

# LONDON & SOUTH COAST RAIL CORRIDOR STUDY

DEPARTMENT FOR TRANSPORT

APRIL 2016

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## FINAL

Project no: PPRO 4-92-157 / 3511970BN  
Date: April 2016

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## EXECUTIVE SUMMARY

The corridor connecting London and the south coast is a critical transport link for supporting the region's daily life and economy. Base passenger demand across the corridor is forecast to double in the next 40 years, even if no further improvements are made beyond those already committed in Control Period 5 (CP5, 2014-2019). But known network infrastructure constraints already compromise the ability of its train and infrastructure operators to deliver an efficient and reliable service for the public.

In this context we were asked to carry out a strategic study into improving rail links between London and the south coast. This was targeted at the Brighton Main Line (BML) corridor, upgrades to existing routes, and the 'BML2' proposal. We were also asked to re-assess proposals for reopening the rail link between Lewes and Uckfield.

Our study has concluded that the key strategic priority for this corridor is to pursue Network Rail's upgrade proposals for the existing Brighton Main Line. Our analysis has shown that no other proposals would deliver a similar level of improvements in similar timescales.

The early parts of Network Rail's upgrade package should be progressed for implementation during a window of opportunity in CP6 (2019-2024). These interventions, centred on the Croydon area bottleneck, form the bedrock for future incremental capacity improvements that will create 50% more peak hour fast-line train paths into London. Our analysis supports Network Rail's view that the full upgrade package will enable expected demand to be met in the corridor for at least 30 years, and perhaps through to the late 2050s, dependent on the scale of housing development in the corridor.

A CP6 implementation timing of Network Rail's proposals is consistent with our demand forecasts, but this timing is also opportunity-based. In particular, implementing the key elements of a BML upgrade in this timescale would avoid a likely loss to redevelopment of the critical land in the central Croydon area, which is necessary to upgrade the railway. It would also facilitate major synergies in aligning well with Network Rail's signalling system renewals programme, the timescale for which is driven by asset condition.

Provided the BML upgrade package is progressed in line with the timeframes Network Rail has indicated, our study indicates that there is no need in capacity terms to start planning for a new line now, or to pursue the full 'BML2' scheme that incorporates a link between Croydon, Lewisham, Stratford and beyond. New lines would be costly and, whilst providing benefits, do not serve an existing strategic need. Furthermore, investment in reliability and resilience for the corridor should be focused on BML itself, not diversionary routes via Uckfield or Arundel.

Our study has found there is a poor transport case for reopening the Lewes-Uckfield line, and for National Rail services between Eridge and Tunbridge Wells. However, a stronger case could potentially be built by harnessing the economic growth agenda, rather than just traditional transport benefits. For these schemes to proceed, local authorities and Local Enterprise Partnerships (LEPs) need to lead on determining how improved regional connections, centred on Lewes-Uckfield, can contribute to economic growth, and how this investment can be funded.

We are grateful to the Department for Transport for commissioning this study, and wish to thank the many stakeholders and other parties that have contributed to it.

# 2

## INTRODUCTION

### 2.1

#### STUDY CONTEXT

The rail corridor between London, central Sussex and the south coast – centred on the Brighton Main Line (BML) – is a critical transport link for supporting the region’s daily life and economy. As well as delivering workers into London and other employment centres along the route, it provides access to Gatwick Airport and connects communities along and beyond the corridor.

Base passenger demand across the corridor is forecast to double in the next 40 years, even if no further improvements are made to the route beyond those already committed in Control Period 5. But known network infrastructure constraints already compromise the ability of its train and infrastructure operators to deliver an efficient and reliable service for the public. The route struggles to meet current demand levels and to achieve satisfactory performance, consistently falling at the lower end of the Public Performance Measure (PPM) nationally, with a moving annual average (MAA) of 81.6% at March 2016.

It is therefore important to understand the extent of the capacity challenges that this network will face over the coming decades, and to explore the range of options for meeting these challenges.

In addition, there are long-standing stakeholder aspirations to improve the connectivity offered by the region’s rail network, particularly centred on the Uckfield line and opportunities for reopening to Lewes.

In the July 2015 Summer Budget, the Chancellor therefore announced a study to look at improving rail links between London and the south coast. This was targeted at the BML corridor, upgrades to existing routes, and the ‘BML2’ proposal. This study fulfils that commitment, and also an earlier commitment in the March 2015 Budget to look again at Lewes-Uckfield reopening.

### 2.2

#### TERMS OF REFERENCE

The Terms of Reference document<sup>1</sup> produced by the Department for Transport lists the key questions that the study is intended to address. The questions fall within three main categories: demand for services; proposals and their feasibility; and finally, the priorities for investment in the short, medium and long term. The questions are listed in full in Figure 1.

The study was intended to focus on infrastructure options. We therefore have not explored rolling stock strategies, demand management policies or other non-physical interventions, although we recognise that in some cases these would offer perfectly valid solutions. We were not asked to develop any new infrastructure solutions beyond those which have been proposed by stakeholders, and were asked to use previous studies and existing evidence in our assessment where available. As a result we have not sought to challenge existing cost estimates unless there is good reason to do so.

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<sup>1</sup> *London and South Coast Rail Corridor Study: Terms of Reference*. DfT, October 2015.

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/465342/London\\_and\\_South\\_Coast\\_Corridor\\_Study.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/465342/London_and_South_Coast_Corridor_Study.pdf)

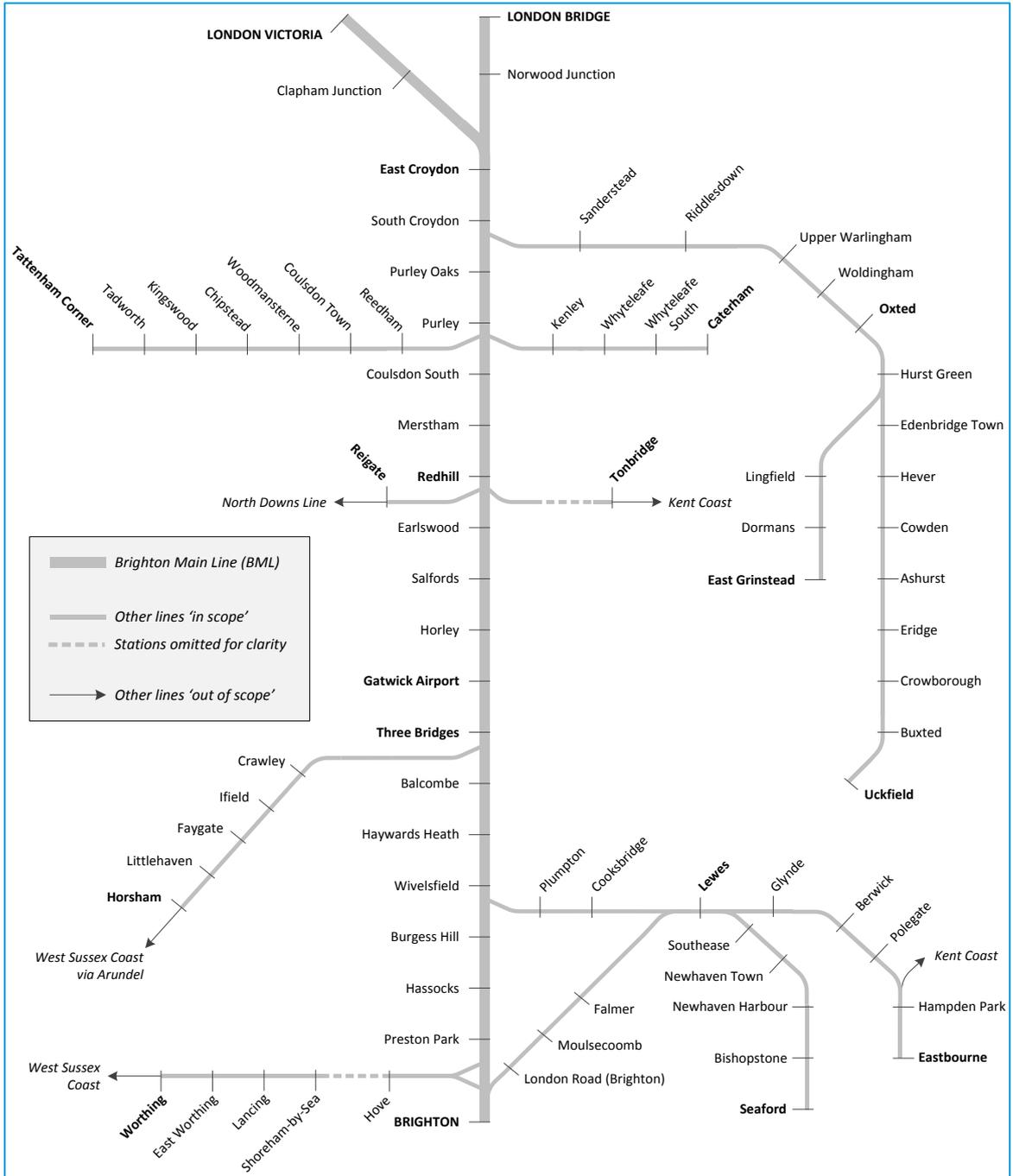
**Figure 1: Extract from Terms of Reference**

1. What is the anticipated demand for services in the Study Area over the short, medium and long term, based on rail industry projections, and future housing and commercial development?
2. Describe the proposed rail schemes identified by Network Rail, Transport for London, local authorities, and Local Enterprise Partnerships that are relevant to the Study Area
3. Describe the proposed rail schemes advocated by stakeholders for entirely or largely new lines between the South Coast and London, including concepts such as 'BML2'.
4. What is the feasibility of the proposed rail schemes in 2 and 3 above, based on:
  - a. How they respond to demand, as identified in 1 above?
  - b. Network design factors, including interactions with other track infrastructure, the availability of land and any tunnelling constraints?
  - c. Operational impacts, including journey time savings, the passenger flow effects of any new travel paths to London terminals, and resilience benefits offered by new infrastructure in times of perturbation to existing lines?
  - d. Estimated cost, as identified in any relevant work performed to date, or estimates based on the cost of projects of a similar nature?
  - e. The extent to which they can be funded by private sector contributions?
5. Based on the above, what are the priorities for investment over short (5-10 years), medium (10-20 years) and long term time horizons (20+ years)?
6. What, if any, potential conflicts exist between priorities for investment in the short, medium and long term, and how are these likely to be best resolved?

The 'study area', or 'corridor', referred to throughout the study is based on the requirements of the Terms of Reference, where it was defined as: *"the Brighton Main Line corridor and surrounding catchment areas, as well as routes and catchment areas to the north east and south east of Croydon that relate to the 'BML2' concept."* Given that the Government has yet to make a decision about increased airport runway capacity in London and the South East, we were asked to assume that Gatwick Airport remains in its current single runway configuration.

The study area boundary and stations and lines that are considered 'in scope' are shown in Figure 2.

Figure 2: Study area



## 3

## PROBLEM DEFINITION

## 3.1

## 'DO NOTHING' DEMAND ASSESSMENT

We created a bespoke demand forecasting model to initially set out the anticipated 'do nothing' base demand over the study time horizon (from 2015 to 2060). This was based on an assessment of current demand levels, informed by the LENNON ticket sales database, to which background growth factors and an allowance for additional housing development were applied. The 'do nothing' base case assumes no further interventions or enhancements will be implemented beyond those already committed in CP5 (2014-2019). These include Thameslink Key Output 2 (KO2) and the Uckfield Line 10-car train lengthening scheme.

All of the demand and capacity modelling undertaken and reported as part of this study refers to the morning 'high peak hour', i.e. arrivals into London or Brighton from 08:00 to 08:59. This ensures that the peak flow into London or Brighton, i.e. the limiting case, is captured.

An annual background demand growth factor of 2.0% was applied across the study time horizon, representing the average of the four demand growth scenarios presented in the London and South East Market Study<sup>2</sup>. The Market Study scenarios are based on Passenger Demand Forecasting Handbook (PDFH) elasticity assumptions that primarily capture the effects of GDP and employment growth.

Planned housing growth (as the main determinant of development growth) was estimated at between 7,900 and 10,250 new homes annually across the study area. The annual housing targets for the district and unitary councils in the corridor are summarised in Figure 3.

**Figure 3: Annual housing delivery targets for district and unitary councils in the Study Area**

DISTRICT/UNITARY COUNCIL	ANNUAL HOUSING TARGET (NEW HOMES)	SOURCE
Adur	181 - 214	Local Plan (2014) / SHLAA (October 2014)
Arun	640 – 2,028	SHLAA (May 2012)
Brighton and Hove	565 - 596	Housing Strategy (2015) / SHLAA (June 2014)
Bromley	641 - 648	London Plan (2014) / Five Year Supply of Deliverable Land for Housing (June 2015)
Crawley	308 - 333	Housing Implementation Strategy (November 2014) / Housing Trajectory (September 2014)
Croydon	1,435	London Plan (2014)

<sup>2</sup> *Long Term Planning Process: London and South East Market Study*. Network Rail, October 2013. <http://www.networkrail.co.uk/publications/market-studies/london-and-south-east-market-study.pdf>

Eastbourne	400	Housing Strategy (2013)
Horsham	750 - 830	Position Statement (July 2015)
Lewes	376 - 490	Housing Land Supply Position (April 2015) / SHLAA (June 2014)
Mid Sussex	325 - 650	District Plan (March, 2015) / SHLAA (November 2015)
Reigate and Banstead	392 - 460	Core Strategy (July 2014) / SHLAA (December 2014)
Sevenoaks	165	Core Strategy (February 2011)
Tandridge	93 - 125	Core Strategy (October 2008) / SHLAA (March 2011)
Tonbridge and Malling	665	Local Plan (February 2015)
Tunbridge Wells	285 - 300	Local Plan (June 2010) / Site Allocations Development Plan Document (Draft, February 2015)
Wealden	675 - 906	Strategic Housing Market Assessment (October 2015) / SHLAA (December 2013)
<b>TOTAL</b>	<b>7,894 - 10,245</b>	

*Note: range represents minimum (constrained) and maximum (unconstrained) targets.*

Our demand forecasts are 'unconstrained'. This means that they do not specifically take into account the effects of crowding on the rail network, and therefore represent the total demand for rail travel if passengers were not put off travelling due to overcrowding. This assumption significantly simplifies the analytical processing burden and is appropriate in a strategic study that seeks to identify and prioritise measures that can remove capacity constraints.

Demand forecasting in this manner over such a long time horizon is complicated and in some cases subjective. Approaches for the application of traditional exogenous demand drivers are well defined, but overlaying development is more difficult, primarily because policy and strategy are sometimes inconsistent over the forecast period, and because housing and transport are not necessarily joined up centrally. It is also possible that overlaying development above traditional background demand growth can cause double-counting. For this reason we have presented base demand 'without (housing) development' and 'with (housing) development' separately throughout this report. In the 'with development' case our analysis assumes a core scenario with total annual housing growth delivery of 8,500 new dwellings, applied across the study time horizon.

The results of our 'do nothing' base demand growth analysis from 2015 to 2023, 2043 and 2060 towards London are presented in Figure 4, alongside Network Rail's own growth estimates. Our forecasts broadly mirror the growth ranges estimated by Network Rail in both the 'with' and 'without' development scenarios, although we accept that Network Rail's figures have a base year of 2011 rather than 2015 so are not directly comparable – particularly for the 2023 estimates. Our 2015 base year demand estimates align closely with Network Rail's 2011 base year if four years of pro-rata growth is added, even though our method of estimation is different.

Our forecasts expect passenger demand in this corridor to have doubled from 2015 levels by the late 2050s to late 2060s depending on whether housing development progresses as planned and assuming no further rail interventions take place beyond the end of CP5. Clearly, if rail investment in the corridor continues beyond the end of CP5, making rail travel more attractive, then passenger numbers can be expected to grow at an even faster rate than the base forecasts.

**Figure 4: Daily high peak hour base demand from Study Area towards London**

	Base year	Demand increase on base year		
	Total Demand	2023 Forecast	2043 Forecast	2060 Forecast
Our estimate (Base year: 2015)	32,600	11-15%	46-60%	90-112%
Network Rail estimate (Base year: 2011)	27,300 <sup>a</sup>	40% <sup>b</sup>	56-74% <sup>c</sup>	74-101% <sup>d</sup>

Notes: a) combined 2011 peak hour passenger demand presented in London and SE Market Study<sup>3</sup> for London Bridge 'Thameslink & Sussex fast' and London Victoria 'Sussex Routes – fast services'.

b) Network Rail estimated high peak hour growth range over 2011-2023 horizon for service groups in (a), presented in London and SE Market Study Figure 6.5.

c) Network Rail estimated high peak hour growth range over 2011-2043 horizon for service groups in (a), presented in London and SE Market Study Figure 6.7.

d) Network Rail estimated growth range in (c) extrapolated to 2060 using equivalent annualised growth rates.

## 3.2

### 'DO NOTHING' CAPACITY ASSESSMENT

Similarly to our base demand assessment, the London-bound base capacity assessments reflect the 'do nothing' scenario, i.e. they present the maximum capacity that would remain on the network if no further infrastructure or rolling stock interventions were made beyond those already committed in CP5. The assessments compare future demand ('with' and 'without' development, as defined in Section 3.1) against the capacity of rolling stock for the planned train service specification, producing a forecast load factor for each year of the study horizon.

Figure 5 and Figure 6 show the load factor forecasts for the BML towards London for the study horizon 2015 to 2060, while Figure 7 and Figure 8 show the same for the Uckfield line. The colours in the Figures indicate the following:

- Green (■) indicates average demand is less than the average seating capacity for the link, i.e. the average load factor is between 0% and the total seating capacity threshold. Therefore, on average, there is enough seating for all passengers.
- Amber (■) indicates average demand is greater than the average seating capacity but less than the average total capacity for the link, i.e. the average load factor is between the total seating capacity threshold and 100%. Therefore, on average, there are passengers standing but the number of standees does not exceed capacity.
- Red (■) indicates average demand is greater than the average total capacity for the link, i.e. the average load factor is greater than 100%. Therefore, on average, demand exceeds capacity, also known as 'passengers in excess of capacity' (PIXC).
- Black (■) indicates average load factors greater than 150%. We have selected this threshold as a means of highlighting where crowding is particularly severe. Typically, this represents an average crowding level of more than twice the density of standees allowed within the standard total capacity.

<sup>3</sup> *ibid.* Figures 6.5 & 6.7.

Figure 5: BML 'do nothing' high peak hour load factors, without housing development

	CP5	CP 6 (2019 - 2024)	CP 7 (2024 - 2029)	CP 8 (2029 - 2034)	CP 9 (2034 - 2039)	CP 10 (2039 - 2044)	CP 11 (2044 - 2049)	CP 12 (2049 - 2054)	CP 13 (2054 - 2059)
East Croydon--London	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
South Croydon--East Croydon	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Purley Oaks--South Croydon	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Purley--Purley Oaks	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Coulsdon South--Purley	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Merstham--Coulsdon South	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Redhill--Merstham	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Earlswood Surrey--Redhill	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Salfords Surrey--Earlswood Surrey	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Horley--Salfords Surrey	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Gatwick Airport--Horley	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Three Bridges--Gatwick Airport	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Balcombe--Three Bridges	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Haywards Heath--Balcombe	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Wivelsfield--Haywards Heath	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Burgess Hill--Wivelsfield	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Hassocks--Burgess Hill	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Preston Park--Hassocks	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Brighton--Preston Park	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

Figure 6: BML 'do nothing' high peak hour load factors, with housing development

	CP5	CP 6 (2019 - 2024)	CP 7 (2024 - 2029)	CP 8 (2029 - 2034)	CP 9 (2034 - 2039)	CP 10 (2039 - 2044)	CP 11 (2044 - 2049)	CP 12 (2049 - 2054)	CP 13 (2054 - 2059)
East Croydon--London	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
South Croydon--East Croydon	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Purley Oaks--South Croydon	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Purley--Purley Oaks	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Coulsdon South--Purley	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Merstham--Coulsdon South	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Redhill--Merstham	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Earlswood Surrey--Redhill	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Salfords Surrey--Earlswood Surrey	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Horley--Salfords Surrey	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Gatwick Airport--Horley	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Three Bridges--Gatwick Airport	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Balcombe--Three Bridges	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Haywards Heath--Balcombe	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Wivelsfield--Haywards Heath	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Burgess Hill--Wivelsfield	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Hassocks--Burgess Hill	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Preston Park--Hassocks	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Brighton--Preston Park	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

Figure 7: Uckfield line 'do nothing' high peak hour load factors, without housing development

	CP5	CP 6 (2019 - 2024)	CP 7 (2024 - 2029)	CP 8 (2029 - 2034)	CP 9 (2034 - 2039)	CP 10 (2039 - 2044)	CP 11 (2044 - 2049)	CP 12 (2049 - 2054)	CP 13 (2054 - 2059)
East Croydon--London	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
South Croydon--East Croydon	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Sanderstead--South Croydon	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Riddlesdown--Sanderstead	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Upper Warlingham--Riddlesdown	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Woldingham--Upper Warlingham	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Oxted--Woldingham	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Hurst Green--Oxted	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Edenbridge Town--Hurst Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Hever--Edenbridge Town	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Cowden Kent--Hever	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Ashurst--Cowden Kent	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Eridge--Ashurst	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Crowborough--Eridge	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Buxted--Crowborough	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Uckfield--Buxted	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

Figure 8: Uckfield line 'do nothing' high peak hour load factors, with housing development

	CP5	CP 6 (2019 - 2024)	CP 7 (2024 - 2029)	CP 8 (2029 - 2034)	CP 9 (2034 - 2039)	CP 10 (2039 - 2044)	CP 11 (2044 - 2049)	CP 12 (2049 - 2054)	CP 13 (2054 - 2059)
East Croydon--London	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
South Croydon--East Croydon	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Sanderstead--South Croydon	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Riddlesdown--Sanderstead	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Upper Warlingham--Riddlesdown	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Woldingham--Upper Warlingham	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Oxted--Woldingham	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Hurst Green--Oxted	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Edenbridge Town--Hurst Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Hever--Edenbridge Town	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Cowden Kent--Hever	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Ashurst--Cowden Kent	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Eridge--Ashurst	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Crowborough--Eridge	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Buxted--Crowborough	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Uckfield--Buxted	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

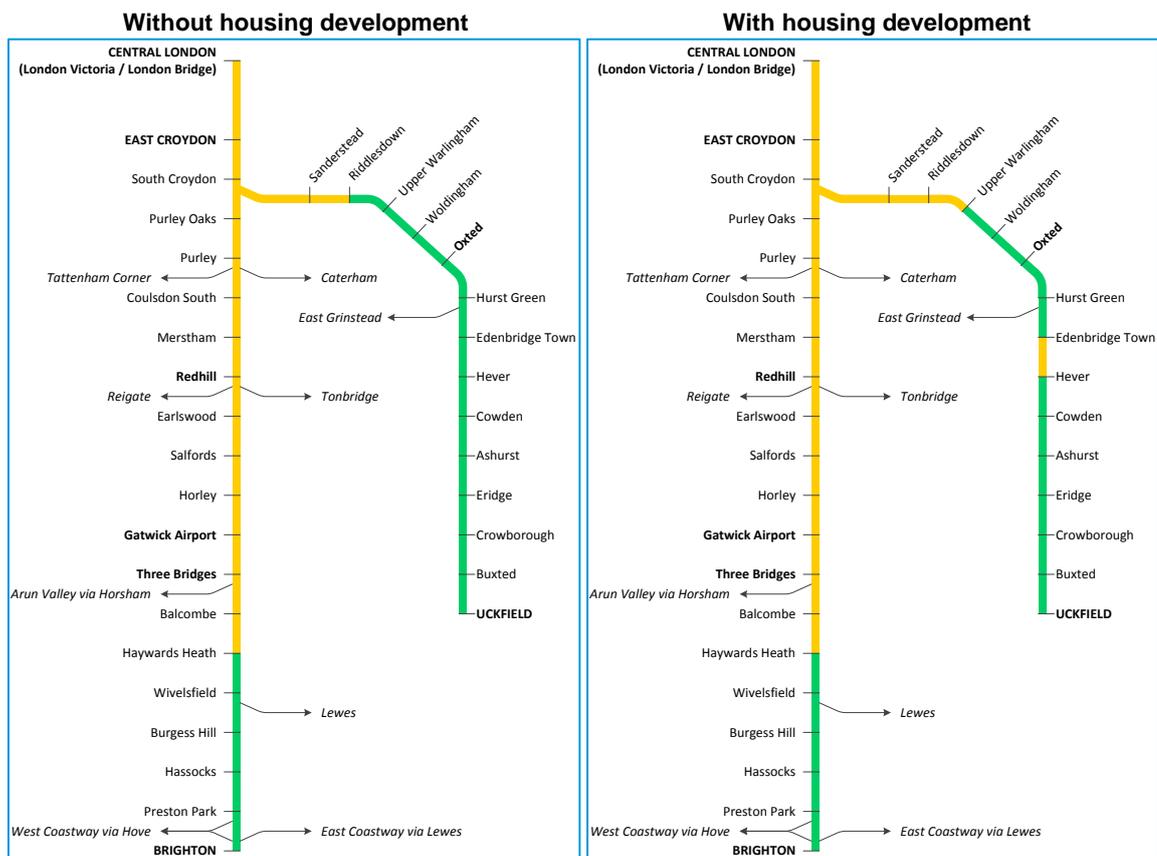
It should be noted that the definition of PIXC loading also includes passengers standing for more than 20 minutes. Our modelling approach does not explicitly capture this, but it can be inferred that any standing (amber, red or black colours) indicated on line sections from Brighton/Uckfield to East Croydon is effectively longer than 20 minutes, as most passengers standing will continue to stand from East Croydon to London, which itself is journey of around 20 minutes. Our LENNON ticket sales analysis for the study area indicates that only 3-4% of total peak hour London-bound passengers exit at Croydon.

It should also be noted that the capacities used in determining the load factors reflect 'perfect' operating conditions, achieving the planned timetable and rolling stock allocation (primarily based on MOIRA data). The load factors therefore do not capture the variations in loading that arise from delays, cancellations or other service disruption.

The Figures show that in 2018 seating capacity is able to fully meet unconstrained demand up to Gatwick Airport in both scenarios for at least 10-15 years as a result of the additional capacity released by the committed Thameslink Key Output 2 works. On the Uckfield line, the committed 10-car train lengthening scheme due for completion in CP5 already results in major crowding alleviation, with seating capacity able to fully meet unconstrained demand on the entire branch until at least CP9 (2034-2039). The effect of housing development on demand is significant, causing PIXC loading thresholds to be surpassed as much as a decade earlier than the 'without development' case.

Figure 9 to Figure 11 illustrate the range of load factors on the BML and Uckfield Line for three discrete years of the study horizon: 2023, 2043 and 2060 respectively. These use the same colour coding as the earlier load factor charts.

Figure 9: 'Do nothing' load factors, high peak hour, Year 2023



The left-hand side of Figure 9 illustrates the average load factors on the BML and Uckfield Line for the high peak hour in the 'without development' scenario, effectively combining Figure 5 and Figure 7, but for 2023 only. This can be considered to present a lower-end estimate of load factors, as it doesn't allow for the additional demand that will be introduced to the network due to new housing developments. The right-hand side of Figure 9 illustrates the load factors for the high peak hour in the 'with development' scenario, effectively combining Figure 6 and Figure 8, but for 2023 only. This can be considered to present a high-end estimate of load factors, accounting for additional demand from new housing development.

The BML (London to Brighton) elements of the Figures are directly comparable to Figure 30 in Network Rail's Sussex Route Study<sup>4</sup> (*'Seat Utilisation on the BML 2023 including committed CP5 interventions'*). Comparing our load factor estimates with Network Rail's seat utilisation forecasts for 2023, there are several key differences. Network Rail expects seating availability between Brighton and Haywards Heath, and then between Gatwick Airport and East Croydon, with standing between Haywards Heath and Gatwick Airport, and then from East Croydon to London. Our estimates are slightly less favourable, indicating in both scenarios seating availability only between Brighton and Haywards Heath. Standing from Haywards Heath to East Croydon and beyond exceeds the 20-minute standing threshold for PIXC. On the Uckfield branch there is not expected to be a particular capacity problem by 2023, although there is the potential need for some passengers to stand north of Riddlesdown or Upper Warlingham.

**Figure 10: 'Do nothing' load factors, high peak hour, Year 2043**

**Without housing development**

**With housing development**

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<sup>4</sup> *South East Route: Sussex Area Route Study*. Network Rail, September 2015.  
<https://www.networkrail.co.uk/Sussex-Area-Route-Study-FINAL.pdf>



The left-hand side of Figure 10 illustrates the expected load factors on the BML and Uckfield Line for the high peak hour in the ‘without development’ scenario for 2043. As before, this can be considered to present a lower-end estimate of load factors. The right-hand side of Figure 10 illustrates the load factors for the high peak hour in the ‘with development’ scenario for 2043, again representing a high-end estimate of load factors.

The BML elements of the Figures are directly comparable to Figure 31 in Network Rail’s Sussex Route Study (‘Seat utilisation on the BML 2043, with no interventions after CP5’). As before, there are several key differences between our load factor estimates and those of Network Rail. Whilst both estimates expect seating availability between Brighton and Preston Park, and standing on the rest of the BML, the density of crowding differs. Network Rail expects total capacity (seats plus standing) to be exceeded between East Croydon and London, whereas our estimate indicates that this could occur as early as Purley Oaks or Merstham. In both cases, the need for passengers to stand from Preston Park or Hassocks onwards to London – a journey of up to one hour 15 minutes - would be classed as PIXC. On the Uckfield branch standing would be expected from Crowborough onwards; also a journey of up to one hour 15 minutes.

**Figure 11: ‘Do nothing’ load factors, high peak hour, Year 2060**

**Without housing development**

**With housing development**

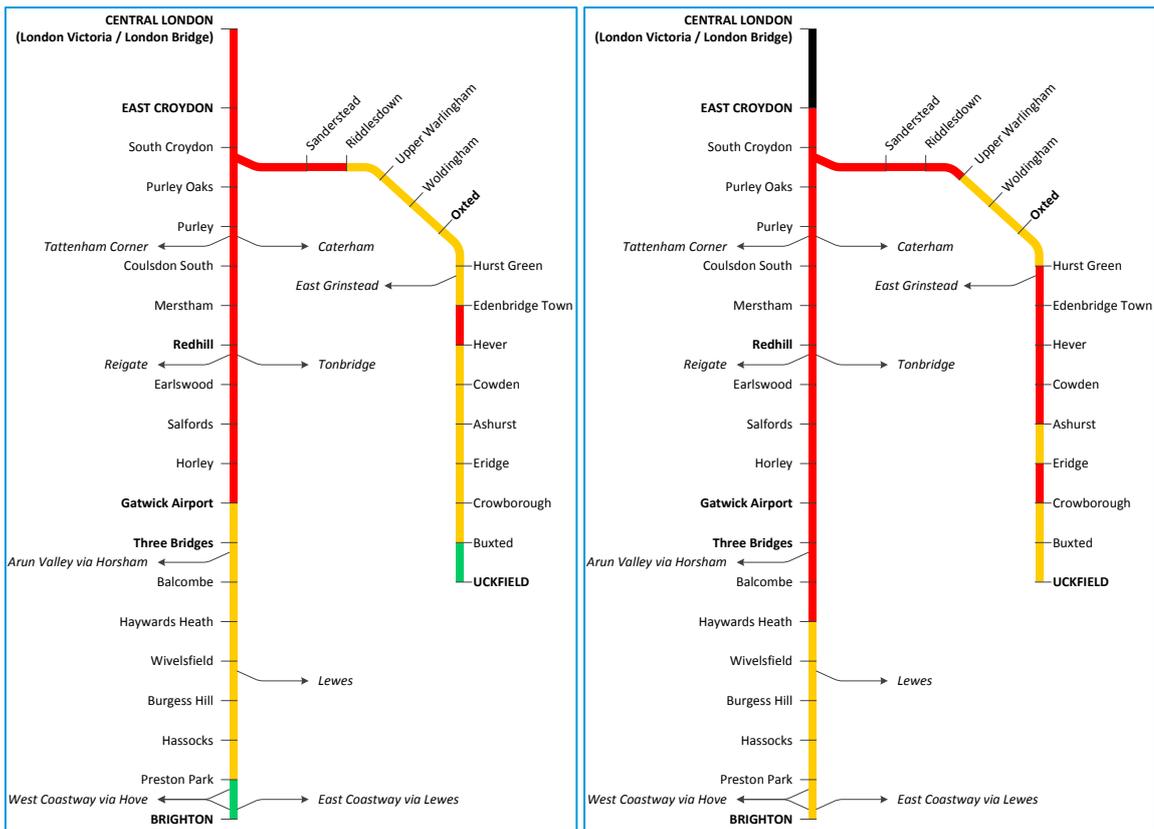


Figure 11 illustrates the same load factor estimates, this time for 2060. Network Rail’s route study did not look as far ahead as 2060, and therefore the diagram is not directly comparable. However, our high-end estimate (the right-hand side of the Figure) expects standing throughout the high peak hour on the entire BML and Uckfield Line if no further interventions are made beyond CP5. Total capacity (seats plus standing) will be exceeded north of Haywards Heath on the BML, and intermittently north of Crowborough. Levels of crowding between East Croydon and London stations would on average be at least twice the permitted density in the high-end estimate.

Overall, our ‘do nothing’ capacity assessment has shown that without further interventions and investment post-CP5 the BML (and to a lesser extent, the Uckfield Line) will see unacceptable periods of standing as the norm and PIXC commonplace for much of the high peak hour, with total rolling stock capacity regularly exceeded in certain locations by as soon as CP7 (2024-2029). With the addition of rapid housing development and resulting rail demand growth, we expect crowding to become an even more pressing issue than described in Network Rail’s Sussex Route Study. However, our central load factor forecasts broadly align with those of Network Rail.

# 4

## REVIEWING THE OPTIONS

### 4.1

#### STAKEHOLDER ENGAGEMENT

As part of the consultation element of this study we have spoken to nearly 30 stakeholder groups, as well as receiving written representations from a smaller number of local groups and individuals.

The relatively short timescale for delivering this study meant that a full and detailed consultation with formal submissions from all interested parties was not feasible. However, it was important to understand the views and priorities of key groups: in particular we met with Network Rail, TfL, GTR (the rail operator), Gatwick Airport and key local authorities and Local Enterprise Partnerships. We also identified and met local interest groups, statutory passenger representative groups, rail user groups and known scheme promoters for the corridor.

### 4.2

#### RAIL SCHEME PROPOSALS

The steps taken in identifying and analysing rail scheme proposals were as follows:

- Gather high level information on formally proposed and advocated schemes for the corridor to create a long-list, compiling a technical summary of the evidence for each proposal
- Complete an assessment and sifting exercise (based on the DfT's Early Assessment and Sifting Tool (EAST) method) to eliminate options that fail to meet prioritisation criteria, strategic aims or to respond to known capacity issues, revealing a short-list of rail schemes
- Condense short-listed scheme options into realistic packages of schemes, based on assumptions about deliverability and compatibility of individual proposals, and develop outline service specifications for each scenario to enable demand impacts to be tested

The long-list of rail scheme proposals is provided in Figure 12. Marshlink (Ashford-Hastings) electrification, North Downs Line (Reigate-Reading) electrification, improvements to Coastway services to/from Brighton, and the Reigate 12-car platform were all deemed to be outside our scope early in the study process, and therefore were not included on the long-list.

**Figure 12: Long-list of rail scheme proposals and summary description**

REF.	SCHEME NAME	SUMMARY
ARU-01	Arundel chord	New chord (North to east spur at Arundel Jn) providing direct link between Arun Valley line (via Horsham) and West Coastway (via Worthing).
BML-01	Network Rail route upgrade package – CP6 'core works'	The key CP6 infrastructure options proposed by Network Rail are: <ul style="list-style-type: none"> <li>→ 2 extra platforms at East Croydon station (to give eight in total) plus full station reconstruction</li> <li>→ Grade separation of Windmill Bridge Junction, Selhurst Junction and Cottage Junction</li> <li>→ Additional tracks between East Croydon and the Selhurst triangle, to tie the above proposals together</li> <li>→ Reigate new 12 car platform</li> <li>→ Norwood Junction track layout alterations</li> <li>→ South Croydon minor signalling improvements</li> </ul>
BML-02	Network Rail route upgrade package – CP7 'further works'	As BML-01 but with the addition of the key CP7 infrastructure options proposed by Network Rail as follows: <ul style="list-style-type: none"> <li>→ Keymer Junction grade separation and Wivelsfield Station rebuild</li> <li>→ 24tph at London Bridge low level, through the Digital Railway programme</li> <li>→ Gatwick track layout modifications (fast line capability enhancements)</li> <li>→ Haywards Heath track layout modifications (London-end turnback enhancements)</li> </ul>

REF.	SCHEME NAME	SUMMARY
BML-03	Network Rail route upgrade package – CP8+ ‘maximum capacity’	As BML-02 but with the addition of the key long term (assumed CP8 or beyond) infrastructure options proposed by Network Rail as follows: → Clapham Junction remodelling → Victoria remodelling → Grade separation at Stoats Nest → Redhill south end remodelling → Three Bridges remodelling → ETCS & Traffic Management
BML-04	Partial quadruple-tracking of BML	An additional two tracks on the existing BML between: → Haywards Heath and Hassocks; and → Preston Park and Brighton. Assumes that in the remaining double-track locations, automatic train control can provide the necessary capacity and mix of stopping and faster trains. This avoids quadrupling the tunnels.
BML-05	Full quadruple-tracking of BML south of Balcombe Tunnel Jn to Brighton	As BML-04 but extended northwards to include Balcombe Tunnel and New Copyhold Junction. Requires additional platforms at all stations between Balcombe and Preston Park.
LEW-01	Uckfield-Lewes reopening: Facing east at Lewes (2008 scheme)	Reinstatement of the former Uckfield-Lewes line, approx 12km (7.5 miles). South end faces east towards Lewes, using the original (1858) route via Hamsey (or near equivalent) to meet the existing Keymer Jn-Lewes line west of Lewes. Relocated Uckfield station with associated closure of B21201 (High Street) to traffic.
LEW-02	Uckfield-Lewes reopening: Turnback siding(s) or loop east of Lewes	As LEW-01, plus a turnback east of Lewes to allow Uckfield line trains to continue to/from Brighton. The turnback would be one of: → LEW-02a: Turnback siding(s) east of Lewes station → LEW-02b: Turnback loop along north side of Lewes Bypass → LEW-02c: Turnback loop at Southerham Junction (in the vee where the Eastbourne and Newhaven lines diverge)
LEW-03	Uckfield-Lewes reopening: With new Ashcombe Tunnel (BML2 Sussex Phase)	As LEW-01, plus: → A new direct connection between the Uckfield-Lewes line near Hamsey and the Lewes-Brighton line west of Lewes, requiring a 2.4km (1.5 mile) tunnel under the South Downs (Ashcombe tunnel) and a bridge over the A27. This allows direct train services between Brighton and the Uckfield line. → Additional platforms at Brighton, to accommodate the additional trains. There would still be a connection between the Uckfield line and Lewes, as per LEW-01.
LEW-04	Uckfield-Lewes reopening: New corridor Isfield-Ringmer-Glynde	Creates a Lewes-Uckfield route using: → The historic alignment from Uckfield to Isfield (approx. 3 miles) → A new alignment from Isfield via Ringmer to a west-facing junction with the Eastbourne-Lewes line east of Glynde (approx. 7 miles). → The existing line from this new junction to Lewes (approx. 3 miles) A potential addition is an east-facing junction at Glynde to allow Uckfield line trains to serve Eastbourne directly.
LON-01	Croydon-Lewisham reopening: direct cross-London route to Canary Wharf and beyond via Selsdon Junction (BML2 London Phase, variant 1)	New cross-London through line from Uckfield/East Grinstead routes at Selsdon, to Lewisham, Canary Wharf and Stratford, with onward connections to West Anglia and/or Great Eastern main lines. Specifically it involves a combination of existing and disused rail corridors between Selsdon and Lewisham, and a new tunnel between Lewisham and Stratford.
LON-02	Croydon-Lewisham reopening: direct cross-London route to Canary Wharf and beyond via East Croydon (BML2 London Phase, variant 2)	New cross-London through line from East Croydon to Lewisham, Canary Wharf and Stratford, with onward connections to West Anglia and/or Great Eastern main lines. This involves a tunnelled route under East Croydon (with an underground level to the station), continuing to Addiscombe, and then continuing northwards as per LON-01.
LON-03	Croydon-Lewisham reopening: direct cross-London route to Canary Wharf and beyond with	New cross-London through line from both BML and East Grinstead / Uckfield corridors Croydon to Lewisham, Canary Wharf and Stratford, with

REF.	SCHEME NAME	SUMMARY
	BML connection and 'Croydon Gateway' station (BML2 London Phase, variant 3)	<p>onward connections to West Anglia and/or Great Eastern main lines. This is as per LON-01, but with the addition of:</p> <ul style="list-style-type: none"> <li>→ A connection at Selsdon between BML (south to/from Gatwick) and BML2 (north to/from Lewisham)</li> <li>→ A potential 'Croydon Gateway' interchange station at Selsdon</li> </ul>
LON-04	Croydon-Stratford tunnel: Thameslink 2 longer-distance services	<p>New Thameslink 2 route via Canary Wharf linking BML at East Croydon with Great Eastern and West Anglia Main Lines at Stratford, as follows:</p> <ul style="list-style-type: none"> <li>→ New cross-London tunnelled route via Docklands, avoiding Central London, linking BML (for Gatwick, Brighton and South Coast) with West and East Anglia routes</li> <li>→ New underground interchange platforms at Lewisham, Canary Wharf and Stratford</li> <li>→ Three options for location of southern portal: <ul style="list-style-type: none"> <li>■ near Purley, with underground platforms at East Croydon</li> <li>■ immediately north of East Croydon, with sixth track between South and East Croydon (this could be grade-separated to avoid the need for the flat junction at South Croydon)</li> <li>■ north of Norwood Junction, with sixth track between South and East Croydon and seventh and eighth track between East Croydon and Cottage Junction</li> </ul> </li> </ul>
LON-05	Croydon-Stratford tunnel: Thameslink 2 metro route	<p>Similar to LON-04 new Thameslink 2 but instead offers metro route via Canary Wharf linking BML at East Croydon with Overground, East and West Anglia lines at Stratford, as follows:</p> <ul style="list-style-type: none"> <li>→ New cross-London through route from Gatwick avoiding Central London with tunnelled line from East Croydon to Addiscombe Railway Park or between Blackhorse Lane and Woodside</li> <li>→ New tunnelled line Lewisham - Stratford via Canary Wharf, to join Overground and East/West Anglia lines</li> <li>→ Double track only Elmers End-Lewisham. Bakerloo Line not extended beyond Lewisham (as to do so would overload the Bakerloo Line central Zone 1 section). Short distance metro services to BML branches and Gatwick, interleaving with Hayes trains.</li> <li>→ New underground interchange platforms at Lewisham, Canary Wharf and Stratford</li> <li>→ Three options for location of southern portal: <ul style="list-style-type: none"> <li>■ near Purley, with underground platforms at East Croydon</li> <li>■ immediately north of East Croydon, with sixth track between South and East Croydon (this could be grade-separated to avoid the need for the flat junction at South Croydon)</li> <li>■ north of Norwood Junction, with sixth track between South and East Croydon, seventh and eighth track between East Croydon and Cottage Junction, and northern portal between Clock House and New Beckenham</li> </ul> </li> </ul>
NEW-01	Entirely new 'high speed' BML to London Victoria	<p>New high speed railway, mainly in tunnel, between Brighton and London. Potentially three tracks, to allow 24/7 operation with one track undergoing maintenance. Automatic operation. Timetable philosophy to combine many short trains into long trains, to provide high frequencies without fighting for scarce paths. Train portions attach and detach without stopping. 50 miles (26 miles 3 track) in total, 30 miles (20 miles 3 track) in tunnels, 2 miles on viaduct, 2 new stations plus rebuild Victoria and Brighton.</p>
NEW-02	Entirely new 'high speed' BML to new central London station	<p>As per NEW-01, but with new central London underground station instead of rebuilding Victoria. Option to link with Great Western Main Line and/or HS2.</p>
NEW-03	BML2 (full proposal incorporating Sussex, Kent and London Phases)	<p>Full BML2 proposal, consisting of:</p> <ul style="list-style-type: none"> <li>→ <b>Sussex Phase:</b> <ul style="list-style-type: none"> <li>■ Lewes-Uckfield reopening. At the south end there would be an east-facing connection towards Lewes station (see LEW-01 for full details), and a west-facing connection towards Brighton with a new tunnel under the South Downs (see LEW-03 for full details). Note: BML2 does not propose any intermediate stations between Lewes and Uckfield</li> <li>■ Additional platforms at Brighton (see LEW-03 for full details)</li> <li>■ Uckfield branch upgraded as a re-doubled, electrified 100mph railway</li> </ul> </li> </ul>

REF.	SCHEME NAME	SUMMARY
		<ul style="list-style-type: none"> <li>■ Eridge station expanded to 4 platforms to provide passing loops (Figure B below)</li> <li>→ <i>Kent Phase</i>: Re-opening link between Uckfield branch and Tunbridge Wells (see TUN-01 and TUN-02 for full details)</li> <li>→ <i>London Phase</i>: New main line Selsdon-Lewisham-Canary Wharf-Stratford (see LON-01 to LON-03 for full details)</li> </ul>
TUN-01	Tunbridge Wells West line reopening: single track through Grove Tunnel (BML2 Kent Phase, variant 1)	<p>Re-opens (for National Rail services) the link between the Uckfield line and Tunbridge Wells:</p> <ul style="list-style-type: none"> <li>→ South-to-East AND North-to-East links reopened at Groombridge</li> <li>→ Realignment at Groombridge to avoid housing encroachment</li> <li>→ Tunbridge Wells West re-opened for National Rail services, with 3x 12-car platforms.</li> <li>→ Re-opened line continues from Tunbridge Wells West through Grove Tunnel to Tunbridge Wells.</li> <li>→ Re-opened line is double-track throughout, except through the single-track Grove Tunnel</li> </ul> <p>Much of this route is currently used by the Spa Valley Railway. Grove Tunnel is reportedly owned by Railway Paths Ltd, an organisation which manages a portfolio of former railway land to provide routes for non-motorised users.</p>
TUN-02	Tunbridge Wells West line reopening: doubling Grove Tunnel (BML2 Kent Phase, variant 2)	<p>As per TUN-01, plus double-tracking Grove Tunnel. The tunnel is part of the 'Grove Link' between Tunbridge Wells and Tunbridge Wells West. The formation and bridges on this link were built for double-track, but the tunnel itself was only built for single-track.</p> <p>There is a parallel with the 2015 doubling of one bore of Farnworth Tunnel, near Bolton. The existing single-track bore was in-filled with soft concrete and a new double-track tunnel was bored.</p>
TUN-03	Tunbridge Wells West line reopening: single line	<p>Re-opens (for National Rail services) the link between the Uckfield line and Tunbridge Wells:</p> <ul style="list-style-type: none"> <li>→ Eridge to Tunbridge Wells West re-opened with single track</li> <li>→ This includes the south-to-east link at Groombridge.</li> <li>→ Straightened alignment at Groombridge</li> <li>→ Tunbridge Wells West re-opened for National Rail services, with a single platform</li> </ul> <p>This entire route is currently used by the Spa Valley Railway. This is a smaller-scale scheme than TUN-01 or TUN-02. The Grove Link between Tunbridge Wells West and Tunbridge Wells (existing station) would not be re-opened. The north-to-east link at Groombridge would also not re-open.</p>
UCK-01	Electrify existing Uckfield line between Hurst Green and Uckfield	Convert existing Uckfield branch to 3rd rail electrification (like-for-like track layout)
UCK-02	Redouble existing Uckfield line between Hever and Uckfield	<p>Redouble existing line (but don't electrify) between:</p> <ul style="list-style-type: none"> <li>→ Hever Jn and Blackham Jn (via Cowden);</li> <li>→ Ashurst Jn and Crowborough Jn; and</li> <li>→ Greenhurst Jn and Uckfield.</li> </ul>
UCK-03	Electrify and redouble entire Uckfield line	Combination of UCK-01 and UCK-02. Newly doubled track also electrified, with line speed upgraded to up to 100mph.
WES-01	West Coastway dynamic loops	Provide a bi-directional third track in the areas of Southwick, Durrington on Sea and Barnham to create dynamic loops which will enable 'fast' services on West Coastway to pass stopping trains
WIL-01	Willingdon chord (avoiding Eastbourne)	New chord (east to west spur at Willingdon Jn) on East Coastway, avoiding Eastbourne. There was historically such a route but part of it has been built on and the new Willingdon Curve would not necessarily use any or all of the old route.

Source: existing industry plans and engagement with stakeholders. The following schemes were agreed to be out of scope for this study: Marshlink (Ashford-Hastings) electrification, North Downs Line (Reigate-Reading) electrification, Improvements to Coastway services to/from Brighton, and Reigate 12-car platform.

A multi-disciplinary option assessment workshop was held to consider all of the schemes on the long-list in turn; reviewing their rationale, capacity/demand impact, engineering feasibility, cost

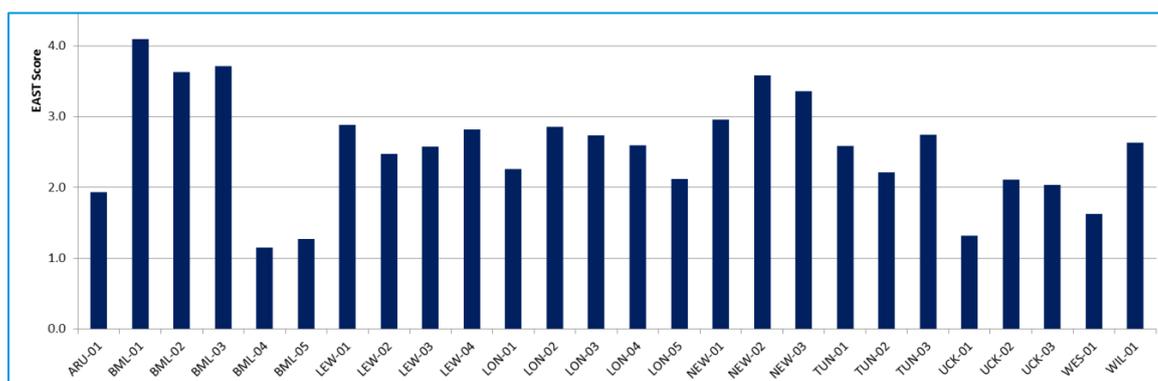
and strategic priority. Final decisions on schemes to be included in the short-list were reached based on a combination of the scoring results from the sifting tool and professional judgement.

The adapted 'EAST' assessment scored every long-listed scheme on the following categories:

- Strategic benefits
  - Scale of impact, relative to the peak capacity and long distance Conditional Outputs (CO) identified in Network Rail's Sussex Route Study<sup>5</sup>
  - Fit with wider transport and government objectives
  - Degree of consensus over outcomes
- Economic growth impact
- Managerial aspects
  - Engineering feasibility
  - Operational feasibility
  - Public acceptability
- Cost risk

An overall score for each scheme was determined using a blended and weighted average of the scheme's scores across each individual category. Three weighting scenarios were created to represent varying priorities and points of view that might be held by decision makers. The scores for the central weighting scenario are presented in Figure 13.

**Figure 13: Overall EAST scores for central weighting scenario**



The EAST scores for all weighting scenarios were supplemented by qualitative professional judgements to determine the final short-list, using the following principles:

1. Based on our modelling and broader understanding of the study area, does the scheme address a recognised demand/capacity issue?
2. Is the standalone scheme expected to have a material demand/capacity impact on the corridor (and particularly for services to London and Brighton)? Or does it need to be implemented in combination with other schemes?
3. Is there a viable business case for the scheme?

<sup>5</sup> *ibid.* CO1, CO6, CO15, CO16 and CO17.

4. Does the scheme have the potential to generate wider economic benefits or have a close fit with wider transport objectives for the study area?
5. Is the scheme sufficiently different from the other scheme options to warrant its own analysis at this stage?

Figure 14 records the results of the option assessment exercise. Nine of the 26 schemes were not taken forward, leaving a short-list of 17 schemes.

**Figure 14: Short-list of schemes resulting from option assessment**

REF.	SCHEME NAME	DECISION	COMMENTS
ARU-01	Arundel chord	Not taken forward	Limited impact on study area and no viable business case
BML-01	Network Rail route upgrade package – CP6 'core works'	Short-listed	-
BML-02	Network Rail route upgrade package – CP7 'further works'	Short-listed	-
BML-03	Network Rail route upgrade package – CP8+ 'maximum capacity'	Short-listed	-
BML-04	Partial quadruple-tracking of BML	Not taken forward	Benefits expected to be limited due to capacity constraints further north on the network
BML-05	Full quadruple-tracking of BML south of Balcombe Tunnel Jn to Brighton	Not taken forward	Benefits expected to be limited due to capacity constraints further north on the network
LEW-01	Uckfield-Lewes reopening: Facing east at Lewes (2008 scheme)	Short-listed	-
LEW-02	Uckfield-Lewes reopening: Turnback siding(s) or loop east of Lewes	Short-listed	-
LEW-03	Uckfield-Lewes reopening: With new Ashcombe Tunnel (BML2 Sussex Phase)	Short-listed	-
LEW-04	Uckfield-Lewes reopening: New corridor Isfield-Ringmer-Glynde	Short-listed	-
LON-01	Croydon-Lewisham reopening: direct cross-London route to Canary Wharf and beyond via Selsdon Junction (BML2 London Phase, variant 1)	Not taken forward	Avoiding East Croydon unacceptable in stand-alone scheme, LON-02/04 preferred
LON-02	Croydon-Lewisham reopening: direct cross-London route to Canary Wharf and beyond via East Croydon (BML2 London Phase, variant 2)	Short-listed	-
LON-03	Croydon-Lewisham reopening: direct cross-London route to Canary Wharf and beyond with BML connection and 'Croydon Gateway' station (BML2 London Phase, variant 3)	Not taken forward	Avoiding East Croydon unacceptable in stand-alone scheme, LON-02/04 preferred
LON-04	Croydon-Stratford tunnel: Thameslink 2 longer-distance services	Short-listed	-
LON-05	Croydon-Stratford tunnel: Thameslink 2 metro route	Short-listed	-
NEW-01	Entirely new 'high speed' BML to London Victoria	Not taken forward	NEW-02 should be investigated instead as too early to define location of London terminus
NEW-02	Entirely new 'high speed' BML to new central London station	Short-listed	-
NEW-03	BML2 (full proposal incorporating Sussex, Kent and London Phases)	Short-listed	-
TUN-01	Tunbridge Wells West line reopening: single track through Grove Tunnel (BML2 Kent Phase, variant 1)	Short-listed	-
TUN-02	Tunbridge Wells West line reopening: doubling Grove Tunnel (BML2 Kent Phase, variant 2)	Short-listed	-
TUN-03	Tunbridge Wells West line reopening: single line	Short-listed	-
UCK-01	Electrify existing Uckfield line between Hurst Green and Uckfield	Not taken forward	Limited capacity impact unless line also redoubled
UCK-02	Redouble existing Uckfield line between Hever and Uckfield	Short-listed	-
UCK-03	Electrify and redouble entire Uckfield line	Short-listed	-
WES-01	West Coastway dynamic loops	Not taken forward	Limited impact on study area; primarily impacts Coastway services to Brighton
WIL-01	Willingdon chord (avoiding Eastbourne)	Not taken forward	Limited impact on study area and no viable business case

## 4.3

## PACKAGE DEFINITION

The short-listed schemes in Figure 14 were assembled into eleven packages. The package definition exercise was based on assumptions about deliverability and compatibility of individual schemes. The packages are defined in Figure 15, which also shows how the remaining chapters of this report are structured.

**Figure 15: Infrastructure package definitions based on short-listed schemes**

GROUP	PACKAGE	DESCRIPTION	SCHEMES INCLUDED ABOVE BASELINE	REPORT CHAPTER
0	-	CP6 upgrade	BML-01	5. The BML Upgrade Package
1	A	CP7 upgrade	BML-01, BML-02	
	B	CP7 and CP8+ upgrades	BML-01, BML-02, BML-03	
2	A	Base option – extend existing 2tph London-Uckfield services to Lewes or beyond (no loop at Lewes)	BML-01, LEW-01	6. Lewes-Uckfield Reopening and Tunbridge Wells Link
	B	As per Package 2A, plus loop at Lewes to extend existing 2tph to Brighton	BML-01, LEW-02	
	C	As per Package 2B, plus Tunbridge Wells West to Eridge shuttle service	BML-01, LEW-02, TUN-03	
	D	Extend existing 2tph London-Uckfield to Eastbourne and/or Newhaven. Double (but don't electrify) Tunbridge Wells West to Eridge and Eridge to Uckfield to enable 2tph service Tunbridge Wells West to Brighton	BML-01, LEW-02, TUN-03, UCK-02 (part)	
	E	As per Package 2D, but construct Ashcombe tunnel for the 2tph to Brighton	BML-01, LEW-03, UCK-03, TUN-03 (plus electrification)	
	F	As per Package 2E, but all 4tph continue to Brighton through Ashcombe tunnel	BML-01, LEW-03, UCK-03, TUN-03 (plus electrification)	
3	A	New high speed rail line with stations at Brighton, Crawley, Gatwick, Croydon and somewhere in central London (accepting that modelling benefits to suburban services are beyond the scope of this study)	BML-01, BML-02, NEW-02	7. New Lines
	B	Entire 'BML2' scheme with Sussex, Kent and London phases (i.e. also captures LON-02 and either TUN-01 or TUN-02)	BML-01, BML-02, NEW-03	

Our early analysis showed that scheme BML-01 (Network Rail's CP6 core route upgrade proposals) was the only scheme that could be delivered in time to achieve Conditional Output 6 (CO6) in the Sussex Route Study, i.e. meeting the forecast demand levels on the network by 2024. The incremental capacity improvements offered by this scheme were in many cases needed to achieve the intended outputs of the other schemes. Through discussion with Network Rail and other stakeholders, it was also established that scheme BML-01 already had widespread support and had made significant progress in terms of design development.

Whilst the CP6 proposals are not committed, and therefore not part of our baseline, the factors above led us to consider it appropriate to create a standalone package (Package 0) for BML-01 to act as a prerequisite for all subsequent packages. The remaining packages have therefore been analysed 'additively', i.e. on the assumption that Network Rail's CP6 proposals are implemented. As previously stated, our assessment relies on the remainder of committed CP5 schemes also being implemented as planned.

The remainder of the schemes fell into three groups: longer-term schemes to improve BML capacity and reliability (Group 1); schemes to contribute to economic growth in Sussex (Group 2); and major new line schemes (Group 3).

The final step in analysing rail scheme proposals was to develop outline service specifications for each package. For all eleven packages, existing data on planned services from previous studies and investigations was compiled to create a morning peak hour service frequency and end-to-end journey time change, in the to-London and to-Brighton flow directions. This enabled each package to be tested in our demand modelling suite.

The following chapters provide our assessment of the schemes and packages investigated as part of this study, listed by theme. In addition to the Chapters identified in Figure 15, in Chapter 8 we also provide our assessment of some other significant scheme proposals that have not fallen within our core demand investigation. We present our conclusions and recommendations throughout these Chapters.

## 5

## THE BML UPGRADE PACKAGE

## 5.1

## THE PROPOSALS

Network Rail is developing a 'BML Upgrade' package, which aims to meet 2023 and 2043 capacity requirements (as set out in the Sussex Route Study) as well as improving performance. The background and rationale for the package and individual key elements were set out in the pre-route-study BML interim report<sup>6</sup> and subsequently the Route Study itself. The background and rationale have not been technically challenged by stakeholders, and (accepting that the detail continues to be refined) we have found no reason ourselves to dispute it.

Development of the package has continued since the Route Study was published. In particular, it has recently been extended beyond 2043 by identifying further capacity increases as an indicative scenario representing the ultimate potential capacity of the existing BML if all realistic potential works are undertaken. This indicative scenario could accommodate longer-term growth, or a level of growth up to 2043 that exceeds the Route Study's predictions, or a combination of the two.

The overall content of the proposed upgrade package is shown in Figure 16. The centrepiece is at Croydon: untangling the East Croydon / Selhurst bottleneck by grade-separating some conflicting routes, thus creating substantial additional capacity through the area and improving its reliability. To make full use of that capacity, other schemes need to be implemented along the corridor, but there is more flexibility about exactly which of, and when, these other schemes are implemented. The current assumptions are as follows:

- For 2023 a 'CP6 core' package of schemes is needed which includes East Croydon / Selhurst and some of the other schemes. (This is option BML-01 in the present study.) Compared to the 2018 timetable, it would allow an additional 2tph into *both* London Bridge and Victoria.
- For the 2043 horizon, further schemes are needed, and these can be implemented as required post-CP6; these are assumed to be a 'CP7: further works' package. (This is option BML-02 in the present study.) Compared to the CP6 package, this would allow a further 4tph into *either* Victoria or London Bridge.
- Beyond 2043, and/or to accommodate higher-than-forecast growth up to 2043, a further 'CP8+: maximum capacity' package would include further schemes representing the ultimate potential capacity of the existing BML if all realistic potential works are undertaken. (This is option BML-03 in the present study.) Compared to the CP7 package, it would allow an additional 8tph into a combination of London Bridge and Victoria.

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<sup>6</sup> Brighton Main Line Emerging Capacity Strategy for CP6: Pre-Route Study report for DfT. Network Rail, May 2014.  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/306997/brighton-main-line-interim-report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/306997/brighton-main-line-interim-report.pdf)



between growth on the London Bridge and Victoria routes. The long term BML maximum capacity assumes growth on both routes.

Figure 17: Illustrative train service outputs (tph) from Network Rail's BML upgrade package

Route	2018 assumed ['CP5 committed']		By mid 2020s ['CP6 Core Works']		By 2030 ['CP7 Further Works'] <sup>a</sup>				Long term BML maximum capacity ['CP8+'] <sup>b</sup>	
	Vic	LB	Vic	LB	Scenario 1: Victoria Growth		Scenario 2: Ldn Bridge Growth		Vic	LB
Brighton	4	4	4	4	4	4	4	4	4	4
East Coastway	2	0	2	1	2	1	2	2	2	2
West Coastway	2	2	2	2	2	2	2	2	4	2
Arun Valley	2	0	2	1	2	1	2	2	2	2
via Redhill	2	4	4	4	4	4	4	4	6	4
Caterham / Tattenham	2	4	2	4	2	4	2	4	4	4
East Grinstead / Uckfield	2	4	2	4	2	4	2	4	2	6
Wallington lines	0	2	0	2	0	2	0	2	0	2
<b>TOTALS</b>	<b>16</b>	<b>20</b>	<b>18</b>	<b>22</b>	<b>22</b>	<b>22</b>	<b>18</b>	<b>26</b>	<b>24</b>	<b>28</b>
<b>Infrastructure required</b>	<ul style="list-style-type: none"> <li>Completion of Thameslink Key Output 2</li> <li>Redhill platform 0</li> </ul>		As 2018 plus: <ul style="list-style-type: none"> <li>Croydon area grade separation</li> <li>East Croydon station</li> <li>Norwood Junction remodelling</li> <li>Reigate extra platform</li> </ul>		As CP6 Core plus: <ul style="list-style-type: none"> <li>Gatwick track layout</li> <li>Haywards Heath track layout</li> <li>Clapham Jn remodelling</li> <li>Victoria remodelling</li> <li>Keymer Jn grade separation</li> </ul>		As CP6 Core plus: <ul style="list-style-type: none"> <li>Gatwick track layout</li> <li>Haywards Heath track layout</li> <li>Signalling capability on Sydenham fast lines</li> <li>London Bridge low level 24tph capability</li> <li>Keymer Jn grade separation</li> </ul>		All works from both CP7 scenarios plus: <ul style="list-style-type: none"> <li>Stoats Nest Jn grade separation</li> <li>Redhill south end remodelling</li> <li>Three Bridges track layout</li> <li>ETCS / Traffic Management System</li> </ul>	

Source: Network Rail.

Notes (based on notes supplied by Network Rail):

Figures represent number of trains during high peak hour.

- Green = fast lines to Victoria (measured at Selhurst).
- Blue = fast lines to/via London Bridge (measured at Sydenham).
- Bold shaded figures** in green or blue denote incremental increases over existing service levels.
- 'HH' denotes additional trains with Haywards Heath infrastructure; totals include these trains.

a) These represent two potential options for the "Route Study end state" (assumed in the Route Study as 2043, but this could be whenever the infrastructure is built)

b) An indicative longer term scenario, to illustrate the ultimate potential capacity of the existing BML route if all realistic potential works are undertaken. This is referred to as CP8+ throughout this study.

The end state has required some assumptions to be made regarding what Digital Railway technology will give at each of London Bridge and towards Victoria, but the design of CP6 infrastructure in the Croydon area and elsewhere is not dependent on this.

The BML Upgrade is also expected to improve performance, partly through performance-focused measures and partly where the schemes listed above reduce the number of conflicting routes. Examples of the former are changed maintenance practices, new technology and remote equipment monitoring. The potential performance benefit of the latter is complex. They would be

expected to improve performance if the train service stayed the same, but the additional peak trains would eat into the performance improvement at peak times. Network Rail's assumption is that no off-peak trains would be added, so there would be a performance benefit throughout the off-peak, including speedier recovery from peak perturbations. Network Rail is carrying out performance modelling to quantify the benefits.

## 5.2

## OUR ASSESSMENT

Our assessment of the BML Upgrade Package is provided in Figure 18.

Figure 18: BML Upgrade Package feasibility assessment

CATEGORY	OUR ASSESSMENT
Demand impacts	<p>The package allows a very significant capacity increase, ultimately up to around 55% more fast line train paths between Three Bridges and Croydon, and 45% more train paths between Croydon and London.</p> <p>Building on the Croydon element in the first stage, the Package allows a degree of flexibility in selecting and timing later investments to allow the full capacity benefit to be realised and 'flowed out' along individual routes in response to demand needs. The impacts of the proposed additional capacity for the full Package (CP6, CP7 and CP8+) are illustrated in Figure 19 to Figure 22.</p> <p>The full Package pushes back the standing densities seen in the base case by typically 20 years or more, and for the BML eliminates average load factors higher than 100% across the entire study horizon to 2060 in both the and without development cases, except for north of Croydon. Even if all planned housing development proceeds, there is expected to be adequate seating provision south of Gatwick Airport to at least 2060.</p> <p>For the Uckfield line, load factors higher than 100% are pushed back until CP11-12 (2044-2054) at the earliest. North of Hurst Green there are reduced levels of standing in the longer term as a result of the additional services operating from East Grinstead.</p>
Network design factors and engineering feasibility	<p>This is overall a credible and well-developed package. The early (CP6) elements, particularly Croydon, will be complex and challenging to construct in constrained conditions but have been the subject of relatively detailed design development compared to other proposals. The later elements, although not yet at GRIP 2 stage, have been the subject of proportionate design development which shows how they fit into the overall package. Further refinements and analyses are on-going.</p> <p>There are two key engineering risks:</p> <ul style="list-style-type: none"> <li>→ Significant land alongside the existing railway would be required in Croydon, which is a rapidly developing area. Unavailability of this land would be a major obstacle to the centrepiece of the package. If this happened, the entire package, and the recommendations of this report, would need to be revisited.</li> <li>→ The final stages of the package (post-2043 on Network Rail's current estimates, but assumed to be carried out in CP8 for the purposes of our analysis) rely on 'digital railway' technology, to allow the final parts of the capacity unlocked at Croydon to be actually used. The 'digital railway' benefits are reliant on technology that is yet to be well-established in UK mainline railways of this complexity, and there is not yet an industry consensus on their achievability in such circumstances. In our view, this risk is acceptable because : <ul style="list-style-type: none"> <li>■ The issue does not affect the feasibility of earlier stages, or the need to undertake them. It just affects how far the incremental upgrades can go.</li> <li>■ Forthcoming 'digital railway' installations on the Thameslink core and other main lines will provide experience that can be used to confirm or amend the strategy for the later stages. This includes the planned ETCS Level 2 signalling and Automatic Train Operation (ATO) on the Thameslink Core.</li> </ul> </li> </ul> <p>Other main risks are:</p>

	<ul style="list-style-type: none"> <li>→ Performance and closure impacts during construction – particularly the significant remodelling of very busy areas at Croydon and (later) Clapham Junction and Victoria.</li> <li>→ The potential for minor land-take impacts in Burgess Hill and Wivelsfield in order to grade-separate Keymer Junction.</li> <li>→ The proposed CP6 implementation is aligned with the signalling system asset condition renewals timeline; a major synergy which would be lost if development was paused.</li> </ul>
Operational feasibility, journey time savings and resilience benefits	In-vehicle journey times are not intended to be affected by the Package. Any changes will be marginal in the context of routine timetable evolution. However, the peak frequency uplifts will improve generalised journey time to many destinations. Resilience benefits arise from the reduction in conflicting movements that will reduce reactionary delays, but we have highlighted that the capacity allows a trade-off to be made between adding trains and improving performance, particularly off-peak. The package does not provide diversionary routes but in our view improving the resilience of the BML itself is likely to offer the best value. The route operator, GTR, is fully supportive of the proposals.
Estimated cost	<p>Delivery is proposed to be split across multiple control periods.</p> <p>Capital cost is assumed at £600m-£700m for CP6; £500m-£600m for CP7; and £100m-£200m for CP8+ works, and is based on a combination of Network Rail's own estimates and our professional judgement. This excludes works associated with re-modelling Clapham Junction and London Victoria, which have not been estimated.</p> <p>The capital cost of the entire package is estimated, at this early stage of development, at £1.2bn to £1.5bn. BCRs range from 1.4 to 3.7 with the Central Case at 2.2. The key driver of the BCR range is whether any and what level of performance improvement could be achieved after completion of the programme.</p>
Funding options	This is a regional package benefiting all areas along the BML. There is potential for oversite development at East Croydon to provide an external funding source. Elsewhere it is unlikely that site-specific developer contributions could be justified in significant amounts beyond marginal elements. Community Infrastructure Levy (CIL) or a business rate supplement could theoretically be used but given other pressures such as Crossrail 2 on these sources, and the fact that it would have to be done on a regionally coordinated basis, we consider this unrealistic.

Source: WSP | Parsons Brinckerhoff project team assessment. High level final cost estimates presented are based on relevant pre-existing work (if listed) or the cost of projects of a similar nature. The cost range reflects the degree of design/option development that has already been undertaken and the evidence that was available to the project team during the study.

The impacts of the proposed peak hour additional capacity for the full BML Upgrade Package (CP6, CP7 and CP8+ combined) are illustrated in load factor terms in Figure 19 to Figure 22. The colour coding used in these Figures is the same as Section 3.2.

Figure 19: Network Rail Upgrade Package impacts on BML, without housing development

	CP5	CP 6 (2019 - 2024)	CP 7 (2024 - 2029)	CP 8 (2029 - 2034)	CP 9 (2034 - 2039)	CP 10 (2039 - 2044)	CP 11 (2044 - 2049)	CP 12 (2049 - 2054)	CP 13 (2054 - 2059)
East Croydon–London	Red								Red
South Croydon–East Croydon					Green				
Purley Oaks–South Croydon									
Purley–Purley Oaks									
Coulsdon South–Purley									
Merstham–Coulsdon South		Green							
Merstham–Merstham		Green							
Earlswood Surrey–Redhill		Green							
Salfords Surrey–Earlswood Surrey		Green							
Horley–Salfords Surrey		Green							
Gatwick Airport–Horley						Green			
Three Bridges–Gatwick Airport	Green								
Balcombe–Three Bridges	Green								
Haywards Heath–Balcombe	Green								
Wivelsfield–Haywards Heath	Green								
Burgess Hill–Wivelsfield	Green	Yellow							
Hassocks–Burgess Hill	Green								
Preston Park–Hassocks	Green								
Brighton–Preston Park	Green								

Figure 20: Network Rail Upgrade Package impacts on BML, with housing development

	CP5	CP 6 (2019 - 2024)	CP 7 (2024 - 2029)	CP 8 (2029 - 2034)	CP 9 (2034 - 2039)	CP 10 (2039 - 2044)	CP 11 (2044 - 2049)	CP 12 (2049 - 2054)	CP 13 (2054 - 2059)
East Croydon--London	Red							Red	Red
South Croydon--East Croydon									
Purley Oaks--South Croydon									
Purley--Purley Oaks									
Coulsdon South--Purley									
Merstham--Coulsdon South		Green							
Redhill--Merstham		Green							
Earlswood Surrey--Redhill		Green							
Salfords Surrey--Earlswood Surrey		Green							
Horley--Salfords Surrey		Green							
Gatwick Airport--Horley		Green							
Three Bridges--Gatwick Airport		Green							
Balcombe--Three Bridges		Green							
Haywards Heath--Balcombe		Green							
Wivelsfield--Haywards Heath		Green							
Burgess Hill--Wivelsfield		Green							Green
Hassocks--Burgess Hill		Green							Green
Preston Park--Hassocks		Green							Green
Brighton--Preston Park		Green							Green

Figure 21: Network Rail Upgrade Package impacts on Uckfield line, without housing development

	CP5	CP 6 (2019 - 2024)	CP 7 (2024 - 2029)	CP 8 (2029 - 2034)	CP 9 (2034 - 2039)	CP 10 (2039 - 2044)	CP 11 (2044 - 2049)	CP 12 (2049 - 2054)	CP 13 (2054 - 2059)
East Croydon--London	Red								Red
South Croydon--East Croydon									
Sanderstead--South Croydon									
Riddlesdown--Sanderstead		Green							
Upper Warlingham--Riddlesdown		Green							
Woldingham--Upper Warlingham		Green							
Oxted--Woldingham		Green							
Hurst Green--Oxted		Green							
Edenbridge Town--Hurst Green		Green							
Haver--Edenbridge Town		Green							
Cowden Kent--Haver		Green							
Ashurst--Cowden Kent		Green							
Erith--Ashurst		Green							
Crowborough--Erith		Green							
Buxted--Crowborough		Green							
Uckfield--Buxted		Green							

Figure 22: Network Rail Upgrade Package impacts on Uckfield line, with housing development

	CP5	CP 6 (2019 - 2024)	CP 7 (2024 - 2029)	CP 8 (2029 - 2034)	CP 9 (2034 - 2039)	CP 10 (2039 - 2044)	CP 11 (2044 - 2049)	CP 12 (2049 - 2054)	CP 13 (2054 - 2059)
East Croydon--London	Red								Red
South Croydon--East Croydon									
Sanderstead--South Croydon									
Riddlesdown--Sanderstead		Green							
Upper Warlingham--Riddlesdown		Green							
Woldingham--Upper Warlingham		Green							
Oxted--Woldingham		Green							
Hurst Green--Oxted		Green							
Edenbridge Town--Hurst Green		Green							
Haver--Edenbridge Town		Green							
Cowden Kent--Haver		Green							
Ashurst--Cowden Kent		Green							
Erith--Ashurst		Green							
Crowborough--Erith		Green							
Buxted--Crowborough		Green							
Uckfield--Buxted		Green							

5.3

STAKEHOLDERS' VIEWS

Stakeholders (including those promoting other schemes) generally have strong support for Network Rail's BML Upgrade (as it was presented in the Route Study), regarding it as the top priority for investment along the corridor.

However, stakeholders are also often concerned that it may not be sufficient, because:

- As noted in Section 3.1, our high-end estimate of demand growth is expected to exceed NR's forecasts in absolute terms, meaning that the forecast 2023 and 2043 demand levels may be reached sooner than those dates.
- There is no reason to believe that demand will not continue to rise beyond 2043 (or some earlier date at which the 2043 forecasts are reached), and indeed our own estimates indicate that growth would accelerate beyond 2043 to 2060.

- There are concerns that in order for the Upgrade package to be shown to meet the 2043 demand forecast, some requirements for passenger comfort have been assumed to be relaxed by that point. Specifically the concerns are that:
  - Metro-type trains (with greater standing space compared to seating space than non-metro trains, thus carrying more people) are assumed.
  - The seat utilisation target has been assumed to be 100%, not 85%.
  - Because a few fast peak trains call at Norwood Junction, the 20-minute standing allowance is measured from East Croydon rather than London Bridge. This is technically correct but is seen as potentially misleading in terms of reflecting passengers' experience.

Despite these concerns, we believe that the assumptions used in Network Rail's analysis are appropriate. For consistency, we have used the same assumptions in our own estimates.

## 5.4

### RECOMMENDED WAY FORWARD

We agree with stakeholders that **Network Rail's BML Upgrade Package should be the highest priority investment on the corridor**. It is a relatively well-developed package with a strong strategic case that not only targets the immediate pressing problem of BML capacity, but (through the Croydon element in CP6) is the key to unlocking medium-term capacity gains as well as offering performance benefits. It is the only viable proposal that would provide major capacity and resilience benefits where they are most needed in the post-Thameslink KO2 short and medium term.

Although the package is a coherent and interdependent whole, it is important to note that:

- The CP6 element, and particularly Croydon, is the bedrock. It not only provides some immediate capacity and performance benefits but also unlocks the subsequent elements.
- The subsequent elements have more flexibility in timing and extent in response to demand growth as it materialises. However, they require the Croydon work in order to allow them to provide additional paths into London.

There are important reasons to carry out the CP6 elements in that control period rather than later:

- Delay would push back the ability to accommodate demand growth
- Delay would mean that the BML signalling system would still be renewed in CP6, but on a like-for-like basis due to asset condition timescales. This would involve significant spend but without a capacity benefit, and major synergies would be lost.
- Since the package is dependent on land acquisition in the Croydon area, where development is proceeding rapidly, a delay would jeopardise the ability to secure that land. Implementation after CP6 would be more disruptive, cost significantly more, and may not be possible at all.

This means that **the CP6 elements of the package are the most critical to progress now and ensure they are delivered within CP6. The industry, funders and stakeholders should prioritise their delivery.**

If the package did have to be delayed, this should be mitigated by making efforts to secure the relevant land.

As noted above, Network Rail's planning has developed since the Route Study was published and now shows that the incremental approach behind the BML upgrade can meet growth beyond 2043, or indeed meet higher-than-forecast growth before that date. Our modelling supports this.

**The BML Upgrade must also focus on improving resilience and reliability.** If funds were to be made available for resilience measures, and subject always to satisfactory business cases, these should be focused on improving the performance and resilience of the BML itself rather than diversionary routes. Diversionary routes, although potentially of value for residual incidents and closures, will always be second-best options because of the stations they cannot serve, other impacts on passengers (such as extended journey times) and the operational limitations on the amount of service that can be provided.

The BML Upgrade is an important opportunity to improve both reliability and capacity through infrastructure measures. However, the balance between maximising the performance benefits and maximising train service throughput (including any off-peak service improvements) will need to be determined. At peak times, throughput is the main goal but there will also be performance benefits from de-conflicting routes and other reliability improvements. Off-peak, the current assumption is that no extra trains will be added and the benefits will all be in performance. However, it is possible that a limited number of additional off-peak trains would meet strategic connectivity or frequency / journey-time objectives, particularly to/from the Coastway. This should be tested against the value of the performance improvement sacrificed to accommodate them.

## 6

# LEWES-UCKFIELD REOPENING AND THE TUNBRIDGE WELLS LINK

## 6.1

## THE PROPOSALS: LEWES-UCKFIELD LINE

Our discussions with stakeholders revealed several proposals for reinstating a rail link between Lewes and Uckfield. These are summarised in the diagram in Figure 23. The variants are as follows:

### Reopening of the original Lewes-Uckfield alignment

- South end faces east towards Lewes, using the original (1858) route via Hamsey (or near equivalent) to meet the existing Wivelsfield-Lewes line west of Lewes
- Optional stations at Isfield and Barcombe Mills, and option for a turnback siding/loop east of Lewes to allow Uckfield line trains to continue to/from Brighton.

### Reopening of the original Lewes-Uckfield alignment, plus a new Ashcombe Tunnel

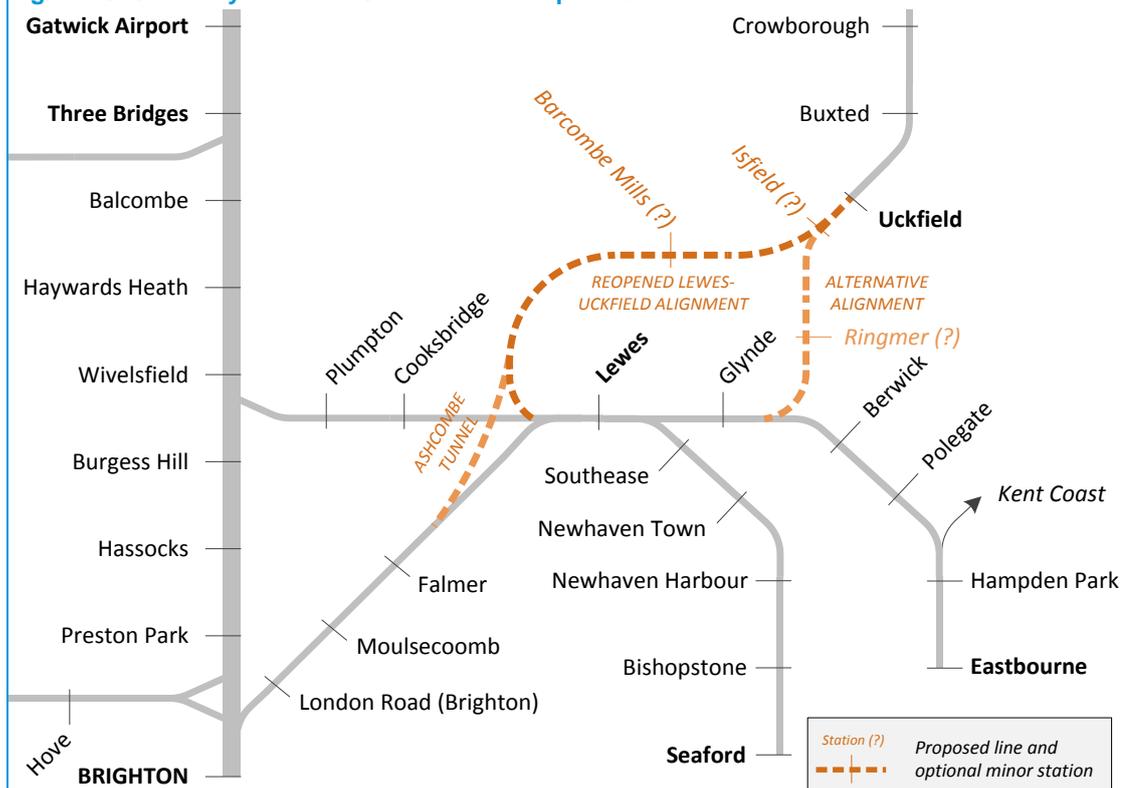
- As above, plus a new direct tunneled connection between the Uckfield-Lewes line near Hamsey and the Lewes-Brighton line west of Lewes, allowing direct train services between Brighton and the Uckfield line.

- Additional platforms at Brighton, to accommodate the additional trains.

### New alignment between Uckfield-Isfield-Ringmer-Glynde

- South end faces west towards Lewes, with optional stations at Isfield and Ringmer.

Figure 23: Summary of Lewes-Uckfield Line Proposals



Network Rail's 2008 'Lewes Uckfield Railway Line Reinstatement Study'<sup>7</sup> (hereafter 'the 2008 study') looked at an east-facing connection at Lewes and assumed the existing single-track sections north of Uckfield would be retained. It looked at extending the 2tph Uckfield services to Lewes, or Eastbourne, or Newhaven. It also looked at options with or without intermediate stations between Lewes and Uckfield. It found that the reopening was technically feasible, but there was insufficient case for it under any of those options. The revenue and social benefits were insufficient to make the BCR viable. The resilience and regeneration benefits were considered to be negligible.

## 6.2

## OUR ASSESSMENT: LEWES-UCKFIELD LINE

Our assessment of Lewes-Uckfield reopening is provided in Figure 24.

**Figure 24: Lewes-Uckfield Reopening feasibility assessment**

CATEGORY	OUR ASSESSMENT
Demand impacts	<p>In general, our analysis has found that the construction of a link between Lewes and Uckfield will not have a significant impact on patronage in the London direction. This is because there is already a tranche of demand which elects to travel north to London from both Lewes and Uckfield. In the case of Lewes this demand travels via Cooksbridge to the BML. For Uckfield, demand uses the existing Uckfield branch, or 'railheads' to the BML (i.e. elects to travel from home to a departure station on the BML to benefit from reduced GJT, even when this is further away than the nearest station).</p> <p>In relation to flows south to Lewes and beyond, including Brighton, the starting-point is that the 2008 study found relatively low flows in comparison to the scale of the reopening scheme. That study assumed a 2tph service on the Uckfield line with interchange at Lewes for Brighton. On this basis it forecast daily demand (two-way single flows) of around 500 trips between Uckfield/Crowborough/Buxted and Lewes, but only around 170 between Uckfield/Crowborough/Buxted and Brighton, and a similar figure for Eastbourne<sup>8</sup>.</p> <p>Our modelling has provided an independent estimate of journeys into Brighton from Uckfield line stations (excluding Lewes), with a forecast of between 150-270 trips in the morning peak, equivalent to an annual demand of approximately 75,000-132,500 trips before background growth and housing development are applied. Our low-end estimate aligns closely with the flow estimates in the 2008 study, using similar assumptions. The high-end estimate reflects the much improved GJTs offered by the most complex scheme (Package 2F), which includes 4tph direct to Brighton via the Ashcombe Tunnel and an electrified and redoubled Uckfield line.</p> <p>Notwithstanding the scale and significance of Brighton as a city, it is not clear whether in reality it represents a major potential commuting market from Uckfield line stations:</p> <ul style="list-style-type: none"> <li>→ As noted above, the 2008 study forecast Lewes to be a much larger market than Brighton.</li> <li>→ Census data show more Uckfield residents currently commuting to Lewes than to Brighton.</li> <li>→ GTR advised us that Polegate, with direct trains to Lewes and Brighton, sells nearly three times as many season tickets to Lewes as to Brighton.</li> </ul> <p>The question then becomes whether background growth, housing growth and a different service pattern (including potentially faster direct services to Brighton) could change this picture significantly, particularly as commuting patterns change in response to new services. It is beyond the scope of this study to determine this question, but our recommended way forward reflects it.</p> <p>In terms of wider housing growth and its impact on demand, the currently anticipated pattern of housing growth in the Weald is not always a close match with the existing or potential rail</p>

<sup>7</sup> *Lewes Uckfield Railway Line Reinstatement Study, FINAL*. Network Rail, July 2008.

[https://eastsussexgovuk.blob.core.windows.net/media/2148/lewes\\_uckfield\\_network\\_rail\\_final\\_report.pdf](https://eastsussexgovuk.blob.core.windows.net/media/2148/lewes_uckfield_network_rail_final_report.pdf)

<sup>8</sup> The 2008 study: paras 3.4.5, 3.4.36 and the table following the latter

	<p>network. Wealden District Council has allocated growth of 1,000 homes in Uckfield and 300 homes in Crowborough as part of the current Wealden Local Plan Core Strategy. The council recently went to consultation on the Issues, Options and Recommendations stage of the Wealden Local Plan review<sup>9</sup>. This is looking to provide 19,500 homes in the District, based on a forecast of around 832 dwellings per year up to 2037. In the consultation document's 'preferred option for testing', much of this growth would be in Hailsham (9,380 dwellings), partly in response to Eastbourne's needs that cannot be accommodated within the Eastbourne boundary. There would be little growth along the Uckfield line. An alternative option, which spread housing more evenly across the district and included around 3,000 dwellings along the Uckfield line, was not considered feasible due to its impacts on Ashdown Forest. None of the currently planned housing growth sites specifically relies on Lewes-Uckfield reopening for deliverability, so this is not currently seen as a reason for doing so.</p>
<p>Network design factors and engineering feasibility</p>	<p>We accept the 2008 conclusion that <u>reopening Lewes-Uckfield</u> as the core infrastructure is technically feasible. There is no evidence that this situation has changed significantly. Although a station car park has been built over the former trackbed at Uckfield, this is a relatively minor issue and the design makes passive provision for a future reopening. The key risks are:</p> <ul style="list-style-type: none"> <li>→ The Lavender Line heritage railway uses part of the route at Isfield, and the 2008 study assumed this would be retained in parallel with a single-track reopened route that could accommodate 2tph. If a double-track reopened route were required (to accommodate more than 2tph), the Lavender Line would probably need to close.</li> <li>→ Acceptability of the probable need to sever Uckfield High Street at the railway, in view of current Office of Rail and Road (ORR) policy pertaining to new level crossings<sup>10</sup>. Alternative vehicular and pedestrian routes would need to be provided. For vehicles this would probably involve bridging the railway west of High Street near the bus station.</li> </ul> <p>There is little existing engineering evidence on the three <u>turnback/turnround options at Lewes</u>. A feasibility study in 1998<sup>11</sup> looked at the turnback siding option, but this was not available for review in the present study and in any case is now dated. All three options are within the South Downs National Park and all raise potential operational or deliverability concerns. Any selection between them could only be made based on a full comparative engineering / timetabling study, cost estimation and business case assessment.</p> <p><u>The Ashcombe Tunnel</u> would be a much greater infrastructure commitment than the turnback/turnround. A 2-3km tunnel under the National Park, and surface approaches within the National Park, would be required. Again there is no significant engineering evidence. Key issues include:</p> <ul style="list-style-type: none"> <li>→ The northern approach to the tunnel, as currently postulated, would run through a Site of Special Scientific Interest (SSSI). It is possible that the route could be adjusted to avoid this, but there has been little or no technical investigation.</li> <li>→ In a tunnel of this length, the Safety in Rail Tunnels Technical Specification for Interoperability (SRT TSI) requires a partitioned or twin-bore tunnel for evacuation reasons. The BML2 proposal has made a technical and cost comparison with the HS1 North Downs tunnel, but that predated the SRT TSI and is no longer a direct comparator. A more appropriate comparator would be the recently-completed A3 Hindhead road tunnel, a single bore of which is broadly comparable in diameter to a double-track rail tunnel. We discuss this under the cost estimates heading below.</li> </ul>
<p>Operational feasibility, journey time savings and resilience benefits</p>	<p>There would be very significant rail journey time savings between Uckfield line stations and Lewes/Eastbourne/Newhaven/Brighton, even if changing at Lewes were required. This is likely to attract passengers who currently railhead to BML stations, although this relates to the counter-peak direction where the capacity issues are less severe on BML. For trips to/from Brighton, the Ashcombe Tunnel would enhance these journey time savings considerably.</p>

<sup>9</sup> *Wealden Local Plan: Issues, Options and Recommendations Consultation*. Wealden DC, October 2015.

<sup>10</sup> ORR's strategy for regulation of health and safety risks – Chapter 4: level crossings  
[http://orr.gov.uk/data/assets/pdf\\_file/0019/6427/safety-strategy-chapter-4.pdf](http://orr.gov.uk/data/assets/pdf_file/0019/6427/safety-strategy-chapter-4.pdf)

<sup>11</sup> *East Sussex Central Rail Corridor Feasibility Study*. Mott MacDonald, 1998. [link not available]

Journey times between Lewes (or points east) and Croydon/London via Uckfield would be slower than via the BML, thus making the Uckfield route less attractive for those trips. Our analysis suggests Lewes-London Bridge journeys via Uckfield would take 91-98 minutes, compared to around 75 minutes via the BML. However, the attractiveness will depend on the interplay between BML timings and Uckfield line timings. Although the latter is indeed slower, at certain times within the morning peak an Uckfield train could (depending on the actual timetable) give the earliest arrival at London Bridge (or the latest departure from the origin for a given arrival time requirement at London Bridge). Furthermore, some passengers may prefer to take a train with a longer journey time if this avoids an interchange or (depending on the relative loadings) crowding.

We assessed the resilience benefits as part of our investigation and concluded that the resilience benefits of Lewes-Uckfield as a diversionary route are limited but may not be negligible. The key factors were:

- Journey times would generally be extended. A Victoria to Brighton journey, timed for 51 or 59 minutes via BML, would take between 76-96 minutes via Uckfield dependent on the infrastructure layout at Lewes. However, journeys between London and Lewes or Eastbourne via Uckfield would have only a 20-25% time penalty compared to BML.
- The route does not serve BML stations between South Croydon and Lewes or Brighton (exclusive), importantly omitting Gatwick Airport and commuter stations from Balcombe to Preston Park.
- The reopened section and the existing Hurst Green-Uckfield section would need to be electrified, and capacity limitations north of Uckfield mean it is unlikely that more than 1tph could be diverted without doubling the existing single line sections. Even then, the likely maximum diversion would be 2tph in unplanned disruption and possibly slightly higher in planned disruption.
- Potential planned diversions via Uckfield would (on the basis of current 2016-17 possession plans) be relevant for only eight weekend days per year. They would also be relevant for a much larger number of overnight closures in the small hours (currently diverted via the Arun Valley, reversing at Littlehampton).
- Overall, a reopened Lewes-Uckfield line would have only partial capability (even with suitable upgrades) to cover specific incident locations and specific passenger flows. It could not act as a complete 'backup' to the BML, even during planned disruption.

We have carried out a high-level assessment of the capacity available for additional paths between Lewes and Brighton (whether for Uckfield line trains or additional East Coastway trains). It focused on Lewes-Brighton line capacity and also platform capacity at Brighton, starting from the existing timetable as a basis. Junction conflicts at/near Lewes, and capacity on the Lewes-Eastbourne/Newhaven lines, were beyond the scope of the assessment. Key results were:

- An additional 2tph into Brighton from the Lewes direction is likely to be possible, subject to some consequential adjustments to existing services, but would require one additional platform at Brighton.
- A further 2tph (total increase 4tph) is also likely to be possible, with consequential adjustments, but would require a second additional platform.
- These results assume the existing Lewes-Brighton short workings remain in place. However, if they were replaced by the new services, and/or if the timetable were recast, it may be possible to reduce the requirement for additional platforms.
- There are potential opportunities to create the additional platform(s), within the train shed (as proposed by BML2) or outside it, but the engineering feasibility would need to be assessed. The throat would need to accommodate as many parallel moves as possible.
- Additional stabling would be required.

The 2008 study found BCRs in the range from 0.64 to 0.79 depending on the service pattern and whether or not intermediate stations were included. This did not include monetised Wider Impacts. Current appraisal guidance, particularly for a locally-promoted scheme, allows for Wider Impacts to be included in an Adjusted BCR and to be taken account of in the overall Value for Money assessment. It is beyond the scope of this study to recalculate the 2008 results under current guidance with Wider Impacts added. However, Wider Impacts are generally expected to

	<p>be in the range of 10% to 30% of user benefits<sup>12</sup>. Using the data from the 2008 study, the top end of this range would imply Adjusted BCRs in the range from 0.69 to 0.83, which is still well below a viable level<sup>13</sup>.</p>
Estimated cost	<p>No costings that are both reliable and up-to-date exist for any of the components. The 2008 study estimated that the basic Uckfield-Lewes reopening would cost around £150m (at 2008 prices including land and 30% contingency, but not optimism bias). However, this figure is now outdated. No costings exist for the Lewes turnback/turnround options. For the Ashcombe Tunnel, as noted above, the cost comparison that BML2 has made with the HS1 North Downs tunnel is no longer appropriate. Using Hindhead as an alternative comparator, and subtracting services that only apply to road tunnels, but adding partitioning, we estimate the tunnel alone (excluding land, approach routes and railway systems) might cost around £120m. A twin-bore design with cross passages is likely to cost more than this. However, costs depend on ground conditions, which are currently unknown.</p> <p>With limited evidence available to inform costs, we have produced our own high level cost estimates for the Lewes-Uckfield reopening schemes as follows:</p> <ul style="list-style-type: none"> <li>→ £150-250m for basic Lewes-Uckfield reopening. This comprises a single unelectrified track on former alignment with potential turnback siding at Lewes, excluding intermediate stations. Increases to more than £250m if turnback loop at Lewes is required.</li> <li>→ £500m-£1bn for Lewes-Uckfield reopening plus Ashcombe Tunnel. This comprises a double-tracked reinstated Lewes-Uckfield line, new Ashcombe Tunnel, grade separation with Lewes branch and skewed viaduct over the A27. Increases to more than £1bn if AC electrification and redoubling of existing Uckfield branch are included.</li> <li>→ £250-500m for new unelectrified Lewes-Uckfield alignment via Ringmer and Glynde. As this route is longer than and does not follow the former alignment, the civil engineering works required to maintain an acceptable vertical alignment while crossing existing features such as roads and rivers will be significant.</li> </ul>
Funding options	<p>In principle, developer contributions could be made, but current site allocations along the line are not on a scale that would generate a significant proportion of the reopening cost. Although some local planning authorities expect housing growth to continue and accelerate, there is no evidence that the additional growth would naturally be focused along the line.</p> <p>In principle, the scheme could be suitable for CIL or business rate contributions, particularly given the wider economic benefits, but other pressures on these sources would need to be considered.</p> <p>If the anticipated pattern of development were to change and become more closely matched with the Lewes-Uckfield corridor, and if the reopening scheme were part of a wider package that could draw in additional locations, then the potential for private sector contributions might be greater. We say more about this in Section 6.6.</p>

*Source: WSP | Parsons Brinckerhoff project team assessment. High level final cost estimates presented are based on relevant pre-existing work (if listed) or the cost of projects of a similar nature. The cost range reflects the degree of design/option development that has already been undertaken and the evidence that was available to the project team during the study.*

### 6.3

## THE PROPOSALS: TUNBRIDGE WELLS LINK WITH THE UCKFIELD LINE

In this section, for clarity we describe Network Rail's existing Tunbridge Wells station under its former name of Tunbridge Wells Central ('TW Central'), to distinguish it from Tunbridge Wells West ('TW West'). References to Tunbridge Wells, without specifying a station, relate to the town as a whole.

<sup>12</sup> *WebTAG Unit A2.1, Table 6.* January 2014

<sup>13</sup> The 2008 study: based on the TEE estimates in Table 1.

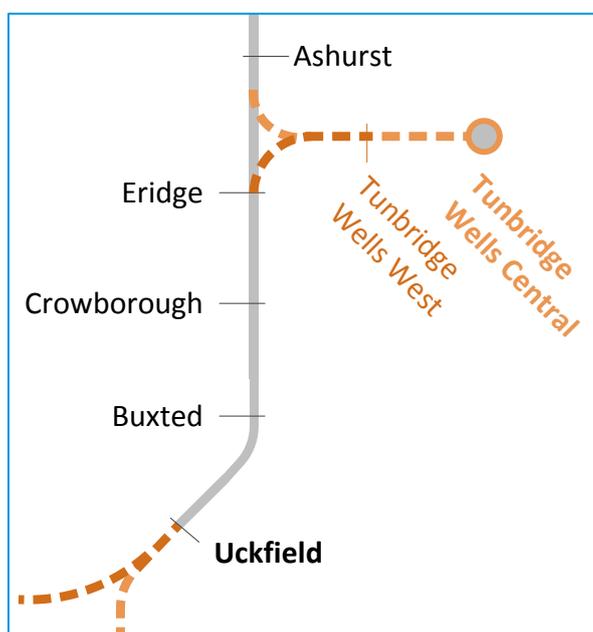
As with the Lewes-Uckfield line, our discussions with stakeholders revealed several proposals for a rail link to Tunbridge Wells. These are summarised in Figure 25. The variants are as follows:

**BML2 scheme:** The BML2 'Kent Phase' proposal includes a link between TW Central, TW West and the Uckfield line, with junctions pointing both north and south on the Uckfield line (our ref TUN-01 and TUN-02). It would include a station at TW West. Infrastructure work, including some realignment, property reconfiguration and accommodation or displacement of the existing Spa Valley Railway, would be needed along the route. The main rationale is to:

- Relieve existing crowding on existing TW Central-London trains via Tonbridge, by allowing Tunbridge Wells to London trains via the Uckfield line (if paths were available towards London – which is assumed to be possible with full implementation of BML2).
- Allow direct services between Tunbridge Wells (or north thereof) and Brighton and/or Lewes and points east. Currently such journeys are circuitous by train.

**Railfuture scheme:** Railfuture has proposed a smaller-scale alternative (our ref TUN-03): running national rail services over the Spa Valley Railway's (SVR) existing single track (with some infrastructure enhancements) between Eridge and TW West, by commercial agreement. In conjunction with Lewes-Uckfield reopening, this would allow an hourly TW West to Brighton service. The link between TW West and TW Central would not be reinstated, at least initially.

Figure 25: Summary of Tunbridge Wells Link Proposals



## 6.4

### OUR ASSESSMENT: TUNBRIDGE WELLS LINK WITH THE UCKFIELD LINE

Our assessment of a Tunbridge Wells link with the Uckfield line is provided in Figure 26.

Figure 26: Tunbridge Wells Link with the Uckfield Line feasibility assessment

CATEGORY	OUR ASSESSMENT
Demand impacts	The scheme does not respond to the core BML peak capacity challenge, nor is it intended to. Instead it responds to potential demand for travel, or wider value of having connectivity, along a Tunbridge Wells–Uckfield–Lewes–South Coast axis. As with Uckfield-Lewes, this demand would need to be demonstrated in the context of future planning scenarios. We have not modelled the incremental demand impacts for a Tunbridge Wells link to the Uckfield Line, but expect that demand impacts to/from the south coast would be similar in scale to Lewes-Uckfield re-opening

	<p>due to the improvements in GJT that would result from the scheme. If a north-facing chord towards London is provided, we expect additional London-bound demand to be limited as Tunbridge Wells already has a main line link to London.</p>
<p>Network design factors and engineering feasibility</p>	<p>From <u>Eridge to TW West</u>, the existing Spa Valley Railway (SVR) heritage railway would generally be used. Between TW West and the point where it meets the Network Rail route at the former Birchden Junction, the SVR currently runs in its own corridor. From Birchden Junction to Eridge, the SVR and TOC services run in parallel on adjacent but not connected tracks. The SVR leases its trackbed here, which originally carried the second track of the Uckfield branch, from Network Rail. There are termination provisions in this lease which would allow the Network Rail line to be re-doubled<sup>14</sup>. At Eridge the SVR shares the Network Rail station as the beneficiary of a Station Access Agreement with GTR.</p> <p>National Rail services using this heritage line would be a unique situation and the best deliverable operational model would need to be determined. We have seen no evidence that SVR has been involved in any discussions about this, but that is to be expected given the very early stage of the proposals that have been made.</p> <p>The main options would be:</p> <ul style="list-style-type: none"> <li>→ SVR remains in place, with National Rail services operating over SVR infrastructure. Southern or a successor TOC would operate the National Rail service as the beneficiary of bespoke track and station access agreements with SVR. Heritage and National Rail services would coexist and compromises may be required in their times of operation etc.</li> <li>→ SVR remains in place, and by commercial arrangement provides routine day-to-day service between Tunbridge Wells-Eridge as if part of the national network as well as being a heritage operation. Compromises may be required to suit the two very different travel markets.</li> <li>→ A promoter (Government or Network Rail) obtains powers to acquire the route and operate it as part of the national network. SVR could retain the land not required for the main line railway, and could operate heritage services similar to today as the beneficiary of bespoke track and station access agreements. Heritage and National Rail services would coexist and compromises may be required in their times of operation etc.</li> <li>→ As above, but SVR operations would cease. The BML2 proposal envisages this.</li> </ul> <p>Each model would have its own delivery, commercial, regulatory, engineering and operational issues and risks. We have been unable to identify an exact precedent for routine day-to-day National Rail services operating over a heritage railway. However, there are partial parallels:</p> <ul style="list-style-type: none"> <li>→ Freight services and occasional TOC-operated special passenger services cross between Network Rail and heritage infrastructure at various locations.</li> <li>→ Great Western Railway (GWR) routinely operates timetabled summer Sunday services over private infrastructure (Devon and Cornwall Railways) to Okehampton, connecting with heritage trains between Okehampton and Meldon. In this case, however, GWR and heritage operations do not directly share track.</li> <li>→ The North Yorkshire Moors Railway runs trains on a significant length of Network Rail infrastructure, shared with TOC services, between Grosmont (junction with its own heritage operation) and Whitby. However, this is an expansion of heritage services onto an NR branch rather than vice versa.</li> <li>→ The Swanage Railway expects to begin in 2017 a two-year trial of services between Swanage and Wareham, over a combination of its own and Network Rail's infrastructure, initially on a limited number of days. This represents the first fulfilment of a long-held local aspiration to provide an 'amenity' service (i.e. one focused on mainstream travel demand rather than a heritage focus). This service would coexist with the railway's existing heritage service, on the proviso that the latter should not be detrimentally affected. This has required consideration of commercial factors (e.g. minimising abstraction from heritage fares) and operational factors (prioritising use of line capacity during the peak summer season).</li> </ul>

<sup>14</sup> The 2008 study: paragraph 10.1.4.

	<p>A service initially to/from TW West by agreement with SVR offers the basis for a potential low-cost, initial scheme. However, there is little evidence to date about its feasibility. Key risks include:</p> <ul style="list-style-type: none"> <li>→ Securing a means to operate routinely over the SVR's infrastructure. SVR's likely commercial approach is not known. Unlike at Okehampton, National Rail and heritage trains would need to work around each other. There has been no assessment to date of potential impacts on each other or potential respective periods of service.</li> <li>→ The deliverability of a station at TW West, either using the existing SVR platform or acquiring powers and land to construct a new platform.</li> <li>→ The extent of infrastructure work needed to support the speeds and frequencies required to make National Rail services viable on this route. (Our assessment of potential timetable patterns has identified a range of options with varying requirements for speeds and track layout.) The majority of this work is likely to come under permitted development rights.</li> <li>→ Depending on the operational model, a reinstated connection between the two systems for either passenger services or empty stock movements may be needed.</li> </ul> <p>A shuttle service between TW West and Eridge does not appear to have been proposed previously, but its feasibility should be considered as part of a potential low-cost initial solution.</p> <p>From TW West to TW Central, there are substantial incremental cost and delivery challenges. A key factor is the physical safeguarding/obstruction of the corridor. The main issue is with the former TW West site. Although a safeguarding policy exists, it is essentially a 'line on a map' and it does not appear feasible to reinstate a railway (even without a TW West station) without major reconfiguration of the site, including substantial or complete demolition of the supermarket building. In our view this should be seen as a longer-term goal than reaching TW West, and our recommended way forward includes a potential incremental strategy for this.</p>
Operational feasibility, journey time savings and resilience benefits	<p>The link, as part of a wider Lewes-Uckfield package, would bring Tunbridge Wells and Brighton within around 75 minutes of each other by rail, compared to around 2 hours by rail today. There would also be large journey time benefits for other rail flows along the corridor to/from Tunbridge Wells.</p> <p>The BML2 proposal for Tunbridge Wells-London services via the Uckfield line, as described above, would run those services on BML2 and therefore not require BML paths into London. However, in principle, and in the absence of BML2 London section, those services could run into London via BML using any new available paths. Our assessment of Package 2C has found that from Tunbridge Wells the journey times via the Uckfield line of more than an hour, even to London Bridge, were poorly competitive with existing peak journey times of around 45 minutes to London Bridge via Sevenoaks. The issue of capacity from Tunbridge Wells should be considered in more detail as part of the Kent Route Study, but is not critical to any of our recommendations.</p>
Estimated cost	<p>No costings that are both reliable and up-to-date exist for any of the components. As such, we have produced our own high level cost estimates for the Eridge-TW reopening schemes as follows:</p> <ul style="list-style-type: none"> <li>→ £10-50m for the basic Railfuture single line scheme, running to TW West only.</li> <li>→ £50-100m for the BML2 'Kent Phase' double-track scheme to TW Central, assuming line unelectrified and single bore through Grove Tunnel. Increases to £100-250m if line electrified and Grove Tunnel doubled.</li> </ul>
Funding options	<p>Our comments under this heading for Lewes-Uckfield broadly apply to this link, which should be seen as part of a wider Lewes-Uckfield package rather than in isolation. Specifically, there is the potential for any future redevelopment of the former TW West station site (Sainsbury and Homebase) to contribute to a funding package, but such redevelopment is not part of current site allocations and would require further consideration.</p>

*Source: WSP | Parsons Brinckerhoff project team assessment. High level final cost estimates presented are based on relevant pre-existing work (if listed) or the cost of projects of a similar nature. The cost range reflects the degree of design/option development that has already been undertaken and the evidence that was available to the project team during the study.*

## 6.5

## STAKEHOLDERS' VIEWS

Reopening of Lewes-Uckfield and Eridge-Tunbridge Wells remains an aspiration of some local stakeholders, in order to:

- Provide improved local connectivity between towns, particularly if a link to Tunbridge Wells is also made, establishing the town as the 'centre of the Weald'
- Help to mitigate general highway congestion in the area
- Support regeneration, particularly the Enterprise Zone at Newhaven
- Provide a diversionary route during planned or unplanned disruption on BML.

Some stakeholders, including local authorities, have concerns about the outcome of the 2008 study into Lewes-Uckfield reopening. This is one of the drivers for the latest proposals that include direct links to Brighton. Their concerns include (in no order of importance):

- The ridership potential, and the resilience benefits as a diversionary route, would both be greater if services ran to Brighton, the single most important destination in the southern part of the study area. The City of Brighton and Hove is significant as:
  - An employment centre, with 155,000 jobs. This is more than Portsmouth, Southampton, Reading or Croydon, and third largest in the south east region after London and Milton Keynes<sup>15</sup>.
  - A further/higher education centre, including the University of Sussex and the University of Brighton, with key campuses close to stations at Falmer and Moulsecoomb as well as in central Brighton.
  - A visitor destination, with around ten million tourism trips per year<sup>16</sup>.
- The demand growth picture has changed. Demand growth is accelerating generally, and additional housing development is now planned (or emerging in forthcoming plans).
- The resilience benefits, regeneration benefits and connectivity (i.e. access to jobs and services) benefits were seen as having been underplayed in the 2008 study. Furthermore, there is now an enterprise zone at Newhaven.
- Reopening is seen as a necessary component of a sustainable transport policy, in the context of concerns over highway capacity constraints. While there are no specific development sites whose delivery requires this reopening, overall growth and congestion issues will demand a general level of investment in alternatives to car travel.
- Finally, the reopening should be seen as a component of a wider package (including redoubling and electrification, a Tunbridge Wells link or ultimately perhaps the full BML2 scheme), and to assess it in isolation is considered a limitation of work to date.

Other stakeholders point to factors acting against the Lewes-Uckfield reopening:

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<sup>15</sup> *Local area data LI01, Local labour market indicators by unitary and local authority*. ONS. Figures are 2013 jobs for the relevant local authority areas. <http://www.ons.gov.uk/ons/rel/subnational-labour/regional-labour-market-statistics/january-2016/rft-lm-table-li01-january-2016.xls>

<sup>16</sup> *The Economic Impact of Tourism: Brighton & Hove 2012, Section 1.2*. Tourism South East, for Brighton and Hove City Council, undated. [http://www.coast2capital.org.uk/images/Brighton\\_Hove\\_Tourism\\_Economic\\_Impact\\_Estimates\\_2012.pdf](http://www.coast2capital.org.uk/images/Brighton_Hove_Tourism_Economic_Impact_Estimates_2012.pdf).

- The 2008 study identified a poor BCR (much less than 1), and circumstances would have to change very significantly to bring the BCR up to a viable level (normally 2 or above).
- Journey times between Lewes / Eastbourne / etc and London would be longer via Uckfield than via BML.
- Both Network Rail and GTR consider that the resilience benefits are limited.

## 6.6

## RECOMMENDED WAY FORWARD

### A NEW APPROACH TO LEWES-UCKFIELD

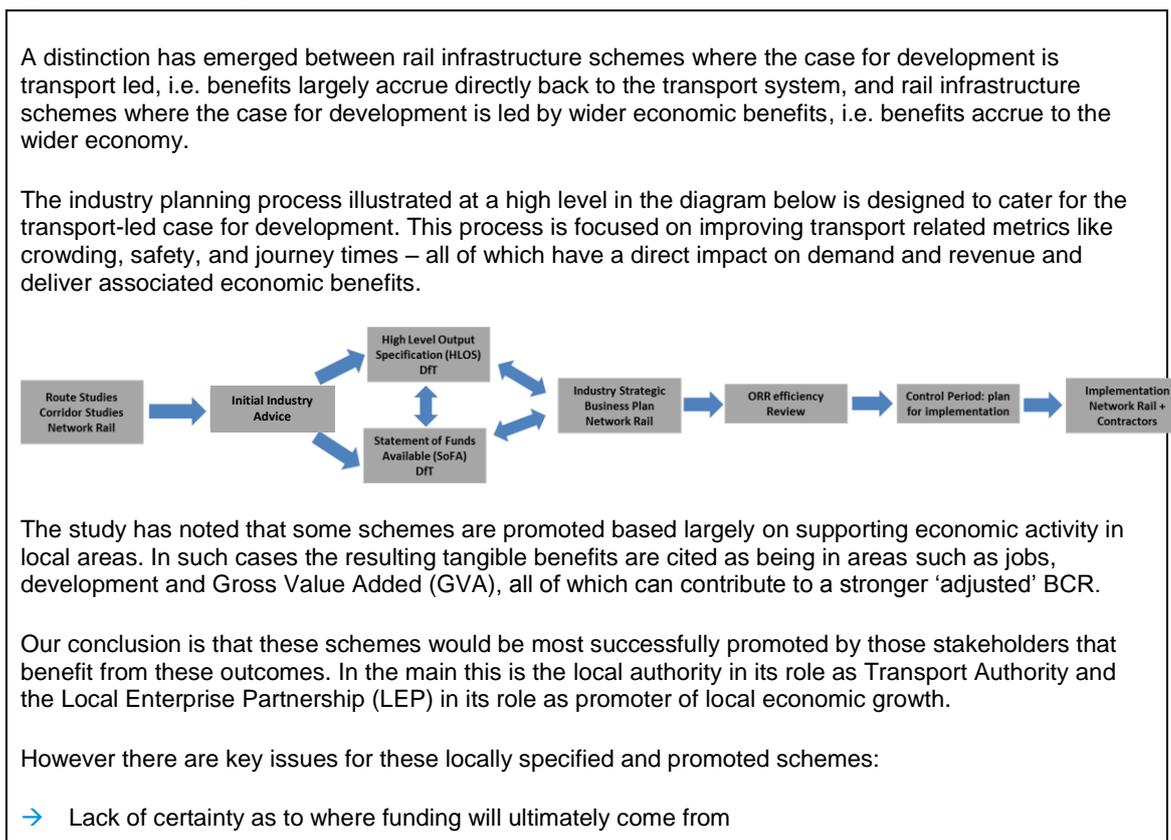
Our analysis has shown that core demand is expected to be relatively low for a reopened Lewes-Uckfield line, and that the traditional transport case for the scheme is likely to be relatively poor. In this regard, our conclusions are similar to the 2008 study.

However, we recognise that some of the circumstances have changed since the 2008 feasibility study. In particular, strong interest from stakeholders in a direct service to Brighton, and the emergence of a range of infrastructure options to allow this, means Uckfield-Lewes(-Brighton) represents a different economic opportunity to what was assessed in 2008.

The growth and devolution agendas mean that not only are the wider economic impacts of transport investment accepted, but also that local authorities, LEPs and Combined Authorities are increasingly tasked with leading the agenda.

Meanwhile, although there is still strong government support for and funding of rail schemes, the focus is increasingly on funding packages involving development contributions, other local funding, and locally-determined use of central funding pots. This is explored further in Figure 27.

**Figure 27: The Transport Case versus the Economic Case**



- Difficulty in measuring benefits that accrue to the schemes
- Lack of payback for any private sector investor

Ultimately it would appear that Central Government may still be the source of funding but not necessarily via a transport-related 'pot'. We have noted rail schemes being developed under the following funding sources:

- UK Government's Growth Deal
- UK Government's City Deal
- UK Government's Devolution proposals

Almost without fail the key to unlocking these sources of funding would be the need to develop robust business cases following Central Government's five-case business case model, supported by an economic appraisal following DfT's WebTAG guidance.

There are two aspects to the economic growth agenda:

- Increased economic output (GVA) per capita, created by new connections (bringing people and businesses closer together in time terms, even if not in physical terms) having agglomeration effects and raising productivity levels.
- Accommodating and attracting additional housing and jobs. The extent to which this can be done here, and is acceptable in order to secure the desired investment, is ultimately for the region's planners and stakeholders to judge, as well as relying on local communities' willingness to accommodate growth.

If there is enough local support for Lewes-Uckfield to proceed, all these factors add up to the need for an entirely new approach; not simply an updated feasibility study. This new approach would consider the need for the investment within the context of the region's economic ambitions.

Figure 28 summarises how we see this new approach working. Figure 29 illustrates the connectivity issue and how it is different from the 2008 approach.

Figure 28: Transport as a potential enabler of economic growth

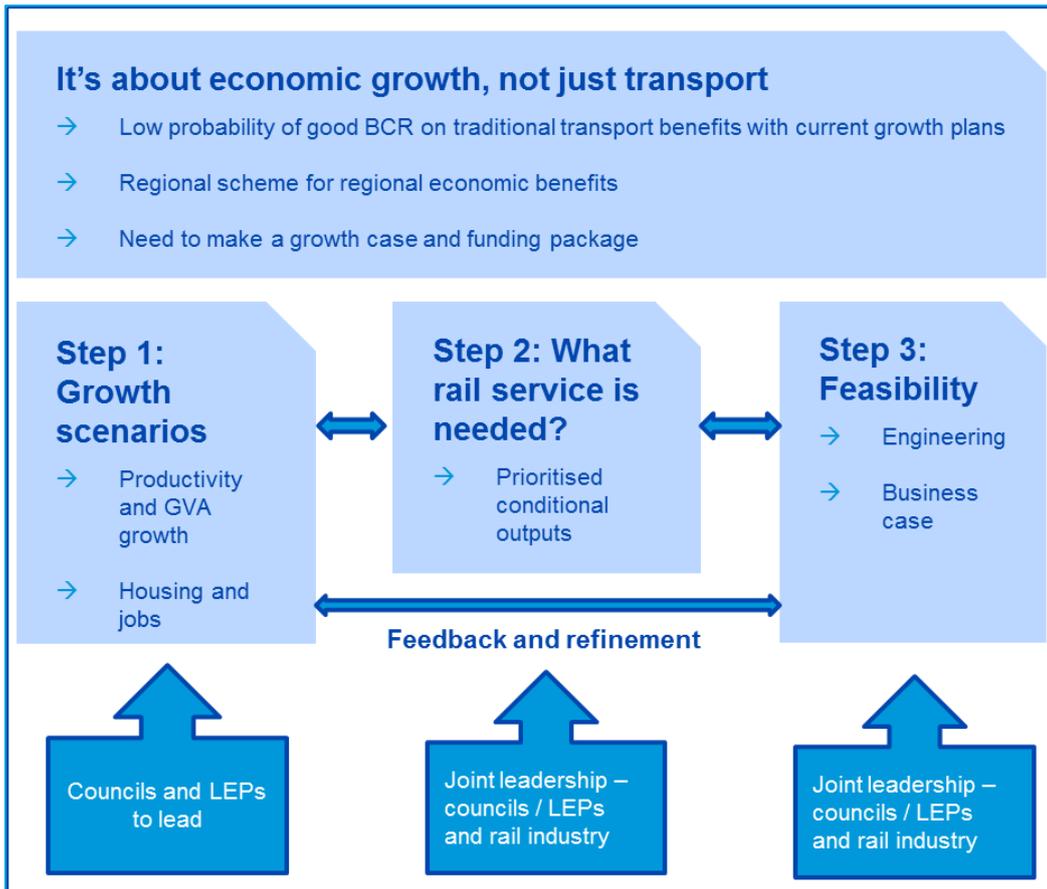
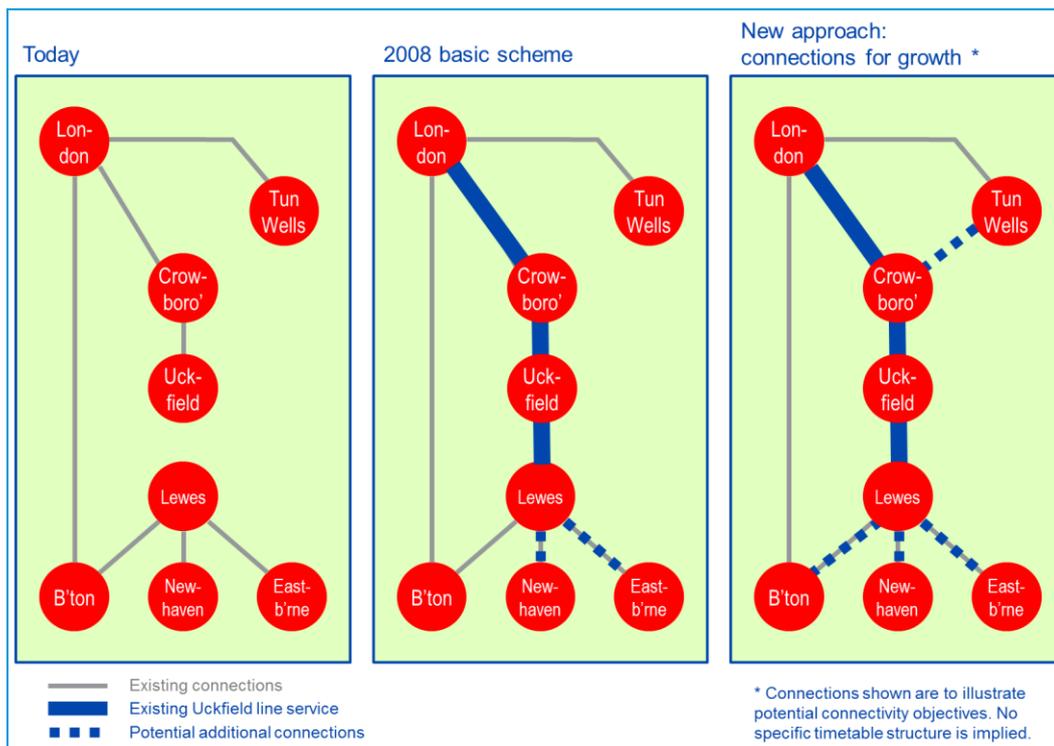


Figure 29: Connections for growth



The three key steps are:

- In Step 1, the region's stakeholders identify potential economic growth scenarios, including support for significant additional housing and anticipated job creation.
- In Step 2, the rail services needed to support those scenarios are identified and prioritised as Conditional Outputs. These are service requirements that are subject to identifying a feasible and affordable scheme to deliver them and may be adjusted in the light of engineering development.
- In Step 3, investment schemes to achieve the Conditional Outputs would be identified, developed and assessed through the usual Governance of Railway Investment Projects (GRIP) processes.

The recent ACES study<sup>17</sup> made some initial progress in this regard, looking at comparative rail-car journey times on a Tunbridge Wells-Uckfield-Lewes-Brighton axis. It identified that there was potential for rail to be very competitive relative to car on a number of these flows.

However, further stages are required to identify (for specific flows and under the different growth scenarios) indicative time savings, demand, transport user benefits and GVA benefits. This would then allow specific and prioritised Conditional Outputs to be agreed.

The new approach will also need to:

- Be a joint effort between the rail industry and local authorities / LEPs, so that each are engaged, each can lead where they are best placed, and each can buy in to the other's technical assessments.
- Be locally led overall, and particularly in the first stage to identify economic growth opportunities and connectivity aspirations.
- Learn from projects of a similar nature, including the development of the proposed East West Rail network's central section between Bedford and Cambridge.
- Assess (and wherever possible, monetise) the potential resilience benefits in a transparent way, even if these are ultimately found to be a negligible figure.
- Identify a funding package covering both capital costs and any ongoing operational support required.
- Assess links between East Coastway towns and Brighton in the same way, to help prioritise use of East Coastway capacity into Brighton. Our capacity analysis highlighted the potential trade-offs in use of East Coastway capacity. Adding Uckfield line trains may impose an opportunity cost against alternative improvements to connectivity between Newhaven/Eastbourne/Hastings and Brighton. The intention is not to bring all East Coastway issues into the mix, but rather to confirm what the Step 2 priorities should be.
- Take account of the impact of any capacity requirements imposed on the existing section from Uckfield northwards.
- Answer the question "What level of housing and employment growth along the Tunbridge Wells-Uckfield-Lewes-Brighton corridor would be needed in order to create viable demand levels and a viable funding package?" This will help stakeholders to understand the potential for securing Lewes-Uckfield reopening and potentially also the Tunbridge Wells link as part of a wider sustainable development package focused around rail links. The ability to do this, and the preferred scenario, will be for the region's planners and stakeholders ultimately to judge.

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<sup>17</sup> *Access and Connections East Sussex*. JRC Ltd for Railfuture, July 2013.

- Consider the overall public transport connectivity picture, taking account of parallel bus services. In particular, route 29 provides Brighton-Lewes-Uckfield-Crowborough-Tunbridge Wells services, broadly half-hourly Monday to Saturday and hourly on Sundays with variations at peak times. Routes 28 and 29B provide additional services on part of this corridor. Rail will offer substantially shorter in-vehicle times for many journeys, particularly to Brighton, but in some intermediate locations the bus route is more conveniently located than the station (such as for parts of Uckfield and much of Crowborough). The potential for the bus service to be weakened, and the potential impacts on intermediate locations not served by the railway, should be considered as a risk.

As noted in Figure 27, any scheme that emerges from this new approach may be best sponsored (i.e. promoted and 'cliented') or co-sponsored by local/regional partners, rather than through national transport investment processes such as the High Level Output Specification (HLOS). This is particularly true in the current policy and financial climate, because:

- Its role would be primarily regional, and supporting economic growth rather than simply transport needs
- The devolution agenda points to local leadership of schemes such as this
- Given the focus of the scheme, and wider pressures on central government budgets, the funding package is likely to be primarily locally-based (including, in this context, devolved funds or non-transport grants, even if they ultimately come from national-level sources as described in Figure 27)
- Central government and the rail industry are already committed to an extensive and challenging programme of investment and change. It may not be possible in the near future for those parties to take on sponsorship of all new schemes.

The regulatory framework allows for third party sponsorship of projects<sup>18</sup>. It allows debt-financing either conventionally through the Regulatory Asset Base (RAB), subject to Government approval, or through non-RAB-based commercial arrangements. The scope for RAB-based debt finance is increasingly constrained, particularly since Network Rail's reclassification into the public sector, and a non-RAB approach may be appropriate here. Governance can be through Network Rail's network licence (monitored by ORR), or through contractual mechanisms (monitored by the sponsor).

However, it is rare for parties outside national government or the rail industry to sponsor large rail projects (on the scale of a new line), because of their specialist nature and the interfaces with the operational railway. Options include seeking co-sponsorship with DfT, or an industry partner such as a train operator to act as sponsor's agent.

It is also possible for a third party to directly deliver an enhancement, through either conventional procurement routes or alternatives such as design-build-finance-operate (DBFO). However, this too is rare on the national network and Network Rail is normally engaged for delivery.

The focus of our proposed approach is on providing additional connections within the Weald/Brighton area. The packages we have assessed do not require additional paths into London from the Uckfield line.

In the medium or long term, Network Rail's BML Upgrade will create additional paths into London. These could in principle be used for Uckfield line services or indeed any other services. Network Rail's position is that the lengthened 2tph peak Uckfield line service will meet that line's capacity

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<sup>18</sup> <http://orr.gov.uk/what-and-how-we-regulate/investments>

needs for the near future (supported by our own analysis), and that any additional paths would be better used to serve BML destinations with ongoing capacity needs.

In terms of resilience benefits of reopening Lewes-Uckfield, we expect there to be some but that these should contribute to any wider case being made for a Lewes-Uckfield package. There is no case on resilience benefits alone. This concurs with the similar conclusion in the Route Study. The potential diversionary benefits should be assessed and monetised/quantified as part of developing that package. Depending on the scale of the package and the capacity/capability it offers, the diversionary value could be greater than what is possible from a minimal scheme. This recommendation is irrespective of whether or not further resilience measures on BML are funded, although such measures if successful could reduce the resilience benefits of Lewes-Uckfield.

## ADDITION OF A TUNBRIDGE WELLS LINK

The value and feasibility of a Tunbridge Wells link should be considered as part of the new approach to Lewes-Uckfield that we are recommending.

The aim should be for a deliverable, low-cost initial link. The key rationale for a Tunbridge Wells link is the connectivity (and hence economic) goal of connecting Tunbridge Wells with Brighton, and connecting other parts of the Weald with Tunbridge Wells. This can be achieved to a large extent without making the West-Central link which has significant additional cost and deliverability challenges.

Thus we have considered incremental packages that connect the Uckfield line at Eridge to TW West initially, without continuing to TW Central. This initial stage would not allow through-running or direct interchange to the Hastings line (e.g. for Sevenoaks-Brighton trips), and would not offer such good connections with buses in the town centre. However, it would help to build demand.

In line with this, the relevant local authorities and LEP should consider a possible incremental strategy for Tunbridge Wells, linking rail and spatial planning. This could be as follows:

- An initial, relatively small-scale TW West terminus for National Rail services, using either the existing Spa Valley Railway platform, or a new dedicated platform immediately to the south (using the Homebase outdoor garden centre plus part of the car park). Access and parking would need to be negotiated, or powers secured for this.
- A later stage in which the line would be extended through to TW Central. The initial terminus could be retained (as a through station) or replaced with a station closer to the centre of the site, perhaps more integrated with development and/or the original station building. Alternatively, appraisal might determine that best value is obtained by closing the initial terminus without replacement. At this later stage:
  - As noted above, substantial reconfiguration of the TW West site would be required, with or without a station there.
  - The BML2 proposal assumes the Sainsbury's building would be reconfigured, and decked parking provided, clear of the railway.
  - Alternatively, bearing in mind growth pressures and the proposed site allocations nearby which are for relatively high densities, the later stage could be associated with an eventual redevelopment of the site, in line with principles of transit-oriented development. By tying the extension to a future redevelopment, this would sidestep the issues associated with the existing site layout. It would also provide a valuable worksite for the reinstatement in what is a constrained area.

The results should feed into the new approach. The results of the new approach would then in turn feed into a future Local Plan update.

## 7

## NEW LINES

## 7.1

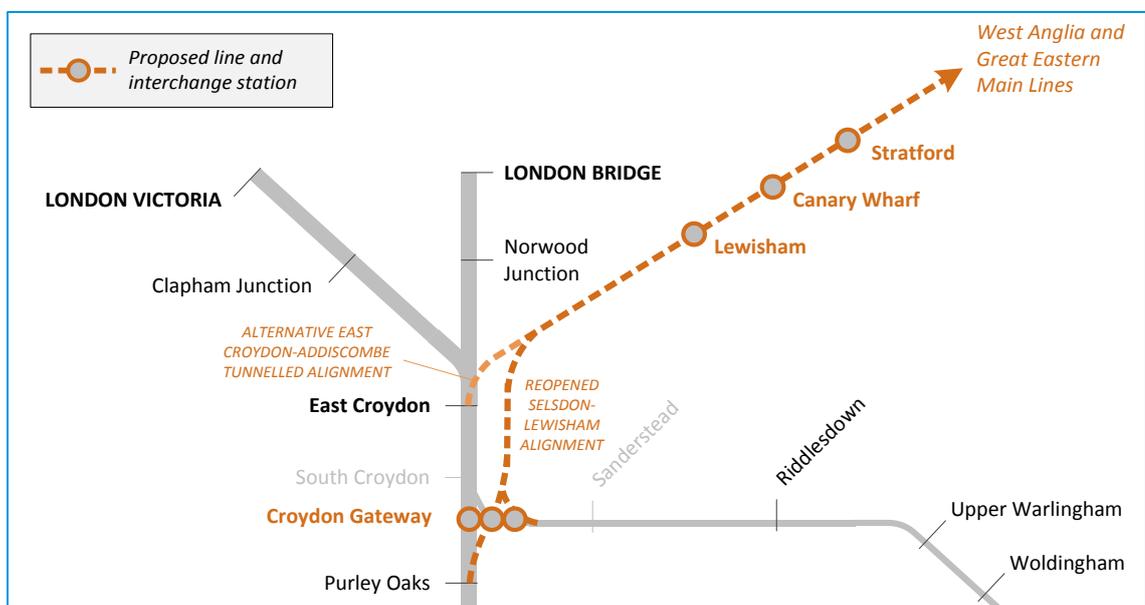
## THE PROPOSALS: BML2 LONDON SECTION

## NORTH OF CROYDON

The BML2 London section is a developing proposal and the promoters accept that further refinement would be needed.

Although the BML2 London section was born out of a need to find additional paths into London for trains from Uckfield, it should not be seen as only serving that need. The proposal is now for a north-south link connecting the BML and/or East Grinstead/Uckfield lines in the Croydon area (see 'Croydon' section below) to Lewisham, Canary Wharf, Stratford and points beyond on the West Anglia and/or Great Eastern main lines. This is in effect a 'Thameslink 2' regional cross-London service with a range of destinations on the north and south sides. The various options are summarised in Figure 30.

Figure 30: Summary of BML2 London Section Proposals



The promoters consider that Network Rail's BML Upgrade, while necessary to meet short and medium term needs on the BML, does not detract from the need for BML2 in the long term. The key elements of the rationale are:

- To provide additional north-south capacity to serve employment growth at Canary Wharf. Currently this is limited by the capacity available on the DLR and Jubilee line, although this capacity will be augmented in 2019 by the opening of Crossrail 1. The proposal would also provide infrastructure capable of supporting a direct link between Canary Wharf and Gatwick Airport, improving connectivity between the two (although the case for providing such a service has not been made, and the impacts on Gatwick platform capacity or pathing and service levels for services between the South Coast and existing London termini are not clear).
- To provide additional capacity for commuting from the south into London, beyond what can be provided through incremental upgrades of the BML.

Between Selsdon and Lewisham, the proposal takes advantage of a rail corridor that the promoters see as a strategic asset to be put to best strategic use. The key elements of this corridor are as follows (and subject to consideration of the East Croydon option as described below):

- Selsdon Road to Coombe Lane: Disused railway.
- Coombe Lane to Addiscombe Road: currently used by Tramlink's route between Croydon and New Addington. BML2's current assumption is that this route would need to be diverted with approximately 1.4km of new, partly on-street alignment replacing an existing, mostly segregated, alignment. The engineering feasibility has yet to be examined in any detail. Although Tramlink is essentially a local service, and does have the flexibility to run on-street, TfL highlights that it is not a quiet backwater, but a busy system with increasingly high-frequency services bringing commuters into Croydon which is a major employment centre. There is potential for the diversion to increase this Tramlink route's journey times and operating costs, and reduce its reliability, but the scale of this and any resulting disbenefits have not been examined in any detail.
- Addiscombe Road to Elmers End: currently used by Tramlink's routes between Croydon and Elmers End or Beckenham Junction. The engineering feasibility of using this section has yet to be examined in any detail. BML2's current assumption is that Tramlink and BML2 would coexist within the existing corridor width. There are two Tramlink level crossings near Addiscombe tramstop, and BML2 is likely to require a grade-separation in this area.
- Elmers End to Lewisham: Currently used by Southeastern services to Hayes. TfL had proposed to take over this route as part of a Bakerloo line extension from Elephant & Castle via Lewisham to Hayes. In December 2015 TfL announced<sup>19</sup> that it would be investigating extending the Bakerloo line to Lewisham. A future phase beyond Lewisham would also be considered further in collaboration with stakeholders. No final decisions had been made and more detailed work would be carried out before further public consultation occurs. If the scheme proceeded, construction (presumably of the initial phase, but not stated) could begin around 2023 with completion around 2030. Figure 31 summarises TfL's stated position on how it will take forward a possible extension beyond Lewisham.

**Figure 31: TfL's current position on a Bakerloo line extension beyond Lewisham**

- |        |   |
|--------|---|
| E1. 31 | An extension to Lewisham as a first stage, could achieve significant transport improvements and unlock growth in south east London. It can achieve this sooner, at lower cost and with less delivery challenges than with an extension beyond Lewisham on to the National Rail network.   |
| E1. 32 | In contrast to options beyond Lewisham which would utilise existing rail routes, a route to Lewisham requires new infrastructure which means it would need to be safeguarded to ensure it is deliverable. This means more planning and scheme development work is required and therefore it is important that further development work for this option is carried out as soon as possible.  |
| E1. 33 | The strategic impact of this extension proposal should also be considered within the wider context of the opportunities to improve the rail network in south east London [...] Improvements to the suburban rail network in London are a key priority. With the wider improvements that could occur to the rail network, an extension to Lewisham still provides the opportunity to generate a significant improvement in radial and orbital connectivity across the region, whilst not discounting the potential for a future extension beyond Lewisham. |
| E1. 34 | Our assessment has shown that an extension beyond Lewisham can provide specific benefits to wider rail capacity, by potentially converting an existing line and re-allocating rail services to other routes. A future extension beyond Lewisham has, therefore, not been ruled out.   |
| E1. 35 | Work with our partners such as Network Rail on their long-term planning process and with wider stakeholders including the London boroughs, will provide an up-to-date understanding of the  |

<sup>19</sup> <https://tfl.gov.uk/info-for/media/press-releases/2015/december/bakerloo-line-extension-to-improve-transport-links-in-south-london-by-2030> and <https://consultations.tfl.gov.uk/tube/bakerloo-extension> (last accessed 7 January 2016)

challenges on the national rail network in south east London. We can then further consider if a Bakerloo line extension beyond Lewisham is the best option to address these challenges. Furthermore, given the requirement to enable development to support London's growth and provide funding for the extension, it will be necessary to work with stakeholders to understand the potential growth a further extension may enable.

Source: TfL. Bakerloo line extension: options assessment report, December 2015.<sup>20</sup>

The BML2 proposal sees this section of its route as a high-capacity main line, and sharing tracks with local stopping services would not provide the required capacity (irrespective of any technical hurdles, particularly regarding sharing with the Bakerloo line). The current BML2 proposal is therefore to widen to four tracks, with one or more grade-separations as required. The extent of land acquisition required for this has yet to be determined. However, TfL reports that an earlier investigation into four-tracking between Lewisham and Catford Bridge (in association with a possible DLR extension) found that some additional land would be required.

Between Lewisham and Stratford, new bored tunnels would be required.

## CROYDON

The BML2 proposals at Croydon are also developing, and the various options were summarised in Figure 30. A limitation of the original proposal was that the London section was to connect at Selsdon Road with only the East Grinstead and Uckfield lines (the latter extended to Lewes and beyond), not directly to the BML. Thus it did not offer capacity relief or additional connectivity for BML destinations such as Gatwick Airport. The BML2 proposal now addresses this by including an additional link between the BML and BML2 to Canary Wharf, also in the Selsdon Road area. This would allow 'Thameslink 2' services to serve the BML as well as the East Grinstead and Uckfield lines.

A further increment would be to construct a purpose-built 'Croydon Gateway' interchange station in the Selsdon Road area, serving all BML and BML2 routes. This is an optional addition to the BML-BML2 link. This would potentially replace existing nearby stations at Sanderstead and/or South Croydon.

Another limitation of the proposals has been that BML2 does not serve East Croydon, a key commercial centre that is undergoing significant regeneration. An option to address this has recently emerged. Instead of leaving the existing Uckfield/East Grinstead lines at Selsdon Road, BML2 would continue (probably in tunnel) to East Croydon where there would probably be a new BML2 underground level to the station. The tunnel would then continue north-east to Addiscombe and come to surface level in the Woodside area, continuing towards Lewisham as per the existing BML2 proposal. This new option has only recently emerged and is not currently a formal part of the BML2 proposal. However, it would address the concern about East Croydon not being served.

## 7.2

### OUR ASSESSMENT: BML2 LONDON SECTION

Our assessment of the BML2 London Section is provided in Figure 32.

**Figure 32: BML2 London Section feasibility assessment**

CATEGORY	OUR ASSESSMENT
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<sup>20</sup> [https://consultations.tfl.gov.uk/tube/bakerloo-extension/user\\_uploads/ble---options-assessment-report\\_final.pdf](https://consultations.tfl.gov.uk/tube/bakerloo-extension/user_uploads/ble---options-assessment-report_final.pdf)

<p>Demand impacts</p>	<p>As already noted, there is no need in BML capacity terms to start planning now for BML2 London Section or any other new line solution, as long as the BML Upgrade package is delivered to the timescales proposed by Network Rail. Our analysis suggests that such a scheme would be unlikely to be required until at least the 2040s/50s.</p> <p>Our demand modelling indicates that the proportion of BML users travelling to Canary Wharf and Stratford (and the immediate surrounding areas) is around 10% of the overall London-bound demand. We were not able to reliably account for planned/targeted employment growth at Canary Wharf which may increase the importance of this location as an attractor.</p> <p>Our analysis indicates that the BML2 London Section would offer limited benefits to a large cohort of travellers, only benefiting the relatively small segment of demand which access Canary Wharf and Stratford from the study area. However, it was beyond the scope of the modelling to examine the potential interchange opportunities at Canary Wharf or Stratford into central or west London, e.g. via Crossrail, and we acknowledge that this could have an impact.</p> <p>It is also worth noting that, due to the distance between BML and the Uckfield line and the clustered nature of the demand in the area, our modelling has shown very little abstraction between lines and therefore it is not considered realistic that a full BML2 scheme would relieve any pressure on the BML in that respect.</p>
<p>Network design factors and engineering feasibility</p>	<p>The promoters, and other supporters of the scheme, have prepared concept sketches, indicative track layouts and indicative timetables, and recognise some key constraints. However, these have not been the subject of significant engineering study. Particular issues and risks include:</p> <ul style="list-style-type: none"> <li>→ The Lewisham-Canary Wharf-Stratford tunnel has not been technically examined in any detail.</li> <li>→ The BML-BML2 link would require very significant engineering work, including several grade-separations in order to avoid creating new conflicting routes. It would require significant amounts of land currently used primarily for commercial buildings but potentially also residential and/or allotments.</li> <li>→ Between Croydon and Elmers End, although the proposal follows historic rail and current tram corridors, the potential impacts on Tramlink (see below), and the local impacts of threading a main-line railway through a corridor that currently sees only trams, represent very substantial deliverability risks.</li> <li>→ Between Elmers End and Lewisham, significant land acquisition is likely to be needed, both permanently and during construction.</li> <li>→ Tramlink represents a very significant existing use of the corridor. It is a high-frequency commuter service, with existing committed or uncommitted enhancement proposals (Figure 33) in response to identified needs. These proposals will increase service levels and make further investments in Tramlink infrastructure on this corridor. In particular, TfL requires an additional tram stabling facility, which would ideally be on the east side of the Tramlink network (to balance out the existing depot on the west side). Potential sites might be on or adjacent to the BML2 corridor. A second platform is also expected to be needed at Elmers End station.</li> </ul>
<p>Operational feasibility, journey time savings and resilience benefits</p>	<p>The incremental benefit of the full BML2 scheme, compared to the Sussex and Kent elements alone, is in acting as a 'Thameslink 2' network centred on Canary Wharf and Stratford. This offers potential for journey time savings for travel to these locations as well as cross-London travel. There is no evidence on the passenger flow effects. There would be resilience benefits (by providing another cross-London link, in particular) but these would not be a significant factor behind any decision to pursue the scheme, as the main benefits would lie in commuter capacity and potential journey time savings.</p> <p>Although Croydon Gateway would open up additional journey opportunities for passengers, the disbenefits from increased journey times for non-interchanging passengers would need to be netted-off. The interchange value itself is unclear. The very presence of the BML/BML2 link means that many origin stations south of Croydon Gateway would have a choice of BML and BML2 trains, and those that did not (perhaps Caterham or stations via Redhill, and Tunbridge Wells) are likely to have existing interchange opportunities such as to Crossrail at Farringdon or to the Jubilee line at London Bridge. The greater value is likely to be in BML2 serving East Croydon directly, as noted above.</p>

Estimated cost	The scheme has not been costed by the promoters, but the London section is similar to Crossrail or Crossrail 2 (£27-32bn) in order-of-magnitude terms and would thus cost £billions, likely in the range £10-20bn based on the infrastructure assumptions outlined in this Chapter.
Funding options	<p>There is the potential for contributions from major landowners in the Canary Wharf, Stratford and Lewisham areas, in view of the connectivity improvements for these areas. However, it is not clear whether the timescale for this scheme matches the timescale for development in these areas, which are already developing strongly. There is also potential for contributions from airports, again in view of the connectivity benefits. However, the potential significance of any such contributions is unclear. Recent research commissioned by TfL<sup>21</sup> into how the Crossrail 1 funding package could be adapted to Crossrail 2 highlighted that private sector contributions to Crossrail 1, although large in absolute amounts, only made up 3-4% of Crossrail 1's costs.</p> <p>A CIL or business rate supplement, as used for Crossrail 1 and potentially Crossrail 2, are possible. However, BML2 as it stands is essentially a regional scheme across the south-east rather than a London-focused metro scheme, and it is unlikely that these measures could be made sufficiently fair and consistent among the potential beneficiaries to be viable.</p>

*Source: WSP | Parsons Brinckerhoff project team assessment. High level final cost estimates presented are based on relevant pre-existing work (if listed) or the cost of projects of a similar nature. The cost range reflects the degree of design/option development that has already been undertaken and the evidence that was available to the project team during the study.*

Figure 33 presents details of the existing committed or uncommitted enhancement proposals for Tramlink relevant to the BML2 London Section corridor.

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<sup>21</sup> *Crossrail 2 funding and financing study*, PwC for TfL, 27 November 2014. <https://www.pwc.co.uk/capital-projects-infrastructure/assets/crossrail-2-funding-and-financing-study.pdf>. See in particular section 7.3.2 of that report.

Figure 33: Tramlink 'Trams 2030' proposals as they affect the BML2 corridor

KEY OUTPUT	0	1	2	3	4	5
Description	Wimbledon 12tph	Dingwall Loop	12tph to New Addington	6tph South Wimbledon – Croydon	25% more frequency across the network	Longer trams across Croydon
Indicative date	2016	2020	2021	2023	2027	2029
Status	Committed	Funding largely committed	Proposed	Proposed	Proposed	Proposed
Infrastructure investment relevant to BML2 corridor	Nil	Elmers End second platform, and additional stabling	As KO1	As KO2, plus additional stabling Phase 2	As KO3	As KO3 and KO4, plus depot works and tramstop lengthening
Trams per hour in each direction:						
Beckenham Jn branch	6	6	6	6	7.5	7.5
Elmers End branch	6	8	8	8	7.5	7.5
Subtotal – Sandilands to Arena	12	14	14	14	15	15
New Addington branch	8	8 or 10	12	12	15	15
Total – East Croydon to Sandilands	20	22 or 24	26	26	30	30

Source: TfL. Based on Trams Update, paper to TfL Rail and Underground Panel, 13 November 2014.<sup>22</sup> Indicative dates have been updated in line with advice from TfL received during this study. Infrastructure investments and tram frequencies shown are only those related to the BML2 corridor. Other investments and frequency changes are planned elsewhere on Tramlink; for details of these, refer to the original TfL paper.

### 7.3

## OTHER NEW LINE SCHEMES

Our engagement with stakeholders also identified early-stage proposals for an entirely new line from Brighton to Central London (our ref NEW-01 and NEW-02). The 'new line' concept involves a mostly tunnelled, high-speed, line from Brighton to London via key strategic station locations en-route: Crawley, Gatwick Airport and Croydon, served by as many as 12tph. It would also provide frequent direct services to other major towns and centres across Sussex and Surrey on the 'classic network', achieved through the splitting and joining of sections of 'classic compatible' high-speed trains. Proposed end-to-end journey times from Brighton to London would be around 25-30 minutes, and the stations served on the classic network could also expect significant journey time reductions.

<sup>22</sup> <https://tfl.gov.uk/cdn/static/cms/documents/rup-20141113-part-1-item09-trams-update.pdf>

Given the cost of such a scheme, estimated to be at least £20-30bn in the most basic configuration, and that we have already demonstrated through our analysis that additional capacity beyond what the upgrade of the existing BML can achieve is not required until at least the 2040s/50s, we do not explore these proposals here in detail. However, our analysis has drawn the following key conclusions:

- In the absence of any additional supporting development it is likely that a new line would abstract demand from the existing BML from its opening year rather than generating a great deal of demand in its own right – primarily because there would be no immediate population change and therefore both lines would compete for the same pool of commuters that were previously using the BML.
- Due to its abstractive nature, the new line concept would have an impact in relieving the existing BML of a significant segment of its peak demand.
- In concert with the existing BML the new line could operate as an express link to London from strategic stations en route with the existing BML line operating as a ‘local’ service and feeding the strategic stations. This is a similar principle to the parallel roles that will be played by HS2 and the West Coast Main Line.
- Key to filling up the legacy local service would be a number of ‘attractors’ of demand to be developed as well as ‘generators’. Longer distance or other commuters would then be free to use the new line to travel to and from London.
- Over a 10 to 20 year timeframe from the opening year, some significant changes to population and demography could occur. It is evident that existing rail users to London from Sussex in the peak period are particularly inelastic to changes in rail provision. Commuter rail users are influenced by where they live and where they work and there is a great deal of inertia associated with these two drivers. However, with significant supporting development, it is possible that a new line could make a positive business case in future, but the concept would require detailed modelling to confirm this. We do not expect the scheme to be able to make a positive business case for at least another 30-40 years (once capacity on the existing BML is outstripped by demand, if Network Rail’s upgrade package proceeds in the timescales they currently propose).
- A new line solution could avoid some of the cost and disruption of further enhancing the existing BML. Indeed this has been part of the case for HS2 over further upgrades of the West Coast Main Line. It is beyond the scope of this study to address this question in detail. However, many key elements of the BML upgrade package are forecast to be needed before a new line solution could open. A new line solution might reduce the need for the final elements of the full BML upgrade, but this alone is unlikely to justify the investment in a new line. A new line should therefore not currently be pursued as an alternative to the later stages of the BML upgrade, but this position should be kept under review as the Upgrade develops.

## 7.4

### RECOMMENDED WAY FORWARD

#### STRATEGIC PLANNING

The starting-point for considering BML2 and other new-line solutions must be the identified or suggested strategic problems. These are (in no order of importance):

- *The potential need for improved north-south capacity to support employment growth at Canary Wharf:* This has been asserted but has not been the subject of a detailed transport planning study to determine the scale and timing of the long-term needs, and the specific locations that any new capacity would serve. There are opportunities for incremental enhancements to existing routes, such as higher-capacity DLR trains, but it is unclear whether and when a new line solution would be required. Nor is it clear whether the right solution would be a Thameslink-style main line link (as per BML2 proposal) or a metro-type service with a focus on London origins. We accept that there is likely to be a significant

existing and future market for direct services between BML/BML2 locations and Canary Wharf. But the real question is what link (between Canary Wharf and these or other locations) would offer the greatest benefits, and how this would compare to incremental upgrades of existing links.

- *The need for a direct connection between Canary Wharf and Gatwick Airport:* This has been asserted, and should be seen as a potential benefit of certain new line options. In our view, however, this connection is only a secondary consideration. Canary Wharf will be connected directly to Heathrow via Crossrail and also has London City Airport nearby. Access to Gatwick Airport is currently available via the Jubilee line to London Bridge or (from 2018) via Crossrail to Farringdon. A new line solution might offer incremental improvements to this picture but would not be a game-changer.
- *The need for a 'new line' solution to provide further capacity along the London-South Coast corridor, beyond what can be provided by incremental upgrades:* See comments on the BML Upgrade in Chapter 5.
- *The opportunity to release fast line capacity within the London suburban area, to allow a step-change enhancement to suburban service frequencies.* Such enhancements are a strategic aspiration for TfL and other stakeholders. The recently-announced DfT/TfL partnership approach to London and South East services<sup>23</sup> includes, as one of its three key principles, enhancements for both local London services and longer-distance services. The partnership also aims to avoid any negative impacts on longer-distance services due to extra peak local London services. This strategic problem is addressed by NEW-01 and NEW-02 which would have a central London terminal and, in effect, move some or all BML fast services onto the new line. It is not part of the rationale for BML2 (NEW-03), which provides additional services (via Canary Wharf) rather than transferring existing BML services.
- *Other potential connectivity gaps,* such as better connecting south London, Gatwick and the south coast to HS2 and/or the Old Oak Common opportunity area.
- *A long-term goal to support ever-increasing expectations, and the competitiveness of London and the South East on a global scale, with a significant leap in the nature of the London-Brighton route and associated branches.* This would be a leap beyond what incremental upgrades or reopened lines could achieve, but instead aspires to the levels of speed, frequency and reliability associated with world-class new-build routes and networks. The Greater Brighton Devolution Prospectus<sup>24</sup> envisages such a leap. A new line solution on this basis would not be a long-distance line in the manner of HS2, but would represent a correspondingly bold vision on a regional rather than national scale. Even with this vision, the history of such new lines is that capacity is most often the bedrock of the case.

The strategic problems need to be more formally defined and evidenced. This in turn would allow options for dealing with them (including BML2 London section and others) to be generated and tested. The aim would be to determine whether and what 'new line' solution(s) should be developed. The strategic problems are linked and should not be considered in isolation from each other. In our view, this needs to be done as part of London's and the rail industry's existing long-term planning processes. Any such solution would probably come after Crossrail 2, although this would need to be confirmed.

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<sup>23</sup> *A new approach to rail passenger services in London and the South East: Working in partnership to improve services and support growth.* Mayor of London, DfT and TfL, January 2016.  
<https://www.gov.uk/government/consultations/rail-passenger-services-in-london-and-the-south-east-a-new-approach>

<sup>24</sup> *Greater Brighton Devolution Prospectus: Platforms for Productivity.* Greater Brighton, September 2015.

There are several potential answers to some or all of these strategic problems. They include (individually or in combination, and with no suggestion in this list as to their feasibility):

- BML2.
- A Metro-style 'Crossrail 3' linking Canary Wharf with inner-suburban destinations. LON-05 follows this model.
- A new line or new sections of line, broadly replicating the existing BML corridor. This could include a new tunnel between the Croydon area and a central London station (potentially connecting northwards). NEW-01 and NEW-02 follow this model.
- As above, but only covering the London to Croydon part of the line, focused on releasing suburban service capacity. This could potentially also be a substitute for some of the later inner-London elements of the BML Upgrade package, if found to be better value than these.
- As-yet unclear capacity enhancements that could be provided on existing tracks by 'digital railway' technology developments.

The BML2 proposal must be viewed as both a total package and as individual elements that could be selected in their own right or in combination. Given our conclusions above, there is no case for pursuing the total BML2 package in the foreseeable future (i.e. implementation before the 2040s/50s), even on a basis of implementing individual elements sequentially towards the total package. Our conclusions have also highlighted that individual elements or combinations do have varying degrees of potential to achieve strategic objectives within a coordinated rail and spatial planning approach. But these can only be viewed as a low investment priority unless it can be shown that there is a very strong business case and/or overwhelming strategic impetus for them.

## FUTURE-PROOFING

In the light of the recommendations above, this sub-section considers whether there is a case for protecting the BML2 London section through planning designations or other future-proofing. Key factors are:

- TfL is beginning to work on details of the Bakerloo line extension to Lewisham and potentially beyond. This would need to mesh with a BML2 tunnel portal and station at Lewisham, irrespective of the Bakerloo line's ultimate destination.
- As noted above, not only is Tramlink a significant, high-frequency commuter service, but there are also existing committed or uncommitted enhancement proposals (Figure 33).
- The Croydon area is rapidly developing and there is potential for land required for BML2 (or indeed another long-term new line solution through the area) to be redeveloped in a way that makes railway use prohibitive.

Overall, our analysis has shown that we do not believe there is a capacity need to pursue new line schemes in the next 30-40 years. However, the principles of whether to protect a long-term new line solution through planning designations or other future-proofing should be as follows:

- Our modelling suggests Croydon to London will be the first BML section where demand will exceed capacity during the study horizon. Any new long-term route through the Croydon area is likely to need to serve the town centre, probably by running via East Croydon. Consideration should be given to developing a broad alignment for this and considering what planning designations might be required. The two most likely options are:
  - A tunnel, which should include potential connections to all existing lines southward, but not a 'Croydon Gateway' station.
  - Additional surface tracks alongside the upgraded BML. (This is entirely separate from, and does not negate the need for, any safeguarding process required for the current BML Upgrade package.)

- In consequence, the corridor from Selsdon Road to Woodside via the existing Tramlink alignment is unlikely to be required for a future new line and should not be protected as such.
- From Woodside to Elmers End, the existing Tramlink alignment *might* be required for a new line in the future if BML2 or a similar scheme using this corridor were to come to fruition. Although the feasibility of Tramlink and BML2 coexisting has not been tested, in our view:
  - It is unlikely that any scheme that permanently displaced this section of Tramlink would be considered acceptable.
  - A route via Croydon town centre needing to connect with this corridor would do so in a tunnel. The portal location would be critical to deliverability and even if it were technically possible to have a portal at Woodside, there would be arguments (buildability/worksites, community impact, and disruption) for having the portal nearer to Elmers End.
- Given the strong uncertainty over whether this part of Tramlink would ever need to coexist with a future new line solution (irrespective of potential portal locations), and the timescales involved, it would be disproportionate for future Tramlink developments to be constrained by consideration of a possible new line.
- From Elmers End (inclusive) to Lewisham, the issues relate to land acquisition and the potential need for the Bakerloo line to preserve the option for a (buildable) future new line tunnel portal. There are three main scenarios:
  - A new line does not use the Elmers End-Lewisham corridor at all.
  - A new line uses that corridor, but given the amount of tunnelling needed north of Lewisham and probably at Croydon, and given the potential disruption during construction, it is considered most cost-effective to tunnel below the existing rail corridor. (This is in effect what has happened with HS2 through Ruislip.) Some elements of future-proofing would be needed.
  - A new line uses the corridor at surface level, as per the BML2 scheme, requiring a greater level of future-proofing.
- We view the third scenario as the least likely and least acceptable given current Bakerloo line extension plans. Ultimately the decision on future-proofing will come down to the incremental cost compared to the likelihood of its use, what future-proofing would entail and the proportionality of doing so. Our recommendation is that protecting this corridor for a new line is disproportionate and therefore Bakerloo line extension planning and development should proceed unencumbered by safeguarding requirements for a new line.

These principles should form the basis of further consideration by the rail industry, TfL, DfT and local planning authorities.

Future consideration of new line solutions should take diversionary/resilience opportunities into account, but these will only be secondary factors in identifying and making a case.

## 8

## OTHER SCHEMES

## 8.1

## UCKFIELD LINE REDOUBLING AND ELECTRIFICATION

## THE PROPOSALS

Currently the section between Hurst Green (where the route to East Grinstead diverges) and Uckfield is non-electrified, and parts (around 12.5 route miles) were reduced from double to single track in 1990. The current 2tph service to Uckfield is all that can be practically achieved on this infrastructure.

Electrification alone would not provide additional capacity (more or longer trains), although there could be operational and journey time benefits. ORR policy (as the railway's safety regulator) on third rail DC electrification<sup>25</sup> has a presumption against both new-build and extended third rail. It is therefore more likely that Hurst Green to Uckfield, which at around 25 miles is a significant length, would have to be electrified at 25kV AC with overhead line. This would require an AC/DC interface and dual-voltage rolling stock.

Network Rail has assessed a standalone AC electrification scheme that would retain the existing single-track sections. The benefits would be from having a homogenous fleet and releasing diesel trains for use elsewhere. Network Rail has informed us that they estimated the BCR as 0.64 for this scheme in their full business case analysis, representing poor value for money.

Redoubling would allow additional services on the Uckfield branch itself, but these trains would need paths available towards London or an alternative terminus such as East Croydon. Such onward paths are not currently available at peak times. The BML Upgrade would make such paths available. However both Network Rail and GTR take the view that these paths are best used for additional trains on the BML itself, where the capacity needs are greater, rather than additional trains to Uckfield.

If Lewes-Uckfield were reopened, the existing single track sections would still be a constraint and 2tph would remain the maximum without redoubling. Redoubling and electrification is part of the BML2 proposal, in connection with this reopening and the BML2 London section which would provide onward paths for additional services.

## OUR ASSESSMENT

**How does it respond to demand?** Electrification alone would not respond directly to demand, although existing users would benefit from slightly improved journey times and ambience, and this might marginally transfer some demand from the BML and generate a small level of new demand locally.

**Network design factors:** Redoubling would be on existing trackbed and is a relatively routine type of intervention, although the engineering scope required in this location (e.g. whether structures would need upgrading or replacement) would need to be confirmed. Much the same applies to electrification. Changeover areas from AC to DC are technically complex but existing busy changeover locations such as Farringdon show that this can be tackled.

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<sup>25</sup> [http://orr.gov.uk/\\_data/assets/pdf\\_file/0017/17621/dc-electrification-policy-statement.pdf](http://orr.gov.uk/_data/assets/pdf_file/0017/17621/dc-electrification-policy-statement.pdf)

**Operational impacts:** Electrification and/or redoubling could improve journey times and performance along the route. There would also be fleet benefits as noted above. There are no significant operational impacts on the BML.

**Estimated cost:** We accept Network Rail's assessment that standalone electrification would have a poor BCR. We estimate AC electrification costs of around £150-250m, and a similar cost range for redoubling. This gives a total cost of £300-500m, excluding dual voltage rolling stock costs.

**Potential for private sector contributions:** In principle, developer contributions could be made, but potential developments are not on a scale that would warrant such contributions. Given the marginal benefits, we see little scope for CIL or business rate contributions.

## RECOMMENDED WAY FORWARD

We accept that there is currently no case for electrifying the Uckfield line on an as-is basis without redoubling.

Redoubling, with possible electrification, may be necessary to support certain options for Lewes-Uckfield reopening, as noted in Chapter 6. This should be addressed in the technical work to support the new approach we are recommending for Lewes-Uckfield.

## 8.2

### THE ARUNDEL CHORD

#### THE PROPOSALS

The Arundel chord would provide a direct route between Brighton and Arundel (and onwards to Horsham and London), by constructing a new east-to-north chord between Angmering and Arundel. This scheme was judged to be 'out of scope' in geographical terms in our option sifting process, but we comment on some specifics in this Section. The rationale for the chord is that it would:

- offer a direct diversionary route if the BML is blocked south of Three Bridges, and/or
- allow new direct services between the Horsham/Arundel line and the west Coastway towards Brighton.

Currently there is only an indirect route via reversal at Littlehampton or Ford; the Arundel chord would reduce the journey time (by 20 minutes according to Network Rail). Conversely, GTR sees Littlehampton as a significant market and considers that any additional services should usefully serve Littlehampton rather than use the new chord to avoid it.

Because of limitations at Brighton station, Network Rail's assessment has shown that it is unlikely that more than 2tph could be diverted that way in planned or unplanned disruption. However, the chord would allow a new 1tph off-peak Brighton-Horsham service, to improve connectivity along the West Coastway (capacity is not available to provide this service at peak times). The scheme had a negative Net Present Value with BCRs of 0.24 to 0.3 depending on the infrastructure option chosen.

#### OUR ASSESSMENT

**How does it respond to demand?** It does not directly support BML demand growth, nor does it aim to. It aims to provide a direct diversionary route to/from Brighton for some BML stations in some closure circumstances. It avoids the time taken by reversing at Littlehampton which is the current way the Arun Valley is used as a diversionary route. To the extent that it can do so (see below), there may be a marginal benefit in retaining trips that would otherwise be made on other modes or not at all.

The potential bonus of a 1tph off-peak Brighton-Horsham service also offers a marginal benefit, including improved journey times for intermediate flows, but does not support peak commuting into Brighton. We accept GTR's view that routing such a service via Littlehampton (not requiring the Arundel Chord) may be more appropriate. Furthermore, Littlehampton and Barnham are currently seen as the main growth locations in the area, and the Arundel Chord would not improve service to these stations.

**Network design factors:** This would be a chord on embankment or viaduct in the angle between two existing routes, with flat junctions at each end. Grade-separation would be disproportionate but a single track would probably be sufficient for 2-3tph total. We accept that existing capacity constraints on the Coastway and Arun Valley limit the amount of routine service possible. It would be a relatively conventional intervention but there is no existing evidence on its engineering feasibility in this location. It would run through an area of Priority Habitat (coastal and floodplain grazing marsh), as do the existing railways in this area.

**Operational impacts:** We concur with Network Rail that the resilience benefits of the chord (incrementally over the existing practice of reversing at Littlehampton) are very limited. The reasons for this are described in Figure 34, which shows the potential incident locations that the chord could bypass. Passengers served by the potential off-peak Horsham-Brighton service would see journey time savings; we have not assessed these because we accept that there is no viable business case for the chord.

**Figure 34: Geographic usefulness of Arun Valley as diversionary route**

If a closure or incident is between...	...and	Number of tracks	Key location-specific resilience and availability issues	What diversionary options are currently available?	Would Arundel chord help significantly?
London	Windmill Bridge Junction etc (north of East Croydon)	4 Victoria, 4 London Bridge	Thameslink stageworks (due to finish 2018)	<ul style="list-style-type: none"> <li>Run as two-track railway if incident allows</li> <li>Thameslink trains via Tulse Hill as per current long-term diversions, if incident allows</li> <li>Victoria trains via Sutton and Dorking to Arun Valley, if incident allows</li> </ul>	Only if Arun Valley is used as diversionary route - likely to be of little benefit, given other alternatives and constraints in reaching Arun Valley via Sutton
Windmill Bridge Junction etc (north of East Croydon)	South Croydon	5		<ul style="list-style-type: none"> <li>Run as two-track railway if incident allows</li> <li>Divert via Dorking and Arun Valley (reversing at Littlehampton or Ford)</li> </ul>	Only if Arun Valley is used as diversionary route - likely to be of little benefit given constraints in reaching Arun Valley via Sutton
South Croydon	Stoats Nest Junction (Coulston)	4		<ul style="list-style-type: none"> <li>As above</li> </ul>	As above
Stoats Nest Junction (Coulston)	Earlwood	Two separate 2-track routes	Earthworks	<ul style="list-style-type: none"> <li>Run as two-track railway if incident allows</li> <li>Divert via Dorking and Arun Valley (reversing at Littlehampton)</li> </ul>	As above
Earlwood	Three Bridges	4		<ul style="list-style-type: none"> <li>As above</li> </ul>	As above
Three Bridges	Keymer Junction (Wivelsfield)	2 (4 from Three Bridges to Balcombe Tunnel Jn)	Tunnels	<ul style="list-style-type: none"> <li>Divert via Arun Valley (reversing at Littlehampton)</li> </ul>	Potentially, if operational constraints allowed, but Network Rail analysis found case to be limited (see main text of report)
Keymer Junction (Wivelsfield)	Brighton	2	Tunnels	<ul style="list-style-type: none"> <li>Divert via reversal at Lewes</li> </ul>	As above, but existing Lewes route provides a shorter diversion if BML is open north of Keymer Jn

**Red shading = little or no benefit** **Yellow shading = potential benefits, subject to caveats and constraints as listed.** This is a generalised table to illustrate the potential contribution of diversionary routes in geographic terms. It does not represent any specific contingency plans, and does not cover any operational constraints with using particular options (see elsewhere in this section). 'Number of tracks' refers to the basic configuration of the railway and does not necessarily represent the exact track layout at a location; additional tracks may exist for some short sections of route.

**Estimated cost:** We agree with the route study estimated capital costs of £44m-£56m (depending on whether the chord is single- or double-track, and embankment or viaduct). The route study found BCRs 0.24 to 0.30. That analysis has not been technically challenged by any of the stakeholders. While different permutations of services and/or further housing growth in the area might improve the business case, it is unlikely that it could improve sufficiently in the near term to become a priority, particularly in the context of other stated needs along the West Coastway.

**Potential for private sector contributions:** Very limited potential for private sector funding. It would be very difficult to tie this scheme logically to developer contributions, CIL or a business rate supplement.

## RECOMMENDED WAY FORWARD

We do not consider the Arundel chord should be progressed now in terms of the London-South Coast corridor. It is possible that in the longer-term, in association with West Coastway capacity improvements and if housing growth plans changed, the case for an Arundel Chord could be worth revisiting as part of a West Coastway strategy.

There is also no case for pursuing the Arundel Chord at this stage in terms of diversionary benefits. This concurs with the similar conclusion in the Route Study. This is irrespective of whether or not further resilience measures on BML are funded.

# 9

## CONCLUSIONS AND STRATEGIC PLAN

### 9.1

#### KEY CONCLUSIONS

- Network Rail's Brighton Main Line Upgrade package should be the highest priority investment on the corridor. Our analysis has confirmed that no other proposals would deliver similar levels of benefits in similar timescales.
- It is important to keep progressing the first parts of the Upgrade package, for implementation during a window of opportunity in Control Period 6. This window, after which the programme would become significantly more challenging to implement, is due to the need to utilise undeveloped land in the central Croydon area and due to the timeline, determined by asset condition, for signalling system renewals.
- The incremental approach behind the Upgrade package can meet demand growth in the corridor for up to 30-40 years, dependent on the scale of housing development.
- Investment in reliability and resilience should be focused on BML itself, not diversionary routes. Our analysis has found that the benefits of diversionary routes via a reopened Lewes-Uckfield line or a new Arundel Chord are very limited.
- As long as the BML Upgrade proceeds in Network Rail's proposed timescales, there is no need in capacity terms to start planning for new line solutions (including BML2) for at least 10-20 years.
- There is a poor transport case for reopening the Lewes-Uckfield line, and for introducing National Rail services between Eridge and Tunbridge Wells. For these schemes to proceed, they would need to rely on harnessing the economic growth agenda, not just traditional transport benefits. The local authorities and Local Enterprise Partnerships (LEPs) need to lead on determining how improved regional connections, centred on Lewes-Uckfield, can contribute to economic growth, and how this investment can be funded.

### 9.2

#### STRATEGIC PLAN

Below we outline our recommended strategic plan that includes priorities for investment over short (5-10 years), medium (10-20 years) and long term time horizons (20+ years).

#### NEXT STEPS (0-5 YEARS)

- Implement the CP5 committed schemes
- Continue development of the BML Upgrade package, feeding into the CP6 High Level Output Specification (HLOS) and Statement of Funds Available (SOFA). This critically includes safeguarding the ability to implement the Croydon element.
- Consider a specific BML resilience fund, within or separate from the BML Upgrade package, feeding into the CP6 HLOS and SOFA
- Local authorities and LEPs to take the lead in Step 1 of the proposed new approach to Lewes-Uckfield and beyond. Our suggested new approach recognises that we have found no transport case for proceeding with the scheme, but that significant uplift in housing or commercial deliverable development put forward by local authorities and LEPs could improve the business case, and therefore it is up to these bodies to take the plans forward. This should be supported by consideration of an incremental transport/spatial strategy for the Tunbridge Wells West site.
- Maintain existing planning designations for protecting Lewes-Uckfield and the Tunbridge Wells link, pending the outcome of the new approach.

- Local planning authorities, TfL and other stakeholders to consider potential requirements for protecting a long-term new line solution in the Croydon area, building on the principles outlined in this study.
- Existing Greater London Authority (GLA), TfL and Network Rail planning processes to define and evidence the relevant long-term strategic problems, then generate and test options for dealing with them.

### SHORT TERM (5-10 YEARS)

- Implement CP6 elements of Network Rail's BML Upgrade package
- Depending on results of 'next steps', *if* a viable case and funding package can be made for a scheme centred around Lewes-Uckfield, continue with its development. There is potential to begin implementation within this timeframe, if required.

### MEDIUM TERM (10-20 YEARS)

- CP7/8 elements of Network Rail's BML Upgrade package, as required to meet demand
- Depending on the situation at that stage, there may be potential to implement a scheme centred on Lewes-Uckfield, or to expand an existing scheme.
- Depending on the situation at that stage, there may be a need to develop a long-term new line solution during this period. Our demand forecasts suggest that such a new line would not be required in capacity terms for 30-40 years.

### LONG TERM (20+ YEARS)

- Any remaining elements of Network Rail's BML Upgrade package, as required to meet demand.
- Depending on the situation at that stage, there may be potential to implement a scheme centred on Lewes-Uckfield, or to expand an existing scheme.
- Depending on the situation at that stage, there may be a need to develop and/or implement a long-term new line solution during this period, although we would not expect such a new line scheme to be required in capacity terms for 30-40 years.

