



MetroWest+

Phase 2 Preliminary Business Case

Appendix C - Socio-economic Appraisal Report,
Network Rail

July 2015

travelwest+

Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire
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MetroWest Phase 2
Socio-economic appraisal report
At GRIP Stage 2

Draft/Issue No 0.3

June 2015



Executive Summary

This socio-economic appraisal has been prepared by Network Rail to identify the benefits and costs of the proposed MetroWest Phase 2 scheme. The appraisal was carried out at GRIP stage two.

The MetroWest programme will address the core issue of transport network resilience, through targeted investment to increase both the capacity and accessibility of the local rail network. The principal aim of the MetroWest project is to facilitate regular interval train services on local lines radiating from Bristol Temple Meads, enhancing linkages across the West of England area as a whole. There are two phases in the project overall:

- Phase 1 aims to re-introduce train services on the Portishead to Bristol line, and implement half hourly service patterns on the Severn Beach line and the Bath Spa to Bristol Temple Meads line, serving local stations. The main infrastructure in Phase 1 is reinstatement of the line to Portishead and upgrade of the Portbury freight line for passenger services (plus new stations at Pill and Portishead); and
- Phase 2 adds half-hourly train services at Yate and hourly services on a reopened Henbury line, with new stations serving the Henbury catchment areas and the Filton Bank areas.

A strategic and a socio-economic business case for Phase 1 were undertaken at GRIP Stage two in the summer of 2014, and the scheme is now progressing to GRIP Stage three. This report outlines the socio-economic appraisal, assessing the case for Phase 2. It assumes Phase 1 is in the baseline (Do-Minimum) and therefore the benefits (and costs) presented in this report represent the benefits (and costs) over and above Phase 1.

The main elements of MetroWest Phase 2 are the operation of a half-hourly train services to Yate from Bristol Temple Meads and hourly services on a reopened Henbury line (with up to two new stations), plus serving new station(s) on Filton Bank. Infrastructure enhancements are required including the upgrade of the Henbury line for use by passenger trains and the operation of new railway stations. Further infrastructure enhancement at Yate is required for some of the options, depending where the Yate services are terminated. The programme for Phase 2 is following a similar process to Phase 1, though running 1 to 2-years later with scheme opening planned for 2021.

The following options were assessed in this report:

Option 1a: Henbury Spur, Yate Extension

- Bristol Temple Meads to Henbury: 1 train per hour (tph) all day
- Extension of existing Weston-Super-Mare to Bristol Parkway service to Yate
- New stations on Filton Bank (Ashley Down and Constable Road)
- New stations at North Filton, Henbury
- Turnback at Yate

Option 1b: Henbury Spur, Gloucester Extension

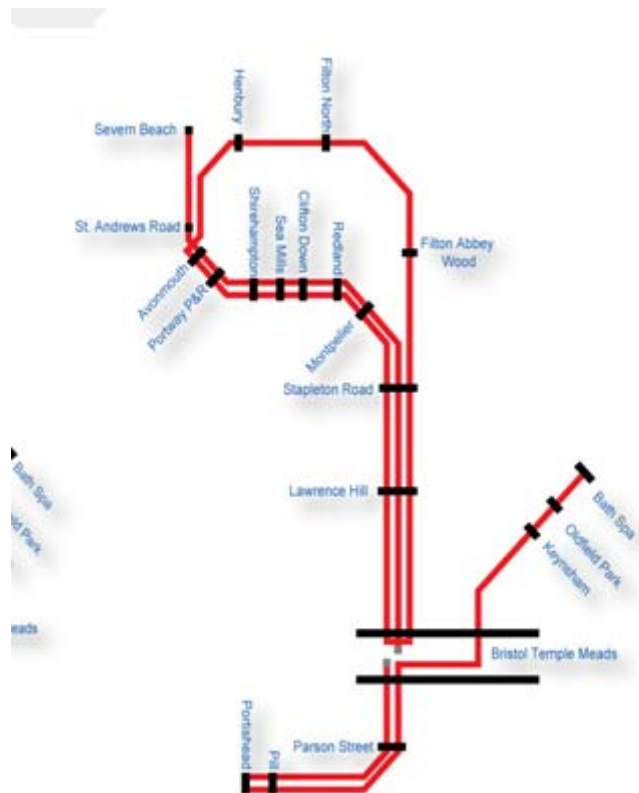
- Bristol Temple Meads to Henbury: 1 train per hour (tph) all day
- Extension of existing Weston-Super-Mare to Bristol Parkway service to Gloucester
- New stations on Filton Bank (Ashley Down and Constable Road)
- New stations at North Filton, Henbury

Option 2a: Henbury Loop, Yate Extension

- Bristol Temple Meads to Henbury: 1 train per hour (tph) all day via Filton Bank and Avonmouth (clockwise and anti-clockwise directions)
- Extension of existing Weston-Super-Mare to Bristol Parkway service to Yate
- New stations on Filton Bank (Ashley Down and Constable Road)
- New stations at North Filton, Henbury
- Turnback at Yate

Option 2b: Henbury Loop, Gloucester Extension

- Bristol Temple Meads to Henbury: 1 train per hour (tph) all day via Filton Bank and Avonmouth (clockwise and anti-clockwise directions)
- Extension of existing Weston-Super-Mare to Bristol Parkway service to Gloucester
- New stations on Filton Bank (Ashley Down and Constable Road)
- New stations at North Filton, Henbury
- For all options, the location of a new station at Henbury could be on either a new site east of the A4018 or the old site west of the A4018.
- Figure 1. Option 2a Loop services on the Henbury Line (with MetroWest Phase 1 Option 6b Enhanced in the base)



This appraisal assesses the impact of improving capacity and connectivity on the Henbury line and between Yate/Gloucester and Bristol Temple Meads. New stations at Henbury, Filton North, Ashley Hill and Constable Road are proposed to open in 2021 encouraging modal shift from road to rail, the monetised benefits of which are included in the appraisal. The appraisal also includes the capital expenditure associated with the new stations on the Henbury line and near Filton Bank, as well as the increased operating costs resulting from the additional services and vehicle mileage.

A socio-economic appraisal for each option was carried out in accordance with the Department for Transport's appraisal guidance. The appraisal assumes the capital cost of the scheme would be funded by the local authorities and therefore is not RAB funded. The main benefits are the journey time benefits, non-user benefits and revenue increase.

Table 4.1 summarises the appraisal results for each option, outlining the BCRs, NPVs and the PVs of costs and benefits. The option of building the Henbury (spur option) station at either a new or old site has been considered.

Table 4.1: Results of socio-economic appraisal	Henbury Spur 1A New Station		Henbury Spur 2A OLD Station			
	Option 1a	Option 1b	Option 1a	Option 1b	Option 2a	Option 2b
	£m PV	£m PV	£m PV	£m PV	£m PV	£m PV
Net benefits to consumers and private sector (plus tax impacts)						
Rail user reliability benefits						
Rail user journey time benefits	74.74	93.13	74.74	93.13	73.70	92.08
Journey ambiance inc. station amenity and crowding benefits	0.00	0.00	0.00	0.00	0.00	0.00
Non user benefits - road decongestion	4.88	6.63	4.88	6.63	5.01	6.76
Non user benefits - noise, air quality, greenhouse gases & accident benefits	1.34	1.82	1.34	1.82	1.38	1.86
Rail user and non user disruption disbenefits during possessions	-1.42	-1.33	-1.34	-1.25	-1.56	-1.47
Current TOC revenue benefits	0.00	0.00	0.00	0.00	0.00	0.00
Current TOC operating costs	0.00	0.00	0.00	0.00	0.00	0.00
Indirect taxation impact on government	-10.33	-12.42	-10.33	-12.42	-10.48	-12.57
sub-total (a)	69.21	87.82	69.29	87.90	68.04	86.65
Costs to government (broad transport budget)						
Capital costs	38.81	36.38	36.59	34.16	42.63	40.20
Non user benefits - road infrastructure cost changes	-0.07	-0.10	-0.07	-0.10	-0.07	-0.10
Revenue transfer	-56.41	-67.11	-56.41	-67.11	-57.20	-67.89
Operating costs transfer	71.89	109.68	71.89	109.68	127.08	164.87
sub-total (b)	54.23	78.85	52.01	76.63	112.44	137.07
Net Present Value (NPV) (a-b)	14.98	8.97	17.28	11.27	-44.40	-50.42
Benefit Cost Ratio to Government (BCR) (a/b)	1.28	1.11	1.33	1.15	0.61	0.63

Note: Present Values (PVs) are in 2010 market prices and are discounted to 2010 using Social Time Preference discount rates: see Table A.2. The appraisal is in accordance with the DfT's WebTAG appraisal guidance. Results are shown for the relevant option etc relative to the Base Case. For net benefits etc, benefits are shown as positive. For costs to government etc, costs are shown as positive.

1. Introduction and objectives

This section includes an introduction to the appraisal, a summary of scheme objectives and a description of the contents of this report; these are addressed in turn.

1.1 Introduction

This appraisal has been prepared by Network Rail to identify the socio-economic costs and benefits of the proposed MetroWest Phase 2 scheme.

This appraisal was carried out at GRIP stage two.

The proposed MetroWest Phase 2 scheme improves capacity and service frequency on the Yate corridor and reopened Henbury line, providing rail access to the Bristol and the regions of West of England and beyond.

The socio-economic appraisal was carried out in accordance with the Department for Transport's (DfT) appraisal guidance, in particular the web-based transport analysis guidance or WebTAG, available at dft.gov.uk.

The appraisal assumptions are discussed in more detail in Sections 3 and in the Appendix (Table A.2).

The appraisal compares the costs and benefits of each option relative to the Do Minimum (see Section 2), in accordance with WebTAG.

In this report, all years refer to financial years (i.e. 2014 = 2014/15) unless stated otherwise.

1.2 Scheme objectives

The MetroWest Phase 2 principal business objectives are:

- To support economic growth, through enhancing the transport links to the enterprise zones and into and across Bristol city centre, from Henbury, Filton Bank catchment areas and the Yate corridor
- To deliver a more resilient transport offer, providing more attractive and guaranteed (future-proofed) journey times for commuters, business and residents into and across Bristol, through better utilisation of strategic rail corridors from Henbury and Filton Bank catchment area and to Yate
- To improve accessibility to the rail network with new and reopened rail stations and reduce the cost (generalised cost) of travel for commuters, business and residents; and
- To make a positive contribution to social well being, life opportunities and improving quality of life.

The MetroWest Phase 2 supporting objectives are:

- To contribute to reducing traffic congestion on the Henbury, and Yate corridors;
- To contribute to enhancing the capacity of the local rail network, increasing the number of seats in the morning and evening peak ;and
- To contribute to reducing the overall environmental impact of the transport network.

The MetroWest programme will address the core issue of transport network resilience, through targeted investment to increase both the capacity and accessibility of the local rail network. The MetroWest concept is to deliver an enhanced local rail offer for the sub-region comprising:

- Existing and disused rail corridors feeding into Bristol;
- Broadly half hourly service frequency (but some variations possible pending the business case);
- Cross Bristol service patterns i.e. Yate to Weston-super-Mare etc; and
- Providing a Metro type service appropriate for a City Region of 1 million population.

This appraisal assesses the impact of improving capacity and connectivity on the Yate corridor by providing half hourly local services through extending the existing Bristol Parkway terminating services. It also assesses the benefits to new rail users associated with improving connectivity to Henbury and Filton Bank areas, encouraging modal shift from road to rail.

1.3 Structure of the report

This report includes the following sections:

- Section 2 describes the scheme options and Do Minimum;
- Section 3 explains how the costs and benefits were estimated;
- Section 4 presents appraisal results and conclusions of the main options;
- Section 5 presents analysis of an additional option which was developed following the appraisals of the main options; and
- Appendix, includes version control (see Table A.1) and further information on assumptions (see Table A.2).

2. Scheme options tests and Do Minimum

This section defines the scheme options and the do-minimum in turn.

2.1 Options assessed

Four main options of service specification are proposed for business case assessment, which are Option 1a, 1b, 2a and 2b.

Option 1a: Henbury Spur, Yate Extension

- Bristol Temple Meads to Henbury: 1 train per hour (tph) all day
- Extension of existing Weston-Super-Mare to Bristol Parkway service to Yate
- New stations on Filton Bank (Ashley Down and Constable Road)
- New stations at North Filton, Henbury
- Turnback at Yate

Option 1b: Henbury Spur, Gloucester Extension

- Bristol Temple Meads to Henbury: 1 train per hour (tph) all day
- Extension of existing Weston-Super-Mare to Bristol Parkway service to Gloucester
- New stations on Filton Bank (Ashley Down and Constable Road)
- New stations at North Filton, Henbury

Option 2a: Henbury Loop, Yate Extension

- Bristol Temple Meads to Henbury: 1 train per hour (tph) all day via Filton Bank and Avonmouth (clockwise and anti-clockwise directions)
- Extension of existing Weston-Super-Mare to Bristol Parkway service to Yate
- New stations on Filton Bank (Ashley Down and Constable Road)
- New stations at North Filton, Henbury
- Turnback at Yate

Option 2b: Henbury Loop, Gloucester Extension

- Bristol Temple Meads to Henbury: 1 train per hour (tph) all day via Filton Bank and Avonmouth (clockwise and anti-clockwise directions)
- Extension of existing Weston-Super-Mare to Bristol Parkway service to Gloucester
- New stations on Filton Bank (Ashley Down and Constable Road)
- New stations at North Filton, Henbury
- For all options, the location of a new station at Henbury could be on either a new site east of the A4018 or the old site west of the A4018.

2.2 Do Minimum – Base case scenario

The do-minimum is defined as the situation with Great Western Main line electrification and Intercity Express Programme (IEP) delivered in the end of Network Rail's Control Period Five (CP5). The service specification of these programmes includes providing two additional trains per hour (each way) from London Paddington to Bristol Temple Meads via Bristol Parkway. The Do Minimum includes CP5 committed schemes. It should be noted that the Do Minimum also includes MetroWest Phase 1 and the proposed service specification associated with Option 6b Enhanced of Phase 1 business case. This appraisal therefore assesses the benefits and costs over and above MetroWest Phase 1.

3. Costs and benefits

This section of the report defines how the costs and benefits in the appraisal were estimated. The results of the appraisal are shown in Section 4. The costs and benefits comprise the following elements, which are addressed in turn:

- Capital costs;
- Operating costs;
- Generalised journey time benefits (frequency and connectivity); and
- Non-user benefits.

3.1 Capital costs

Capital costs consist of initial capital and renewal costs, which are addressed in turn.

Initial capital costs

Initial capital costs are shown in Table 3.1. These costs are the point estimates (i.e. without risks and contingency) at GRIP stage two.

Table 3.1: Capital costs		
Option	Proposed funding source	£m
Option 1a (Henbury 1A new station)	Public funds - local government	32.95
Option 1b (Henbury 1A new station)	Public funds - local government	30.88
Option 1a (Henbury 2A old station)	Public funds - local government	31.06
Option 1b (Henbury 2A old station)	Public funds - local government	29.00
Option 2a	Public funds - local government	36.19
Option 2b	Public funds - local government	34.12
<p>Note</p> <p>The capital cost used for the appraisal, as quoted above, includes the point estimate but excludes any QRA-based risk allowance and excludes general contingency/generalised risk allowance etc.</p> <p>Note that the capital costs for appraisal purposes do not include the QRA-based risk allowance even though a QRA has been carried out.</p> <p>The above capital costs include Schedule 4 possession costs: see Table A.2. User and non-user disbenefits associated with possessions are based on these costs: for assumptions see Table A.2; these disbenefits are shown in Table 4.1.</p> <p>40% of the above total costs are assumed to be incurred in 2019, 50% are assumed to be incurred in 2020 and 10% are assumed to be incurred in 2021. These are yet to be confirmed by the project team.</p> <p>The above costs are in 2014 factor prices, at GRIP stage 2, are undiscounted and exclude optimism bias.</p> <p>No real terms changes in costs are applied to the above costs during the appraisal period, leaving aside the issue of optimism bias.</p> <p>The PVs for total capital costs are shown in Table 4.1. These include optimism bias (of 50% at GRIP 2) and are discounted (using the discount rates shown in Table A.2).</p> <p>The above costs are assumed to be funded by the local government. The PVs in Table 4.1 therefore exclude RAB finance costs.</p> <p>Costs are relative to the Base Case. Initial capital costs only (renewal costs are excluded). Costs are shown as positive.</p> <p>Source: Project Team.</p>		

- Option 1 a (Henbury 1A new station) includes the costs (point estimates) of building the new stations of Henbury (£6.1m) on a new site, North Filton (£4.7m) , Ashley Down (£7.3m) and Constable Road (£12.7 m). It also includes the costs of a new Yate turnback siding (£2.1m).
- Option 1b (Henbury 1A new station), is the same as Option 1a, except it does not require a new Yate turnback siding.
- Option 1a (Henbury 2A old station), is the same as Option 1a (Henbury 1A new station), except the cost of the Henbury station is £4.2m and is built at an old site.
- Option 1b (Henbury 2A old station), is the same as Option 1b (Henbury 1A new station) except the cost of the Henbury station is £4.2m. and is built at an old site.
- Option 2a, also includes the costs of building the new stations of Henbury and the infrastructures required for the “loop” including Hallen Marsh (£7.8m). A Yate turnback is also assumed.
- Option 2b, is the same as Option 2a, except the Yate turnback is excluded.

Renewal costs and / or cost savings

Renewal costs have not been estimated in this appraisal. It is recommended that this is included in the next GRIP stage appraisal.

3.2 Operating costs

This scheme requires ongoing operating and maintenance costs and the key cost components are summarised as follows:

- Train Operating Company (TOC) staff costs: additional drivers and train managers are required to operate the new and enhanced rail services;
- TOC vehicle leasing costs for the additional rolling stock;
- TOC vehicle mileage related operating costs: includes increased track access charges, fuel costs and vehicle maintenance costs as a result of the additional vehicle mileages; and
- TOC operating costs (new stations): operating and maintenance costs associated with the new stations at Henbury, North Filton, Ashley Down and Constable Road.

Table 3.3 summarises the annual operating costs for each option. These costs are high level estimates and need to be refined further should the scheme progress to the next GRIP stage.

Table 3.2 Operating costs	Option 1a	Option 1b	Option 2a	Option 2b
NR operating costs	-	-	-	-
TOC staff costs	880,000	1,320,000	1,760,000	2,200,000
TOC vehicle leasing costs	629,000	943,000	1,259,000	1,573,000
TOC vehicle operating costs	353,548	876,272	475,112	997,836
TOC operating costs (other)	552,000	552,000	580,000	580,000

Notes:

Costs are shown as positive.

Costs are in 2012 factor prices, at GRIP stage 2, are undiscounted and exclude optimism bias.

The PVs are shown in Table 4.1 and include optimism bias as shown in Table A.2.

Costs are relative to the Base Case.

The appraisal compares the operating costs of each option with those in the do-minimum, as defined in Section 2.2. The appraisal therefore considers and monetises the incremental operating costs (and benefits) over and above the base. The assumptions of each cost component are discussed in turn.

TOC staff costs and TOC vehicle leasing costs

Table 3.3 Number of unit required	Do minimum (Phase 1 Option 6b)				
	Option 1a	Option 1b	Option 2a	Option 2b	
Total number of unit requirement	6	8	9	10	11
Incremental (compared to the Base Case)		2	3	4	5

Table 3.3 summarises the assumed number of unit requirement for each option. It compares the unit requirement between each option and the Do-Minimum Scenario (MetroWest Phase 1 Option 6b enhanced). These assumptions are sourced from the Capability Analysis report undertaken by Network Rail.

The appraisal assumes each unit requires six train drivers and four train managers per day to operate. This is based on the assumptions provided by the train operator, assuming three turns per Diesel Multiple Unit (DMU) unit, working all day, where each turn requires two drivers. This assumption was also used in the MetroWest Phase 1 appraisal at GRIP Stage two. In terms of train managers, the Phase One business case assumed six train managers per unit, while in this appraisal four has been assumed. This assumption reflects a higher pool of resources is likely to be available when combining Phase 1 and Phase 2, and hence less spare resources are required for train managers. The average salaries of a driver and a train manager are assumed to be £50,000 and £35,000 per annum respectively (in 2012 factor prices).

Each train is assumed to be formed of 2-car DMU. Standard unit rates of leasing cost, track access charges and fuels costs for 2-car DMU (diesel multiple unit) are applied. The leasing cost for each vehicle is assumed to be £157,000 in 2012 factor prices.

TOC vehicle operating costs

The vehicle operating costs are related to the total vehicle mileage. This is calculated based on the assumption 12 services are extended to Yate/Gloucester (each way) per day. It is assumed the new services on the Henbury line runs at hourly frequency throughout the day. Services are assumed to run 363 days per year.

The unit rates for the vehicle operating costs are as follow:

- Vehicle maintenance cost of £0.6 per vehicle mile;
- Variable track access charges of £0.1 per vehicle mile; and
- Fuel cost of £0.46 per vehicle mile.

These prices are in 2012 factor prices.

TOC other operating costs

This includes the costs of operating the new stations of Henbury, North Filton, Constable Road and Ashley Hill. It is assumed that all stations are two platforms, except in Option 1a and 1b, Henbury station is of single platform. The cost of operating a new station is estimated as £117,000 per annum (in 2014 factor prices) for a single platform and £145,000 per annum (in 2014 prices) for a two platform station. Both are assumed to be unmanned with no staff. This cost assumption is taken from the MetroWest Phase 1 business case assumption for the new station of Pill.

3.3 Journey time benefits

This section addresses value of time improvement to new and existing passengers. It also discusses revenue benefits and non-user benefits, as well as tax costs. These benefits and costs are addressed in turn.

Journey time saving /value of time benefits

Improving frequency and connectivity on the Yate corridor and Henbury line as outlined in Section 2.1, will improve the generalised journey time for existing rail passengers. It also encourages modal shift from road and other public transport to rail. Generalised Journey Time (GJT) defined in Passenger Demand Forecasting Handbook 5.1 (PDFH 5.1) comprises the following components:

- rail in-vehicle journey time;
- frequency (which is converted into equivalent minutes);and
- interchange penalty (which is converted into equivalent minutes).

The service specification provided by the project team¹ for each option is modelled in MOIRA – a rail industry demand forecasting model that assesses the impact of timetable changes on rail demand and revenue. In the model, WebTAG and PDFH5.1 values and parameters are used to estimate the journey time improvement to passengers on the existing lines. A baseline timetable, based on MetroWest Phase 1 Option 6b enhanced is modelled in MOIRA. The option timetables are then assessed against the baseline. An indicative timetable for the Henbury line services is found in the Appendix Tables A4 and A5.

Outputs from MOIRA are used for the appraisal. These outputs include the value of time improvement to existing rail users, and new rail users (at existing stations). Revenue impact, as a result of increased demand at existing rail stations are also modelled by MOIRA, using the PDFH 5.1 parameters.

The demand forecasting approach used in MOIRA is based on an elasticity approach as outlined in PDFH 5.1 and it is not capable of predicting demand to and from new stations. To estimate the value of time improvement to the new passengers at the new stations of Henbury, North Filton, Ashley Down and Constable Road, the new station forecasts provided by the consultants working on behalf of the project team are used.

Demand forecasts for the new stations, for each option, are presented in Table 3.4.

Table 3.4: New station forecasts, rail journeys in 2021 (first year of opening)				
	Option 1a	Option 1b	Option 2a	Option 2b
Henbury	98,872	98,872	100,020	100,020
Filton North	92,287	92,287	93,202	93,202
Ashley Hill	89,389	89,389	89,445	89,445
Constable Road	37,717	37,717	37,745	37,745

Forecasts include CPNN growth.

A ramp up of demand is assumed, with 80% in the first year, 85% in the second year, 90% in the third year and 100% in the year after.

The journey time improvement to the new rail passengers at the new stations are estimated by comparing the generalised costs of travel by car and by rail. The

¹ Capacity Analysis Report produced by Network Rail December 2014.

generalised cost of travel by rail is calculated by working out the generalised journey time (in minutes), which include the following components

- In vehicle time (in minutes)
- Frequency penalty (in minutes), from PDFH 5.1
- Interchange penalty (in minutes), from PDFH 5.1
- Average rail fare per single trip in minutes (by converting fares to equivalent minutes, using the weighted value of time for rail passengers from WebTAG. It is weighted by the proportion of commuters, business and leisure users. These values are extracted from MOIRA).

The generalised cost of travel by car includes in-vehicle journey time in the peak and road costs such as parking cost in Bristol city centre. It also includes the costs of operating cost per vehicle mile such as petrol and maintenance of vehicles. This is assumed to be £0.3 per vehicle mile and sourced from AA website. The generalised costs of travel by road are then converted to the equivalent journey time, using WebTAG value of time.

The generalised journey times (and costs) of travel between the two modes are then compared. The value of time improvement to new rail users are halved; applying “the rule of half”, as described by WebTAG.

The value of time improvement to passengers using the new rail stations are shown in Table 3.5. The PVs of these benefits over the appraisal period is shown in Table 4.1.²

Table 3.5. Total value of time improvement to the new stations passengers in 2021				
	Option 1a	Option 1b	Option 2a	Option 2b
Henbury	£236,267	£236,267	£212,005	£212,005
Filton North	£256,970	£256,970	£237,149	£237,149
Ashley Hill	£159,122	£159,122	£153,856	£153,856
Constable Road	£87,907	£87,907	£87,973	£87,973
Total	£740,266	£740,266	£690,983	£690,983

Note: In 2010 value of time, factor prices and undiscounted.

The values of time improvement for both new and existing passengers on the existing lines are shown in Table 3.6. The PVs of these benefits over the appraisal period is shown in Table 4.1.

Table 3.6. Total value of time improvement to passengers on the existing lines and stations in 2021				
	Option 1a	Option 1b	Option 2a	Option 2b
Total	£789,929	£1,174,815	£830,684	£1,215,546

Note: In 2010 value of time, factor prices and undiscounted.

Revenue benefits

Revenue benefits are based on an estimation of the additional passengers generated by the scheme and are presented in Tables 3.3 and 3.4. The total revenue predicted in 2021 is presented in Table 3.7. The PVs of these benefits are shown in Table 4.1.

² ~Additional calculations have also been carried out, as a sensitivity test, using comparator journeys by bus to calculate rail journey time benefits from new stations. These calculations resulted in a slightly lower level of benefits, than the car comparator calculations, but the effect on overall project benefit cost ratios was negligible.

	Option 1a	Option 1b	Option 2a	Option 2b
Existing rail stations	389,135	652,428	403,278	666,241
New rail stations	813,767	813,767	817,947	817,947
Total	1,202,902	1,466,195	1,221,225	1,484,188

Note: In 2014 factor prices and undiscounted.

Revenue for the new stations excludes abstraction from other existing stations.

Revenue forecasts for existing rail stations are modelled in MOIRA, and include background demand growth to 2021.

Revenue forecasts for new stations are provided by CH2MHill.

Non user benefits

The additional rail journeys result in non-user benefits associated with a reduction in the number of cars on the roads. The PVs of these benefits are shown in Table 4.1.

The assumed benefits per car mile are shown in Table 3.8.

Benefit type	£ per car mile
Congestion	£0.07
Infrastructure	£0.00
Accident	£0.02
Air pollution	£0.00
Noise	£0.00
Climate change	£0.01
Total	£0.11

Note: Benefits are based on the marginal costs (MEC) of car use from WebTAG (Unit A5.4).

Tax costs

The additional rail journeys result in tax costs associated with a reduction in the number of cars on the roads. These tax costs, both fuel duty and VAT, were estimated in accordance with WebTAG. The PVs of the costs is shown in Table 4.1.

4. Appraisal results and conclusions

This section of the report presents socio-economic appraisal results, for each option. A financial analysis comparing the revenue and operating cost (OPEX) is also presented.

4.1 Appraisal results

The socio-economic appraisal includes the following costs and socio-economic benefits:

- Capital costs (see Section 3.1);
- Operating costs or cost savings (Section 3.2); and
- Journey time benefits, comprising value of time benefits and associated revenue and non-user benefits and tax costs (Section 3.3);

The results for each central option are shown in Table 4.1. The Transport Economic Efficiency (TEE) table(s) and Appraisal Summary Table (AST) are shown in the appendix.

4.2 Conclusions

A socio-economic appraisal for each option was carried out in accordance with the Department for Transport's appraisal guidance. The appraisal assumes the capital cost of the scheme would be funded by the local authorities and therefore is not RAB funded. The main benefits are the journey time benefits, non-user benefits and revenue increase.

Table 4.1 summarises the appraisal results for each option, outlining the BCRs, NPVs and the PVs of costs and benefits.

Table 4.1: Results of socio-economic appraisal	Henbury Spur 1A New Station		Henbury Spur 2A OLD Station			
	Option 1a £m PV	Option 1b £m PV	Option 1a £m PV	Option 1b £m PV	Option 2a £m PV	Option 2b £m PV
Net benefits to consumers and private sector (plus tax impacts)						
Rail user reliability benefits						
Rail user journey time benefits	74.74	93.13	74.74	93.13	73.70	92.08
Journey ambience inc. station amenity and crowding benefits	0.00	0.00	0.00	0.00	0.00	0.00
Non user benefits - road decongestion	4.88	6.63	4.88	6.63	5.01	6.76
Non user benefits - noise, air quality, greenhouse gases & accident benefits	1.34	1.82	1.34	1.82	1.38	1.86
Rail user and non user disruption disbenefits during possessions	-1.42	-1.33	-1.34	-1.25	-1.56	-1.47
Current TOC revenue benefits	0.00	0.00	0.00	0.00	0.00	0.00
Current TOC operating costs	0.00	0.00	0.00	0.00	0.00	0.00
Indirect taxation impact on government	-10.33	-12.42	-10.33	-12.42	-10.48	-12.57
sub-total (a)	69.21	87.82	69.29	87.90	68.04	86.65
Costs to government (broad transport budget)						
Capital costs	38.81	36.38	36.59	34.16	42.63	40.20
Non user benefits - road infrastructure cost changes	-0.07	-0.10	-0.07	-0.10	-0.07	-0.10
Revenue transfer	-56.41	-67.11	-56.41	-67.11	-57.20	-67.89
Operating costs transfer	71.89	109.68	71.89	109.68	127.08	164.87
sub-total (b)	54.23	78.85	52.01	76.63	112.44	137.07
Net Present Value (NPV) (a-b)	14.98	8.97	17.28	11.27	-44.40	-50.42
Benefit Cost Ratio to Government (BCR) (a/b)	1.28	1.11	1.33	1.15	0.61	0.63

Note: Present Values (PVs) are in 2010 market prices and are discounted to 2010 using Social Time Preference discount rates: see Table A.2. The appraisal is in accordance with the DfT's WebTAG appraisal guidance. Results are shown for the relevant option etc relative to the Base Case. For net benefits etc, benefits are shown as positive. For costs to government etc, costs are shown as positive.

4.3 Financial analysis and subsidy requirement

A financial analysis has been undertaken to compare the ongoing operating costs against the revenue forecasts during the appraisal period, as requested by the local authorities. The calculation is different to how values are treated under a socio-economic appraisal. Table 4.2 summarises the subsidy requirement for each option. Values are presented in outturn prices and use the following assumptions:

- Prices are undiscounted, in factor prices and in nominal term³ (grown by Retail Price Index to reflect inflation growth);
- Revenue is assumed to increase by RPI+1% until 2034, in nominal term;
- Demand is capped in 2034 (20 years after the appraisal year per DfT guidance);
- Staff related operating costs are assumed to grow by Average Earning Index (which is above RPI). Vehicle operating costs are assumed to grow by RPI;
- Costs are assumed to grow until the end of the appraisal period; and
- The subsidy requirement does not include capital expenditure or renewal cost.

Option 1a requires subsidy until year 2033. All other options require subsidy throughout the appraisal period.

Table 4.2: Subsidy requirement			
Summary (Revenue - OPEX)			
	total 2021-2030	total 2031-2040	In 2021
Option 1a	(7,523,422)	1,147,919	(1,348,669)
Option 1b	(21,474,659)	(16,235,902)	(2,621,967)
Option 2a	(31,701,928)	(33,445,601)	(3,404,937)
Option 2b	(45,659,255)	(50,839,912)	(4,678,685)

Note: Negative represents subsidy requirement i.e. costs.

Prices are presented in outturn prices (in factor prices, in nominal terms with inflation, undiscounted).

³ While in economic appraisal in accordance to WebTAG, prices are presented in 2010 market values, are discounted and in real terms.

5. Additional Option

Analysis of the costs and benefits of the four scheme options considered (Option 1a, 1b, 2a and 2b) have indicated that there may be a need to consider further options, principally to understand whether the benefits of MetroWest Phase 2 could be achieved with an option that would cost less to deliver.

To this end, an additional option has been devised, based on option 1a. This option is very similar to option 1a, but with only one station on the Filton Bank between Stapleton Road and Filton Abbey Wood instead of two, located at Ashley Down. Option '1a_x' can therefore be briefly described as follows:

Option 1a_x – additional option

- Re-opened Henbury line with hourly service operating as a spur from Bristol Temple Meads;
- New stations at Henbury, North Filton and Ashley Down; and
- Extension of existing service terminating at Bristol Parkway to Yate (providing a service of 2 trains per hour at Yate).

This section draws together the results of assessing this option, including new station demand forecasts and the socio-economic appraisal results.

Option 1a_x is appraised using the same framework and methodology per Option 1a.

5.2 Capital cost

Capital costs for the additional option (option 1a_x) is shown in Table 5.1, and they consist of the following:

- Option 1a (Henbury 1A new station) includes the costs (point estimates) of building the new stations of Henbury (£6.1m) on a new site, North Filton (£4.7m) and Ashley Down (£7.3m). It also includes the costs of a new Yate turnback siding (£2.1m).
- Option 1a (Henbury 2A old station), is the same as Option 1a (Henbury 1A new station), except the cost of the Henbury station is £4.2m and is built at an old site.

Table 5.1: Capital costs		
Option	Proposed funding source	£m
Option 1a x (Henbury 1A new station)	Public funds - local government	20.22
Option 1a x (Henbury 1A Old station)	Public funds - local government	18.35
<p>Note</p> <p>The capital cost used for the appraisal, as quoted above, includes the point estimate but excludes any QRA-based risk allowance and excludes general contingency/generalised risk allowance etc.</p> <p>Note that the capital costs for appraisal purposes do not include the QRA-based risk allowance even though a QRA has been carried out.</p> <p>The above capital costs include Schedule 4 possession costs: see Table A.2. User and non-user disbenefits associated with possessions are based on these costs: for assumptions see Table A.2; these disbenefits are shown in Table 4.1.</p> <p>40% of the above total costs are assumed to be incurred in 2019, 50% are assumed to be incurred in 2020 and 10% are assumed to be incurred in 2021. These are yet to be confirmed by the project team.</p>		

Table 5.1: Capital costs

The above costs are in 2014 factor prices, at GRIP stage 2, are undiscounted and exclude optimism bias.

No real terms changes in costs are applied to the above costs during the appraisal period, leaving aside the issue of optimism bias.

The PVs for total capital costs are shown in Table 4.1. These include optimism bias (of 50% at GRIP 2) and are discounted (using the discount rates shown in Table A.2).

The above costs are assumed to be funded by the local government. The PVs in Table 4.1 therefore exclude RAB finance costs.

Costs are relative to the Base Case. Initial capital costs only (renewal costs are excluded). Costs are shown as positive.

Source: Project Team.

5.2 Operating cost

The operating cost for Option 1a x is very similar to Option 1a, except it does not have the cost of operating and maintaining the new station Constable Road that is included in the Option 1a. In other words, it includes the costs of three new stations of Henbury, North Filton and Ashley Down.

5.3 New station forecast

Table 5.1 presents the new station forecasts for Option 1a x

Table 5.3 New station forecast: Rail journeys in 2021 (opening year)	
Option 1a x	
Henbury	98,872
Filton North	92,287
Ashley Hill	100,874

Forecasts include CPNN growth.

A ramp up of demand is assumed, with 80% in the first year, 85% in the second year, 90% in the third year and 100% in the year after.

5.4 Socio-economic appraisal results

Table 5.4 presents the socio-economic appraisal results for Option 1a x, along with the results for Option 1a for comparison. Option 1a x offers a medium value for money with a BCR of 1.71.

Table 5.4: Results of socio-economic appraisal	Option 1a	Option 1a x
	£m PV	£m PV
Net benefits to consumers and private sector (plus tax impacts)		
Rail user reliability benefits		
Rail user journey time benefits	74.74	71.31
Non user benefits - road decongestion	4.88	4.81
Non user benefits - noise, air quality, greenhouse gases & accident benefits	1.34	1.32
Rail user and non user disruption disbenefits during possessions	-1.42	-0.87
Current TOC revenue benefits	0.00	0.00
Current TOC operating costs	0.00	0.00
Indirect taxation impact on government	-10.33	-9.81
sub-total (a)	69.21	66.75
Costs to government (broad transport budget)		
Capital costs	38.81	23.83
Non user benefits - road infrastructure cost changes	-0.07	-0.07
Revenue transfer	-56.41	-53.44
Operating costs transfer	71.89	68.73
sub-total (b)	54.23	39.04
Net Present Value (NPV) (a-b)	14.98	27.71
Benefit Cost Ratio to Government (BCR) (a/b)	1.28	1.71

Appendix

This section includes the following further information:

- Table A.1, version control;
- Table A.2, further information on appraisal assumptions;
- Transport Economic Efficiency (TEE) tables;
- Table A3, background growth demand assumptions; and
- Table A4 and A5, indicative timetables for the Henbury line services in Option 1a, 1b, 2a and 2b.

TEE tables - MetroWest Phase 2
Option 1a (Henbury Spur 1A New station)

Table 1: Economic Efficiency of Transport System (All costs & disbenefits are negative, all benefits & savings are positive)

	Total in 2010 price base £	Cars, LGVs & goods vehicles	Bus & Coach	Rail Total	Rail infra- structure - Network Rail	Rail passengers, TOCs
Non-business commuting benefits						
Travel time saving	50,471,330	1,218,953		49,252,378		49,252,378
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-355,770	-32,343		-323,427		-323,427
Net (1a)	50,115,560	1,186,610	0	48,928,950	0	48,928,950
Non-business other benefits						
Travel time saving	21,485,870	1,218,953		20,266,917		20,266,917
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-355,770	-32,343		-323,427		-323,427
Net (1b)	21,130,099	1,186,610	0	19,943,489	0	19,943,489
Business benefits						
Business user benefits						
Travel time saving	7,659,690	2,437,906		5,221,784		5,221,784
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-711,540	-64,685		-646,855		-646,855
Net (2)	6,948,150	2,373,220	0	4,574,930	0	4,574,930
Private sector provider impacts						
Revenue	56,407,546			56,407,546		56,407,546
Opcost	-71,894,230			-71,894,230	0	-71,894,230
Investment cost	-38,811,292			-38,811,292	-38,811,292	
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0	0	
Grant/subsidy: Network Rail private funding	0			0	0	
Grant/subsidy: Public funds - local government	38,811,292			38,811,292	38,811,292	
Revenue transfer (100% to government)	-56,407,546			-56,407,546		-56,407,546
Opcost transfer (100% to government)	71,894,230			71,894,230	0	71,894,230
Sub total (3)	0	0	0	0	0	0
Other business impacts						
Developer contribution (4)	0			0		
Net business impact (5 = 2+3+4)	6,948,150	2,373,220	0	4,574,930		
Total, PV of transport econ eff. benefits (6 = 1a+1b+5)	78,193,810	1(a), 1(b) and (5) flow into the AMCB table, not (6)				

Table 2 Public Accounts (costs should be recorded as a positive number, surpluses as a negative one)

	All Modes Total	Road		Rail
		Infrastructure	Bus & Coach	
Local Government funding				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Public funds - local government	38,811,292			38,811,292
Revenue transfer	0			
Net (7)	38,811,292	0	0	38,811,292
General Government funding: transport				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0
Revenue transfer (100% to government)	-56,407,546			-56,407,546
Opcost transfer (100% to government)	71,894,230			71,894,230
Infrastructure cost savings	-72,065	-72,065		
Net (8)	15,414,619	-72,065	0	15,486,684
General Government funding: non-transport				
Indirect Tax Revenues (9)	10,326,778	10,326,778		0
Totals				
Broad transport budget (10=7+8)	54,225,911	* These costs exclude developer contributions		
Wider public finances (11=9)	10,326,778			

Table 3: Analysis of Monetised Costs and Benefits (AMCB)

Noise	57,135	
Local air quality	0	
Greenhouse gases	416,792	
Rail environmental costs	0	
Journey ambience (inc. station amenity and crowding benefits)	0	
Accidents (incl. safety)	867,009	
Consumer users (sub-total 1a+1b, Table 1)	71,245,660	
Business users and providers (sub-total 5, Table 1)	6,948,150	
Reliability (including performance)	0	
Option values	0	
Wider public finances (indirect taxation revenues) (sub-total 11)	-10,326,778	Sign changed from Table 2
PV of Benefits (a = sum of all benefits)	69,207,968	
Broad transport budget (sub-total 10)	54,225,911	From Table 2
PV of Costs (b = 10)	54,225,911	
Overall impacts		
NPV (a-b)	14,982,057	
BCR (a/b)	1.28	

TEE tables - MetroWest Phase 2
Option 1b (Henbury Spur 1A New station)

Table 1: Economic Efficiency of Transport System (All costs & disbenefits are negative, all benefits & savings are positive)

	Total in 2010 price base £	Cars, LGVs & goods vehicles	Bus & Coach	Rail Total	Rail infra- structure - Network Rail	Rail passengers, TOCs
Non-business commuting benefits						
Travel time saving	52,502,313	1,656,934		50,845,379		50,845,379
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-333,445	-30,313		-303,132		-303,132
Net (1a)	52,168,868	1,626,621	0	50,542,247	0	50,542,247
Non-business other benefits						
Travel time saving	34,295,026	1,656,934		32,638,092		32,638,092
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-333,445	-30,313		-303,132		-303,132
Net (1b)	33,961,581	1,626,621	0	32,334,960	0	32,334,960
Business benefits						
Business user benefits						
Travel time saving	12,956,920	3,313,868		9,643,052		9,643,052
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-666,890	-60,626		-606,263		-606,263
Net (2)	12,290,030	3,253,242	0	9,036,788	0	9,036,788
Private sector provider impacts						
Revenue	67,107,832			67,107,832		67,107,832
Opcost	-109,678,810			-109,678,810	0	-109,678,810
Investment cost	-36,375,808			-36,375,808	-36,375,808	
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0	0	
Grant/subsidy: Network Rail private funding	0			0	0	
Grant/subsidy: Public funds - local government	36,375,808			36,375,808	36,375,808	
Revenue transfer (100% to government)	-67,107,832			-67,107,832		-67,107,832
Opcost transfer (100% to government)	109,678,810			109,678,810	0	109,678,810
Sub total (3)	0	0	0	0	0	0
Other business impacts						
Developer contribution (4)	0			0		
Net business impact (5 = 2+3+4)	12,290,030	3,253,242	0	9,036,788		
Total, PV of transport econ eff. benefits (6 = 1a+1b+5)	98,420,479	1(a), 1(b) and (5) flow into the AMCB table, not (6)				

Table 2 Public Accounts (costs should be recorded as a positive number, surpluses as a negative one)

	All Modes			
	Total	Road Infrastructure	Bus & Coach	Rail
Local Government funding				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Public funds - local government	36,375,808			36,375,808
Revenue transfer	0			
Net (7)	36,375,808	0	0	36,375,808
General Government funding: transport				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0
Revenue transfer (100% to government)	-67,107,832			-67,107,832
Opcost transfer (100% to government)	109,678,810			109,678,810
Infrastructure cost savings	-97,948	-97,948		
Net (8)	42,473,029	-97,948	0	42,570,977
General Government funding: non-transport				
Indirect Tax Revenues (9)	12,421,562	12,421,562		0
Totals				
Broad transport budget (10=7+8)	78,848,837	* These costs exclude developer contributions		
Wider public finances (11=9)	12,421,562			

Table 3: Analysis of Monetised Costs and Benefits (AMCB)

Noise	77,680	
Local air quality	0	
Greenhouse gases	566,777	
Rail environmental costs	0	
Journey ambience (inc. station amenity and crowding benefits)	0	
Accidents (incl. safety)	1,178,949	
Consumer users (sub-total 1a+1b, Table 1)	86,130,449	
Business users and providers (sub-total 5, Table 1)	12,290,030	
Reliability (including performance)	0	
Option values	0	
Wider public finances (indirect taxation revenues) (sub-total 11)	-12,421,562	Sign changed from Table 2
PV of Benefits (a = sum of all benefits)	87,822,324	
Broad transport budget (sub-total 10)	78,848,837	From Table 2
PV of Costs (b = 10)	78,848,837	
Overall impacts		
NPV (a-b)	8,973,487	
BCR (a/b)	1.11	

TEE tables - MetroWest Phase 2
Option 1a (Henbury Spur 2A Old station)

Table 1: Economic Efficiency of Transport System (All costs & disbenefits are negative, all benefits & savings are positive)

	Total in 2010 price base £	Cars, LGVs & goods vehicles	Bus & Coach	Rail Total	Rail infra- structure - Network Rail	Rail passengers, TOCs
Non-business commuting benefits						
Travel time saving	50,471,330	1,218,953		49,252,378		49,252,378
Vehicle operating costs	0			0		0
User charges	0			0		0
During construction & maintenance	-335,426	-30,493		-304,933		-304,933
Net (1a)	50,135,905	1,188,460	0	48,947,445	0	48,947,445
Non-business other benefits						
Travel time saving	21,485,870	1,218,953		20,266,917		20,266,917
Vehicle operating costs	0			0		0
User charges	0			0		0
During construction & maintenance	-335,426	-30,493		-304,933		-304,933
Net (1b)	21,150,444	1,188,460	0	19,961,984	0	19,961,984
Business benefits						
Business user benefits						
Travel time saving	7,659,690	2,437,906		5,221,784		5,221,784
Vehicle operating costs	0			0		0
User charges	0			0		0
During construction & maintenance	-670,852	-60,987		-609,865		-609,865
Net (2)	6,988,839	2,376,919	0	4,611,919	0	4,611,919
Private sector provider impacts						
Revenue	56,407,546			56,407,546		56,407,546
Opcost	-71,894,230			-71,894,230	0	-71,894,230
Investment cost	-36,591,911			-36,591,911	-36,591,911	
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0	0	0
Grant/subsidy: Network Rail private funding	0			0	0	0
Grant/subsidy: Public funds - local government	36,591,911			36,591,911	36,591,911	
Revenue transfer (100% to government)	-56,407,546			-56,407,546		-56,407,546
Opcost transfer (100% to government)	71,894,230			71,894,230	0	71,894,230
Sub total (3)	0	0	0	0	0	0
Other business impacts						
Developer contribution (4)	0			0		0
Net business impact (5 = 2+3+4)	6,988,839	2,376,919	0	4,611,919		
Total, PV of transport econ eff. benefits (6 = 1a+1b+5)	78,275,187	11(a), 1(b) and (5) flow into the AMCB table, not (6)				

Table 2 Public Accounts (costs should be recorded as a positive number, surpluses as a negative one)

	All Modes			
	Total	Road Infrastructure	Bus & Coach	Rail
Local Government funding				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Public funds - local government	36,591,911			36,591,911
Revenue transfer	0			
Net (7)	36,591,911	0	0	36,591,911
General Government funding: transport				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0
Revenue transfer (100% to government)	-56,407,546			-56,407,546
Opcost transfer (100% to government)	71,894,230			71,894,230
Infrastructure cost savings	-72,065	-72,065		
Net (8)	15,414,619	-72,065	0	15,486,684
General Government funding: non-transport				
Indirect Tax Revenues (9)	10,326,778	10,326,778		0
Totals				
Broad transport budget (10=7+8)	52,006,530	* These costs exclude developer contributions		
Wider public finances (11=9)	10,326,778			

Table 3: Analysis of Monetised Costs and Benefits (AMCB)

Noise	57,135	
Local air quality	0	
Greenhouse gases	416,792	
Rail environmental costs	0	
Journey ambience (inc. station amenity and crowding benefits)	0	
Accidents (incl. safety)	867,009	
Consumer users (sub-total 1a+1b, Table 1)	71,286,348	
Business users and providers (sub-total 5, Table 1)	6,988,839	
Reliability (including performance)	0	
Option values	0	
Wider public finances (indirect taxation revenues) (sub-total 11)	-10,326,778	Sign changed from Table 2
PV of Benefits (a = sum of all benefits)	69,289,345	
Broad transport budget (sub-total 10)	52,006,530	From Table 2
PV of Costs (b = 10)	52,006,530	
Overall impacts		
NPV (a-b)	17,282,815	
BCR (a/b)	1.33	

TEE tables - MetroWest Phase 2
Option 1b (Henbury Spur 2A Old station)

Table 1: Economic Efficiency of Transport System (All costs & disbenefits are negative, all benefits & savings are positive)

	Total in 2010 price base £	Cars, LGVs & goods vehicles	Bus & Coach	Rail Total	Rail infra- structure - Network Rail	Rail passengers, TOCs
Non-business commuting benefits						
Travel time saving	52,502,313	1,656,934		50,845,379		50,845,379
Vehicle operating costs	0			0		0
User charges	0			0		0
During construction & maintenance	-313,101	-28,464		-284,637		-284,637
Net (1a)	52,189,212	1,628,470	0	50,560,742	0	50,560,742
Non-business other benefits						
Travel time saving	34,295,026	1,656,934		32,638,092		32,638,092
Vehicle operating costs	0			0		0
User charges	0			0		0
During construction & maintenance	-313,101	-28,464		-284,637		-284,637
Net (1b)	33,981,925	1,628,470	0	32,353,455	0	32,353,455
Business benefits						
Business user benefits						
Travel time saving	12,956,920	3,313,868		9,643,052		9,643,052
Vehicle operating costs	0			0		0
User charges	0			0		0
During construction & maintenance	-626,201	-56,927		-569,274		-569,274
Net (2)	12,330,719	3,256,941	0	9,073,778	0	9,073,778
Private sector provider impacts						
Revenue	67,107,832			67,107,832		67,107,832
Opcost	-109,678,810			-109,678,810	0	-109,678,810
Investment cost	-34,156,428			-34,156,428	-34,156,428	
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0	0	0
Grant/subsidy: Network Rail private funding	0			0	0	0
Grant/subsidy: Public funds - local government	34,156,428			34,156,428	34,156,428	
Revenue transfer (100% to government)	-67,107,832			-67,107,832		-67,107,832
Opcost transfer (100% to government)	109,678,810			109,678,810	0	109,678,810
Sub total (3)	0	0	0	0	0	0
Other business impacts						
Developer contribution (4)	0			0		0
Net business impact (5 = 2+3+4)	12,330,719	3,256,941	0	9,073,778		
Total, PV of transport econ eff. benefits (6 = 1a+1b+5)	98,501,857	1(a), 1(b) and (5) flow into the AMCB table, not (6)				

Table 2 Public Accounts (costs should be recorded as a positive number, surpluses as a negative one)

	All Modes			
	Total	Road Infrastructure	Bus & Coach	Rail
Local Government funding				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Public funds - local government	34,156,428			34,156,428
Revenue transfer	0			
Net (7)	34,156,428	0	0	34,156,428
General Government funding: transport				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0
Revenue transfer (100% to government)	-67,107,832			-67,107,832
Opcost transfer (100% to government)	109,678,810			109,678,810
Infrastructure cost savings	-97,948	-97,948		
Net (8)	42,473,029	-97,948	0	42,570,977
General Government funding: non-transport				
Indirect Tax Revenues (9)	12,421,562	12,421,562		0
Totals				
Broad transport budget (10=7+8)	76,629,457	* These costs exclude developer contributions		
Wider public finances (11=9)	12,421,562			

Table 3: Analysis of Monetised Costs and Benefits (AMCB)

Noise	77,680	
Local air quality	0	
Greenhouse gases	566,777	
Rail environmental costs	0	
Journey ambience (inc. station amenity and crowding benefits)	0	
Accidents (incl. safety)	1,178,949	
Consumer users (sub-total 1a+1b, Table 1)	86,171,138	
Business users and providers (sub-total 5, Table 1)	12,330,719	
Reliability (including performance)	0	
Option values	0	
Wider public finances (indirect taxation revenues) (sub-total 11)	-12,421,562	Sign changed from Table 2
PV of Benefits (a = sum of all benefits)	87,903,702	
Broad transport budget (sub-total 10)	76,629,457	From Table 2
PV of Costs (b = 10)	76,629,457	
Overall impacts		
NPV (a-b)	11,274,245	
BCR (a/b)	1.15	

TEE tables - MetroWest Phase 2

Option 2a

Table 1: Economic Efficiency of Transport System (All costs & disbenefits are negative, all benefits & savings are positive)

	Total in 2010 price base £	Cars, LGVs & goods vehicles	Bus & Coach	Rail Total	Rail infra- structure - Network Rail	Rail passengers, TOCs
Non-business commuting benefits						
Travel time saving	43,796,511	1,251,457		42,545,053		42,545,053
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-390,789	-35,526		-355,263		-355,263
Net (1a)	43,405,721	1,215,931	0	42,189,790	0	42,189,790
Non-business other benefits						
Travel time saving	24,409,108	1,251,457		23,157,650		23,157,650
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-390,789	-35,526		-355,263		-355,263
Net (1b)	24,018,318	1,215,931	0	22,802,387	0	22,802,387
Business benefits						
Business user benefits						
Travel time saving	10,500,653	2,502,914		7,997,739		7,997,739
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-781,579	-71,053		-710,526		-710,526
Net (2)	9,719,075	2,431,862	0	7,287,213	0	7,287,213
Private sector provider impacts						
Revenue	57,201,841			57,201,841		57,201,841
Opcost	-127,081,167			-127,081,167	0	-127,081,167
Investment cost	-42,631,555			-42,631,555	-42,631,555	
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0	0	
Grant/subsidy: Network Rail private funding	0			0	0	
Grant/subsidy: Public funds - local government	42,631,555			42,631,555	42,631,555	
Revenue transfer (100% to government)	-57,201,841			-57,201,841		-57,201,841
Opcost transfer (100% to government)	127,081,167			127,081,167	0	127,081,167
Sub total (3)	0	0	0	0	0	0
Other business impacts						
Developer contribution (4)	0			0		
Net business impact (5 = 2+3+4)	9,719,075	2,431,862	0	7,287,213		
Total, PV of transport econ eff. benefits (6 = 1a+1b+5)	77,143,115	1(a), 1(b) and (5) flow into the AMCB table, not (6)				

Table 2 Public Accounts (costs should be recorded as a positive number, surpluses as a negative one)

	All Modes			
	Total	Road Infrastructure	Bus & Coach	Rail
Local Government funding				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Public funds - local government	42,631,555			42,631,555
Revenue transfer	0			
Net (7)	42,631,555	0	0	42,631,555
General Government funding: transport				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0
Revenue transfer (100% to government)	-57,201,841			-57,201,841
Opcost transfer (100% to government)	127,081,167			127,081,167
Infrastructure cost savings	-73,987	-73,987		
Net (8)	69,805,339	-73,987	0	69,879,325
General Government funding: non-transport				
Indirect Tax Revenues (9)	10,482,242	10,482,242		0
Totals				
Broad transport budget (10=7+8)	112,436,894	* These costs exclude developer contributions		
Wider public finances (11=9)	10,482,242			

Table 3: Analysis of Monetised Costs and Benefits (AMCB)

Noise	58,659	
Local air quality	0	
Greenhouse gases	427,918	
Rail environmental costs	0	
Journey ambience (inc. station amenity and crowding benefits)	0	
Accidents (incl. safety)	890,150	
Consumer users (sub-total 1a+1b, Table 1)	67,424,040	
Business users and providers (sub-total 5, Table 1)	9,719,075	
Reliability (including performance)	0	
Option values	0	
Wider public finances (indirect taxation revenues) (sub-total 11)	-10,482,242	Sign changed from Table 2
PV of Benefits (a = sum of all benefits)	68,037,598	
Broad transport budget (sub-total 10)	112,436,894	From Table 2
PV of Costs (b = 10)	112,436,894	
Overall impacts		
NPV (a-b)	-44,399,296	
BCR (a/b)	0.61	

TEE tables - MetroWest Phase 2

Option 2b

Table 1: Economic Efficiency of Transport System (All costs & disbenefits are negative, all benefits & savings are positive)

	Total in 2010 price base £	Cars, LGVs & goods vehicles	Bus & Coach	Rail Total	Rail infra- structure - Network Rail	Rail passengers, TOCs
Non-business commuting benefits						
Travel time saving	52,721,546	1,689,391		51,032,155		51,032,155
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-368,464	-33,497		-334,967		-334,967
Net (1a)	52,353,082	1,655,894	0	50,697,188	0	50,697,188
Non-business other benefits						
Travel time saving	33,447,321	1,689,391		31,757,930		31,757,930
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-368,464	-33,497		-334,967		-334,967
Net (1b)	33,078,857	1,655,894	0	31,422,963	0	31,422,963
Business benefits						
Business user benefits						
Travel time saving	12,673,430	3,378,782		9,294,648		9,294,648
Vehicle operating costs	0			0		
User charges	0			0		
During construction & maintenance	-736,928	-66,993		-669,935		-669,935
Net (2)	11,936,502	3,311,789	0	8,624,714	0	8,624,714
Private sector provider impacts						
Revenue	67,888,678			67,888,678		67,888,678
Opcost	-164,865,746			-164,865,746	0	-164,865,746
Investment cost	-40,196,072			-40,196,072	-40,196,072	
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0	0	
Grant/subsidy: Network Rail private funding	0			0	0	
Grant/subsidy: Public funds - local government	40,196,072			40,196,072	40,196,072	
Revenue transfer (100% to government)	-67,888,678			-67,888,678		-67,888,678
Opcost transfer (100% to government)	164,865,746			164,865,746	0	164,865,746
Sub total (3)	0	0	0	0	0	0
Other business impacts						
Developer contribution (4)	0			0		
Net business impact (5 = 2+3+4)	11,936,502	3,311,789	0	8,624,714		
Total, PV of transport econ eff. benefits (6 = 1a+1b+5)	97,368,442	1(a), 1(b) and (5) flow into the AMCB table, not (6)				

Table 2 Public Accounts (costs should be recorded as a positive number, surpluses as a negative one)

	All Modes Total	Road		Rail
		Infrastructure	Bus & Coach	
Local Government funding				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Public funds - local government	40,196,072			40,196,072
Revenue transfer	0			
Net (7)	40,196,072	0	0	40,196,072
General Government funding: transport				
Revenue	0			
Operating costs	0			
Investment costs*	0			
Grant/subsidy: Specific fund TBC (Public funds - central government)	0			0
Revenue transfer (100% to government)	-67,888,678			-67,888,678
Opcost transfer (100% to government)	164,865,746			164,865,746
Infrastructure cost savings	-99,867	-99,867		
Net (8)	96,877,202	-99,867	0	96,977,068
General Government funding: non-transport				
Indirect Tax Revenues (9)	12,574,722	12,574,722		0
Totals				
Broad transport budget (10=7+8)	137,073,273	* These costs exclude developer contributions		
Wider public finances (11=9)	12,574,722			

Table 3: Analysis of Monetised Costs and Benefits (AMCB)

Noise	79,203	
Local air quality	0	
Greenhouse gases	577,886	
Rail environmental costs	0	
Journey ambience (inc. station amenity and crowding benefits)	0	
Accidents (incl. safety)	1,202,056	
Consumer users (sub-total 1a+1b, Table 1)	85,431,940	
Business users and providers (sub-total 5, Table 1)	11,936,502	
Reliability (including performance)	0	
Option values	0	
Wider public finances (indirect taxation revenues) (sub-total 11)	-12,574,722	Sign changed from Table 2
PV of Benefits (a = sum of all benefits)	86,652,865	
Broad transport budget (sub-total 10)	137,073,273	From Table 2
PV of Costs (b = 10)	137,073,273	
Overall impacts		
NPV (a-b)	-50,420,409	
BCR (a/b)	0.63	

Table A.2: Further appraisal assumptions

Assumptions apply to central case unless stated. Further assumptions are in tables in main text. All years refer to financial years e.g. 2014 refers to 2014/15 F/Y.

Assumption	Value	Source	Comment
General assumptions:			
Current year	2014	WebTAG	
Model base year	2014	WebTAG	
First year of benefits	2021	Project Team	100% of benefits realised from this year
Benefits profile by year	% of total 2021 100% 2080 100%	Project Team Project Team	
Appraisal period (years)	60	Project Team	The maximum is 60 years under WebTAG
Price base year	2010	WebTAG (Unit A1.1, Para 2.6.3)	Values converted from model base year to price base year using GDP deflator
Base year for discounting	2010	WebTAG (Unit A1.1, Para 2.7.6)	
Discount rate (Social Time Preference Rate)	3.5% for 30 years from the current year and 3.0% thereafter	WebTAG (data-book-may-2014, Table A1.1.1) & HM Treasury Green Book	
Unit of account	Market prices	WebTAG (Unit A1.1, Para 2.5.2)	19% added to convert factor prices to market prices
Capital and operating cost assumptions:			
Changes in capital costs in real terms during appraisal period	Not applied		
Changes in operating costs costs in real terms during appraisal period	Labour costs are assumed to increase in real terms (relative to GDP deflator) during appraisal period. Increases are c. 2% per annum between 2015 and end of appraisal period.	DfT	No other real terms changes in operating costs are assumed.
Cost of TOC profit as percentage of any change in operating costs	8%	DfT	
Optimism bias for:			
Capital costs	50% at GRIP stage 2	WebTAG (Unit A5.3, Table 2)	
Operating costs	2% at GRIP stage 2	WebTAG (Unit A5.3, Table 2)	
Passenger benefit-related assumptions			
Passenger demand growth Passenger set or all services	See Table A.3 for the demand profile	Growth assumptions agreed with the funders. The long term growth is consistent with the forecasts from Network Rail's Market Studies, although higher growth is used for the earlier years to reflect the continuation of recent high demand growth.	
Year in which underlying demand growth is capped (20 years from current year)	2034	WebTAG (Unit A5.3, 3.3.1)	This cap year also applies to fare increases applied (see below) and any real terms cost increases applied (see above).

Table A.2: Appraisal assumptions (continued)			
Proportion of work time journeys:	11%	Based on above journey types and January 2011 PDFH assumptions relating ticket splits (from MOIRA) and above journey types to user type	Remaining passengers are all non-work time (commuters or leisure - see below).
Values of time (VoT) by user type: Business (work) users Commuters Others	£31.96 per hour in 2010 prices £6.81 per hour in 2010 prices £6.04 per hour in 2010 prices	WebTAG (data-book-may-2014, Table A1.3.1)	All data are in market prices
"Rule of the half"	50%	WebTAG (Unit A.1.3 Para 2.1.6)	Time savings applied to new users at half the rate applied to existing users
VoT growth (per annum) by user type: Business (work) users Non-work	GDP (real terms) per person GDP (real terms) per person	WebTAG (data-book-may-2014, Annual Parameters)	
Weighting for delays relative to in-vehicle journey time for economic benefits by user type : Business (work) users Non-work	1.0 3.0	WebTAG (Unit A5.3, Table 3) WebTAG (Unit A5.3, Table 3) & PDFH (v5.0 Section B5.5)	Applied to economic i.e. VoT benefits only - see below for weighting for demand impacts
Average fare increases per annum (% per annum above RPI) except for specified years (see below). No increases applied after demand cap year (see above). Revenue growth also takes account of forecast increases in RPI relative to GDP deflator (until demand cap year), since appraisal uses GDP deflator to deflate prices to price base year.	1.0%	DfT advice	
Average fare increase in 2014 and 2015	0%	DfT advice	
Average elasticity of demand with respect to Generalised Journey Time (GJT)	-1.11	Weighted average elasticity with elasticities from PDFH 5.1 (except for airport flows: PDFH 5.0) as recommended by WebTAG (Unit M4, Table 1) and with weightings based on proportion of total journeys under each journey/area type.	
Reduction in car kms for 100% increase in rail passenger kms (diversion rate), for external costs of car use	26%	WebTAG (Unit A5.4, Table 1)	Same rate applied across GB

Table A.2: Appraisal assumptions (continued)			
MEC congestion benefits			These allocations are also applied to disruption disbenefits
Proportion allocated to work time	50%	DfT	
Proportion allocated to commuting	25%	DfT	
Proportion allocated to other	25%	DfT	
Other assumptions			
TOC revenue and operating cost transfer: After current franchise expires the following proportion of revenue and operating costs is assumed to be transferred to government	100%	DfT	
Network Rail operating cost transfer : During current Control Period the following proportion of operating costs is assumed to be transferred to government	0%	WebTAG (Unit A5.3, Section 3.4)	Overall operating cost transfer assumptions are shown in the TEE tables.
After current Control Period expires the following proportion of operating costs is assumed to be transferred to government:	100%	WebTAG (Unit A5.3, Section 3.4)	
Disruption during construction: Schedule 4 costs as a proportion of investment cost	5%	Project Team	User & non-user benefits are increased to allow for factor to market price adjustment.
User disbenefits as a proportion of revenue disbenefits (i.e. Schedule 4)	100%	Economic Analysis Team assumption	
Non user disbenefits as a proportion of revenue disbenefits	10%	Economic Analysis Team assumption	
Indirect tax costs	Various including current fuel duty rates, resource costs of fuel and average fuel efficiency, and forecast changes in these parameters over the appraisal period	WebTAG (Unit A5.3, 4.7 and data-book-may-2014)	As a simplifying assumption, the share of petrol and diesel in total car miles is assumed to be 50%/50% throughout the appraisal period. No electric car mileage is assumed.
Value of preventing a fatality (VPF)	£1.633m in 2010 prices	WebTAG (data-book-may-2014, A4.1.5)	Growth in line with GDP (real terms) per person growth

Table A.3: Background demand growth assumptions	
2014-2015	5.6%
2015-2016	4.7%
2016-2017	3.9%
2017-2018	3.0%
2018-2019	3.0%
2019-2020	2.9%
2020-2021	2.7%
2021-2022	2.5%
2022-2023	2.3%
2023-2024	2.2%
2024-2025	2.2%
2025-2026	2.1%
2026-2027	2.1%
2027-2028	2.0%
2028-2029	2.0%
2029-2030	1.9%
2030-2031	1.9%
2031-2032	1.8%
2032-2033	1.8%
2033-2034	1.7%

Source: CH2M

Table A.4. Indicative timetable for the Henbury line services in Option 2a and 2b

Loop Scenario (based on Option 6b)

clockwise	Origin	BTM	BTM
	Destination	Severn Beach	BTM
Bristol Temple Meads	arr		
	dep	xx:25½	xx:57½
Lawrence Hill	arr	xx:58	xx:59
	dep	xx:29	xx:00
Stapleton Road	arr	xx:30½	xx:01½
	dep	xx:31½	xx:02½
Montpellier	arr	xx:34½	xx:05
	dep	xx:35	xx:06
Redland	arr	xx:36½	xx:07
	dep	xx:37	xx:08
Clifton Down	arr	xx:39	xx:09½
	dep	xx:40	xx:11½
Sea Mills	arr	xx:43½	xx:15
	dep	xx:44	xx:16
Shirehampton	arr	xx:47	xx:19½
	dep	xx:47½	xx:20½
Portbury P&R	arr		xx:21
	dep		xx:22
Avonmouth	arr	xx:51	xx:24
	dep	xx:52	xx:25
St Andrews Road	arr	xx:55	xx:27
	dep	xx:55½	xx:28
Severn Beach	arr	xx:02	
	dep		
Henbury	arr		xx:34½
	dep		xx:35½
Filton North	arr		xx:38½
	dep		xx:45
Filton Abbey Wood	arr		xx:48½
	dep		xx:49
Constable Road	arr		xx:50
	dep		xx:50½
Ashley Hill	arr		xx:52½
	dep		xx:53
Stapleton Road	arr		xx:55
	dep		xx:55½
Lawrence Hill	arr		xx:56½
	dep		xx:57½
Bristol Temple Meads	arr		xx:00
	dep		

Table A.5 Indicative timetable for the Henbury line services in Option 1a and 1b.

Spur scenario (based on Option 6b)

clockwise	Origin	BTM	BTM	Henbury
	Destination	Severn Beach	Avonmouth	BTM
Bristol Temple Meads	arr			
	dep	xx:25½	xx:52½	
Lawrence Hill	arr	xx:58	xx:55	
	dep	xx:29	xx:55½	
Stapleton Road	arr	xx:30½	xx:57	
	dep	xx:31½	xx:58	
Montpellier	arr	xx:34½	xx:01	
	dep	xx:35	xx:01½	
Redland	arr	xx:36½	xx:03	
	dep	xx:37	xx:03½	
Clifton Down	arr	xx:39	xx:05½	
	dep	xx:40	xx:09	
Sea Mills	arr	xx:43½	xx:12½	
	dep	xx:44	xx:13	
Shirehampton	arr	xx:47	xx:16	
	dep	xx:47½	xx:16½	
Portbury P&R	arr		xx:17	
	dep		xx:18	
Avonmouth	arr	xx:51	xx:20	
	dep	xx:52		
St Andrews Road	arr	xx:55		
	dep	xx:55½		
Severn Beach	arr	xx:02		
	dep			
Henbury	arr			xx:59½
	dep			xx:02½
Filton North	arr			xx:03
	dep			
Filton Abbey Wood	arr			xx:06½
	dep			xx:07
Constable Road	arr			xx:08
	dep			xx:08½
Ashley Hill	arr			xx:10½
	dep			xx:11
Stapleton Road	arr			xx:12½
	dep			xx:13
Lawrence Hill	arr			xx:14
	dep			xx:15
Bristol Temple Meads	arr			xx:17½
	dep			