional stop at the Hub station.
- 4.6.5 In addition, the figure quoted by Heathrow Hub assumes no interchange penalty is applied to Hub users, while an interchange penalty is incurred by passengers using WRAtH services from Reading. As indicated earlier in this report, the constraints associated with interchanging at the Hub may warrant the application of an interchange penalty, which would decrease the attractiveness of a journey via the station, particularly for passengers arriving at the airport and reclaiming their baggage before travelling on the APM.

5. Conclusions

5.1 Summary of impacts

5.1.1 The review of the HH surface access proposals resulted in the identification of a range of impacts associated with the scheme. Each of these impacts is summarised in the remainder of this chapter.

5.2 Avoiding interchange at Paddington/Reading

5.2.1 Both the Jacobs 2030 model and the HH analysis indicate that the Hub surface access proposal will significantly increase rail mode share from the Great Western market sector. The rail mode share from this sector (based on the Jacobs definition) in 2012 was 11%, and the Jacobs model forecasts an increase to 30% as a result of the Hub proposal, while HH indicate an increase to 38%.

5.2.2 For this sector of the rail market, Heathrow Hub offers benefits by avoiding the current need to interchange at Paddington or Reading stations. Instead the Hub will provide direct access to GWML services to destinations in the Thames Valley, South West England and South Wales, with the APM linking air terminals directly to the GWML.

5.2.3 However, the analysis undertaken also indicates that the Great Western market sector share of all trips to Heathrow will remain low in 2030. The Jacobs model forecasts that the Great Western rail share would be 2% of all surface access trips to Heathrow and the HH analysis indicates a comparable figure of 4%.

5.3 Reducing congestion

5.3.1 At the Hub, 10,000 additional parking spaces creates the potential to relieve congested sections of the M4 and M25 of airport-related trips by passengers, airport workers and commuters into London.

5.3.2 In particular, the Hub has the potential to intercept traffic flows destined for Heathrow from the north and west, reducing pressure on already congested sections of the M4 and M25, plus the local roads approaching the terminals. Jacobs traffic analysis provides evidence that the approach reduces pressure on M25 junction 15, with lower peak hour flows approaching from all directions.

5.4 Northern Gateway to Heathrow

5.4.1 The Heathrow Hub interchange could provide a focal point for access to Heathrow from the north by road, and also provide an effective terminal/interchange for express coaches serving Heathrow from the South West, the Midlands and the North, enabling them to avoid accessing the CTA to pick-up and set-down passengers. The Hub may also become a focal point for taxi operations, especially for arrivals and onward links to destinations in the Thames Valley and Outer West London.

5.5 Passengers destined for Greater London and the South East

5.5.1 According to CAA passenger survey data, 75% (32.5m) of passengers at Heathrow originated from the South East in 2012, with 46% (22.3m) originating in Greater London.

5.5.2 For the majority of these passengers, HEX, Crossrail and Piccadilly Line rail options with direct connections to terminals (and in the case of Crossrail and Piccadilly Line penetration into Central London) are likely to be more attractive than using the GWML via Paddington and the APM at the Hub station. Therefore, for the largest current market sector, the Hub is likely to have little attraction.

5.6 Scheme costs

- 5.6.1 Infrastructure costs for the Hub are likely to be significantly higher than those for WRAtH. The current indicative Network Rail estimate for WRAtH is approximately £500m while HH's estimate for the Hub station and associated works in their June submission was £2.82bn.
- 5.6.2 HH also included a 24% contingency factor in their June cost estimate for the Hub station scheme, which is lower than contingency estimates typically applied by Network Rail for rail infrastructure schemes at a similar stage of development. In contrast, the WRAtH scheme has already passed through two stages of Network Rail's GRIP process.
- 5.6.3 WRAtH is likely to provide many of the benefits of the Hub rail connection for passengers on the GWML, and it is likely that these benefits will be delivered at a lower cost. When fully completed, the Reading Redevelopment Programme (RSAR) will provide five extra platforms, a minimum of four additional train paths per hour and an anticipated reduction in delays in the general area of 38%. The modernised station will be an attractive interchange proposition to passengers as the introduction of lifts and escalators will ensure access to all platforms is step-free.
- 5.6.4 In addition, the design for WRAtH includes gauge clearance for Inter City trains to Terminal 5, which is a requirement under interoperability regulations. There will therefore theoretically be the ability to run longer distance Inter City services to Terminal 5 from the west. This could, in due course, achieve many of the direct access benefits arising from the Hub proposals via the mainline rail network to/from Reading.

5.7 Interchange experience and baggage handling

- 5.7.1 While a high-quality interchange experience could undoubtedly be provided at the Hub station, passengers will still be required to transfer between rail services and the APM. This will inevitably result in some inconvenience and waiting time.
- 5.7.2 In addition, the HH proposal assumes that passengers leaving the airport would still have to collect their baggage in the terminal before boarding the APM. This could result in a perception among passengers of the Hub station as an additional interchange on their journey from the airport.
- 5.7.3 The analysis undertaken by both HH and Jacobs assumes no interchange penalty at the Hub station when assessing the generalised cost of rail trips to and from the airport, which can be considered a 'best case' scenario. Should passengers perceive the interchange experience in the same manner as a standard rail station interchange, comparable treatment in forecasting would incur an interchange penalty of between 10-20 minutes for passengers travelling through the Hub.
- 5.7.4 In addition, in general terms, the separation of baggage drop and reclaim facilities would also likely lead to a less efficient baggage system that would be more expensive to operate than having all the facilities in one location within each terminal.

5.8 Additional trip generation associated with land-use

- 5.8.1 It is noted that the current proposals for Hub station car parking included in the HH submission do not envisage additional trip generation resulting from development in the vicinity of the station. However, if development is proposed (i.e. hotels, shopping centres, conference centres etc) this is likely to result in additional trip generation that could create significant congestion issues over a wide area.

5.9 Impact on existing users of GWML

- 5.9.1 The introduction of a new station stop for services on GWML trains between London Paddington, Reading and South West England / South Wales will incur a penalty for existing users of rail services, whose journeys would be extended as a result of the new station stop. Network Rail advised that the appropriate assumption for this penalty is 4 minutes.

- 5.9.2 This leads to an annual monetised disbenefit of £30,113,592 (2014 prices) for GWML users stopping at the Hub in 2030. Over a 30-year period, the discounted value of the non-user impacts at Heathrow Hub is estimated to be £565m (discounting at 3.5% per annum).
- 5.9.3 It is acknowledged that this disbenefit would be off-set to some degree by journey time savings for rail passengers accessing Heathrow via the Hub when compared to WRAtH. However, out of all current GWML users, a low proportion make trips to and from Heathrow and as a result, any benefits for airport passengers are likely to be lower than the disbenefits incurred by the majority of GWML passengers.

5.10 Implications for Iver Station and other stations on the GWML

- 5.10.1 In general terms the service levels and stopping patterns of trains that form a timetable is dependent on the achievable capacity of a line. Railway infrastructure, train speed profiles, station layouts and train control systems all constrain the hypothetical capacity of a route, and making significant alterations to any of these elements will influence train service patterns and timetables.
- 5.10.2 In 2012/13, rail statistics indicate that Iver station was used by 186,132 boarders and alighters with a balanced flow reflecting the predominance of commuting traffic originating at the station. Currently, Iver is served by 4 departures to London Paddington in the peak hours. The addition of Heathrow Hub in close proximity of Iver, along with the associated infrastructure and timetable proposals, may influence stopping patterns at Iver and at other stations on the GWML, which cannot be assumed to remain at current levels. This may make rail usage for passengers at some GWML stations less convenient.

5.11 Land-use dispersal and planning policy

- 5.11.1 The proposal for Heathrow Hub would contribute to further dispersal and extension of airport land-uses and their impacts across a wider area of the Thames Valley and West London than at present, and the related impacts need to be considered in the context of economic, environmental and social objectives both locally and nationally. The impact of further dispersal on the operational efficiency and resilience of the airport itself also requires consideration.
- 5.11.2 In addition, the scope and scale of the Heathrow Hub proposal exceeds the level of development envisaged by the South Bucks Local Plan, both in terms of the footprint of the station and the likely traffic generation, noise and emission impacts.
- 5.11.3 The development of facilities associated with the Hub station, particularly with regard to the provision of a hotel(s) and a 10,000 space car park, would challenge the character and biodiversity policy objectives in the Local Plan, and strategic fit with the designated Green Belt is acknowledged by HH, who identify the need for Green Belt deletions in a way not current signalled by policy.
- 5.11.4 It is acknowledged that Local Plans by nature do not anticipate the scale of required infrastructure associated with a national expansion of airport capacity, and also that any proposal to expand aviation capacity at Heathrow will likely have some implications for local and national planning policy. However, when compared with a surface access proposal for Heathrow that incorporates the provision of WRAtH in lieu of the Hub, the Hub scheme is likely to present more challenges with regard to planning policy than the former option.