| Subject | Date raised | Action | Comments |
|---|---|---|---|
| Derby upgrade | 23/05/2016 | To be reviewed once validated SRTs are produced | From Network Rail: Derby Proposed Option Performance Modelling report, version 0.8.<br>Down: -2 mins approaching, -0.5 min departing<br>Up: -0.5 min approaching, -1 min departing<br><br>Network Rail also supplied signalling scheme plan: Derby 13-NE-0050 (sheet 1-4) ver 5.1 |
| Derby - Sheffield upgrade | 20/07/2016 | To be reviewed once validated SRTs are produced | -0.5 min in both directions in 2023 central case only |
| Corby Branch SRTs do not exist for the new infrastructure | 23/05/2016 | To be reviewed once validated SRTs are produced | Existing SRTs have been used. |
| Planning rules do not exist for new higher speed Wellingborough Jn | 23/05/2016 | To be reviewed once planning rules are determined for the new infrastructure | For the time being, platform end conflict standard values will be used at Wellingborough for trains that call. |
| Freight provision | 23/05/2016 | None | Down: 1No. 2200t + 1No. 800t<br>UP: 1No. 2200t + 1No. 2200t / 2600t (via Corby only)<br>(remit assumption) |
| GTR timetable conflict at Bedford | 20/06/2016 | GTR to amend | GTR platform working at Bedford to be amended with Platforms 1 and 3 swapped. The GTR timetable will require minor amendment to accommodate this. |
| GTR timetable conflict: 2 minute headway at Carlton Road Jn | 13/06/2016 | GTR to resolve with NR | Network Rail informs that the move at Carlton Road is not one that is currently under discussion for a reduction in permitted headway. However, the situation at West Hampstead was analysed and a 2.5min headway may be acceptable (for a similar move in very close proximity to Carlton Road Jn). 2.5 min has been assumed to be acceptable at Carlton Road at this stage, with a retiming of TL services by 0.5 mins outside the core. |

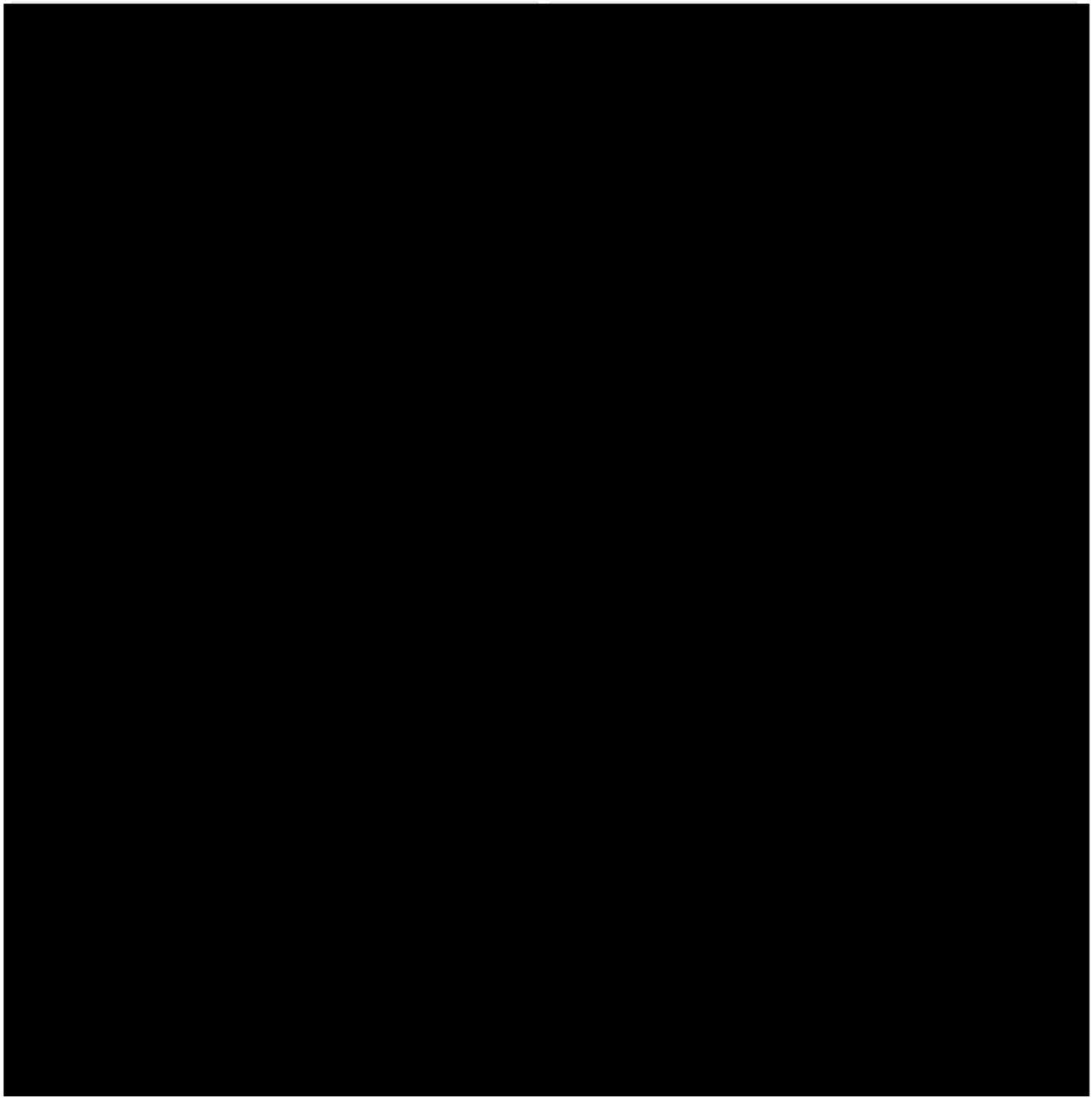
| Subject | Date raised | Action | Comments |
|---|---|---|---|
| Down GTR peak paths conflict with all up EM trains at both Carlton Road Jn and Harpenden Junction | 13/06/2016 | GTR to resolve. This is likely to have an impact on the MML timetable and platform working at St Pancras which will need to be reviewed once a solution is found. | For the time being, this conflict will be left in so as not to delay the business case while waiting for GTR to resolve |
| 2600t SRTs | 13/06/2016 | None | Network Rail supplied from b-plan |
| 2200t freight, 800t freight and CL222 SRTs required | 20/06/2016 | None | Network Rail supplied from b-plan |
| Understanding of rule "following non-stop train" in headways between Bedford and Leicester | 20/06/2016 | None | Network Rail confirmed this can be used for flighted fast trains |
| Freight SRTs at Kilby Bridge Junction - using the s/p timing from Kilby Bridge to Market Harborough results in excessive pathing being required in passenger trains. The existing WTT uses p/p timings even where the train is likely to start from a stand at Kilby Bridge Jn | 24/06/2016 | This should be a subject for future review / more detailed investigation | Network Rail stated that many SRTs in the area are generous. It is reasonable to assume at this stage that the p/p timing can be used, provided this is recorded and verified in later stages of the project. |
| No SL Harrowden - Kettering SRT in b-plan for 2200t freight | 29/06/2016 | To be reviewed once validated SRTs are produced | All freight to use FL timing as SL linespeed will be raised to min 60mph; therefore, there should be no difference |
| No Corby - Kettering North Jn SRT in b-plan for 2600t freight | 29/06/2016 | To be reviewed once validated SRTs are produced | Not shown between Corby and Kettering as this is not a particularly critical section once it is doubled |
| Corby reoccupation | 20/07/2016 | to be reviewed once planning rules are determined for the new infrastructure | Reoccupation at Corby leaves only a small margin for freight to pass through. This is assumed acceptable for the business case, but should be reviewed once planning rules are agreed for the new infrastructure at Corby. |
| St Pancras - Cricklewood ECS moves | 20/07/2016 | To be reviewed once a full GTR timetable is agreed | Counter-peak direction trains are not yet finalised in the GTR timetable. At this stage, it is assumed that 2tph may run between St Pancras and Cricklewood |

| Subject | Date raised | Action | Comments |
|---|---|---|---|
| Slow line freight south of Bedford | 20/07/2016 | Specification to be agreed between GTR, NR and DfT | GTR have worked to a slightly different specification for freight than this commission. Atkins have not timetabled freight south of Bedford as this is more about integration with the GTR timetable than the MML timetable. 4 tracking north of Bedford provides ample opportunity for freight to wait if there is a mismatch between paths north and south of Bedford. |
| 100mph EMU restriction south of Bedford in 2019 | 07/09/2016 | To be reviewed once validated SRTs are produced | Atkins have used RouteRunner to estimate the impact of restricting 110mph EMUs to 100mph in the 2019 case. This added approximately 1 minute (distributed 0.5mins between St Pancras and Harpenden and 0.5 mins between Luton and Bedford) in both directions. |
| Performance time | 20/07/2016 | None | 1 min performance time was added approaching Nottingham to match today's timetable. This represents a change to Atkins' previous assumptions and reduces the amount of performance time compared to the previous timetable development. This approach was deemed reasonable by EMT at the workshop held on 20/07/2016 |

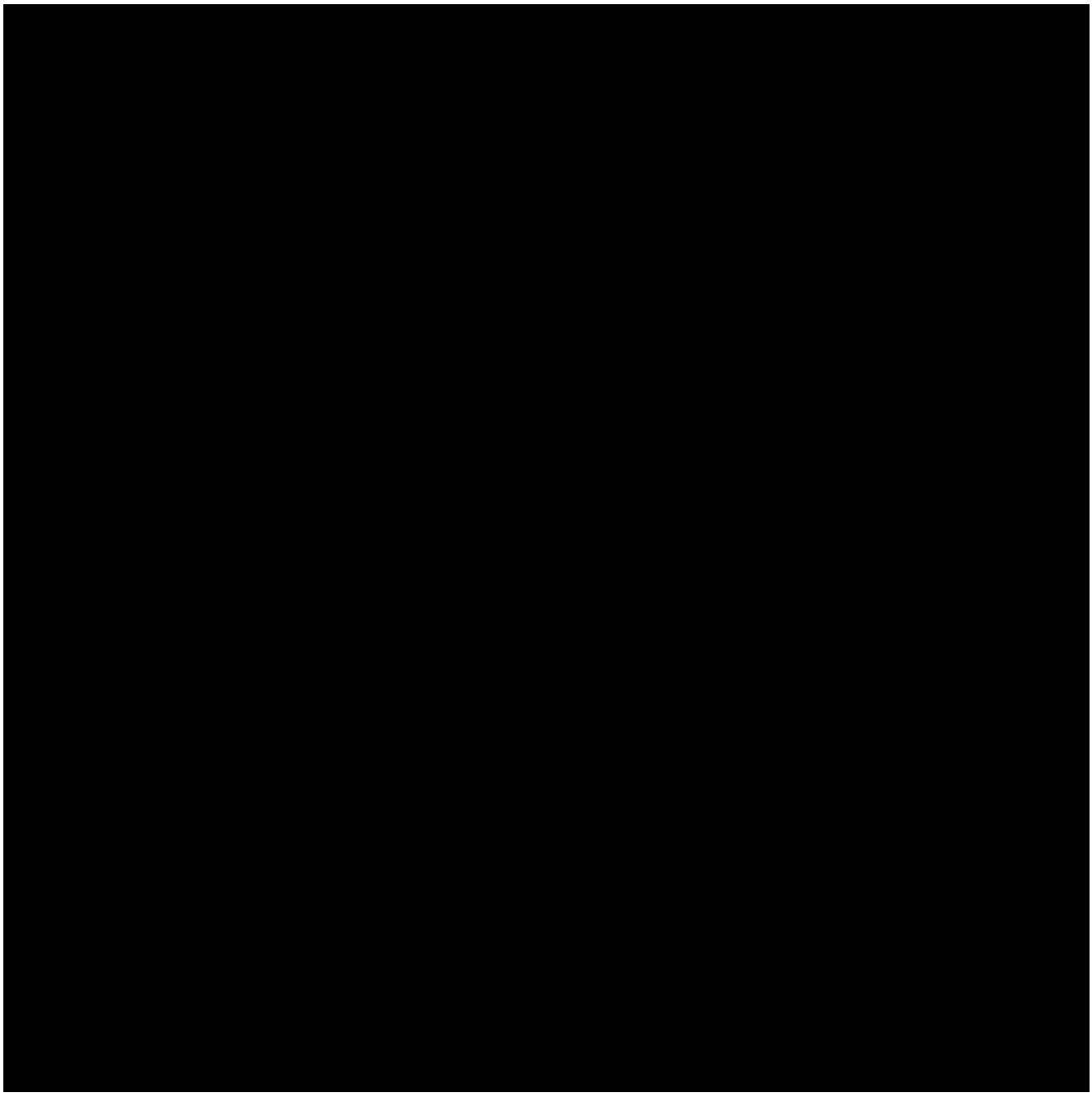
# Appendix B. Crowding Charts

The charts below present train loading forecasts (current day demand) for each sensitivity test. The intention is to show the impact the proposed timetable has on train loading and the impact the proposed service pattern has on requirements for train capacity.

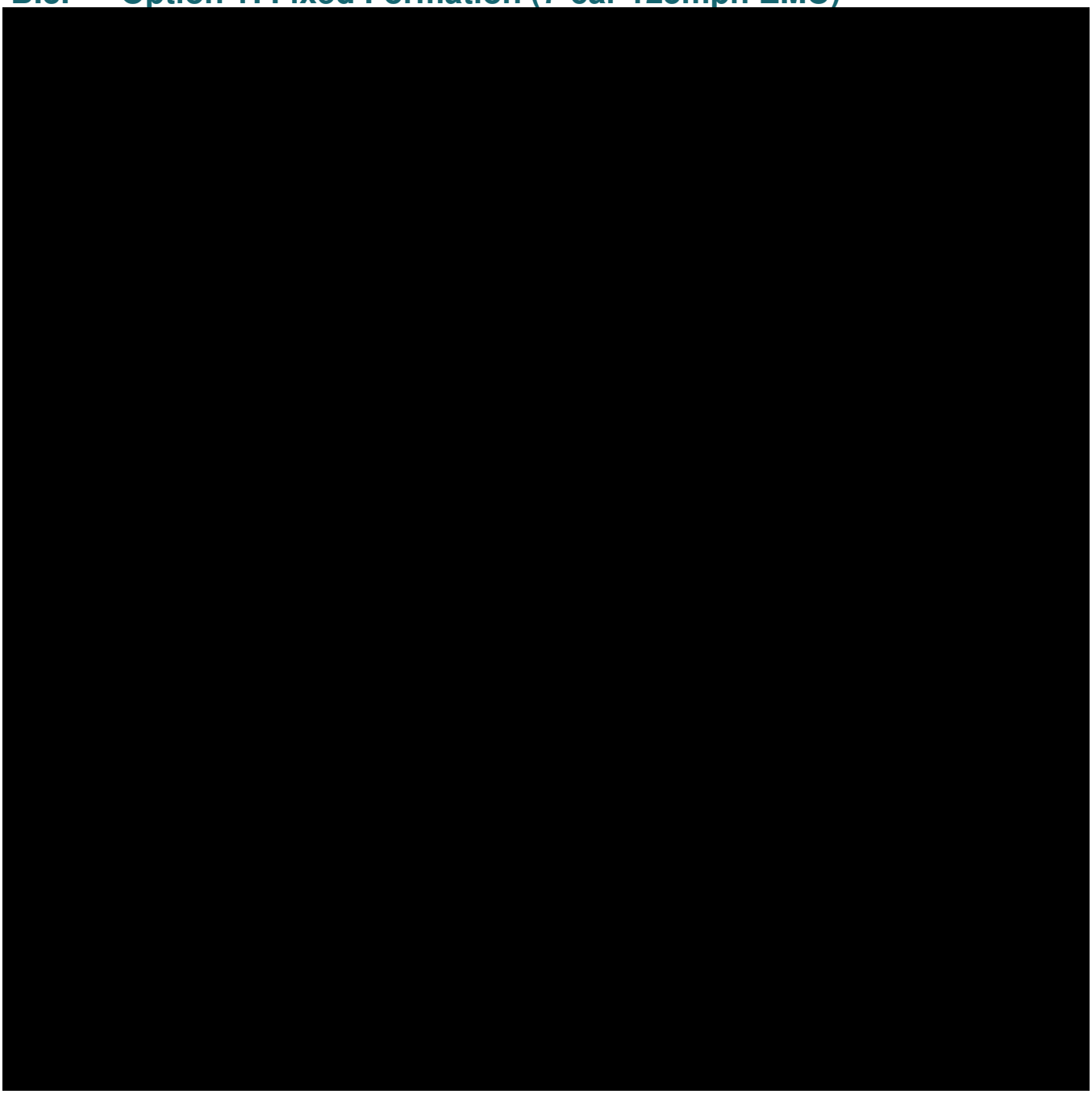
## B.1. Baseline



## B.2. Central Case

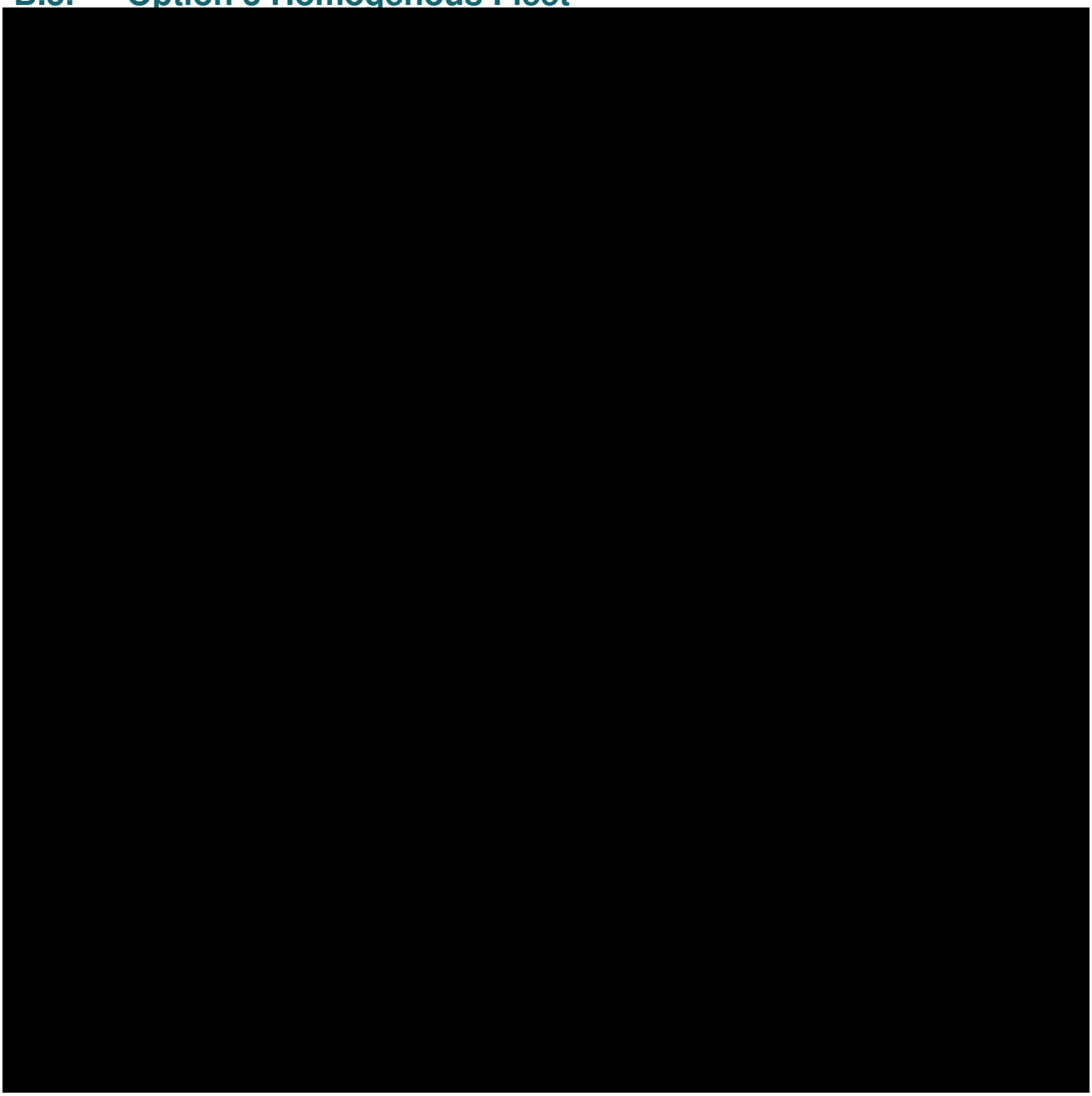


## B.3. Option 1: Fixed Formation (7-car 125mph EMU)

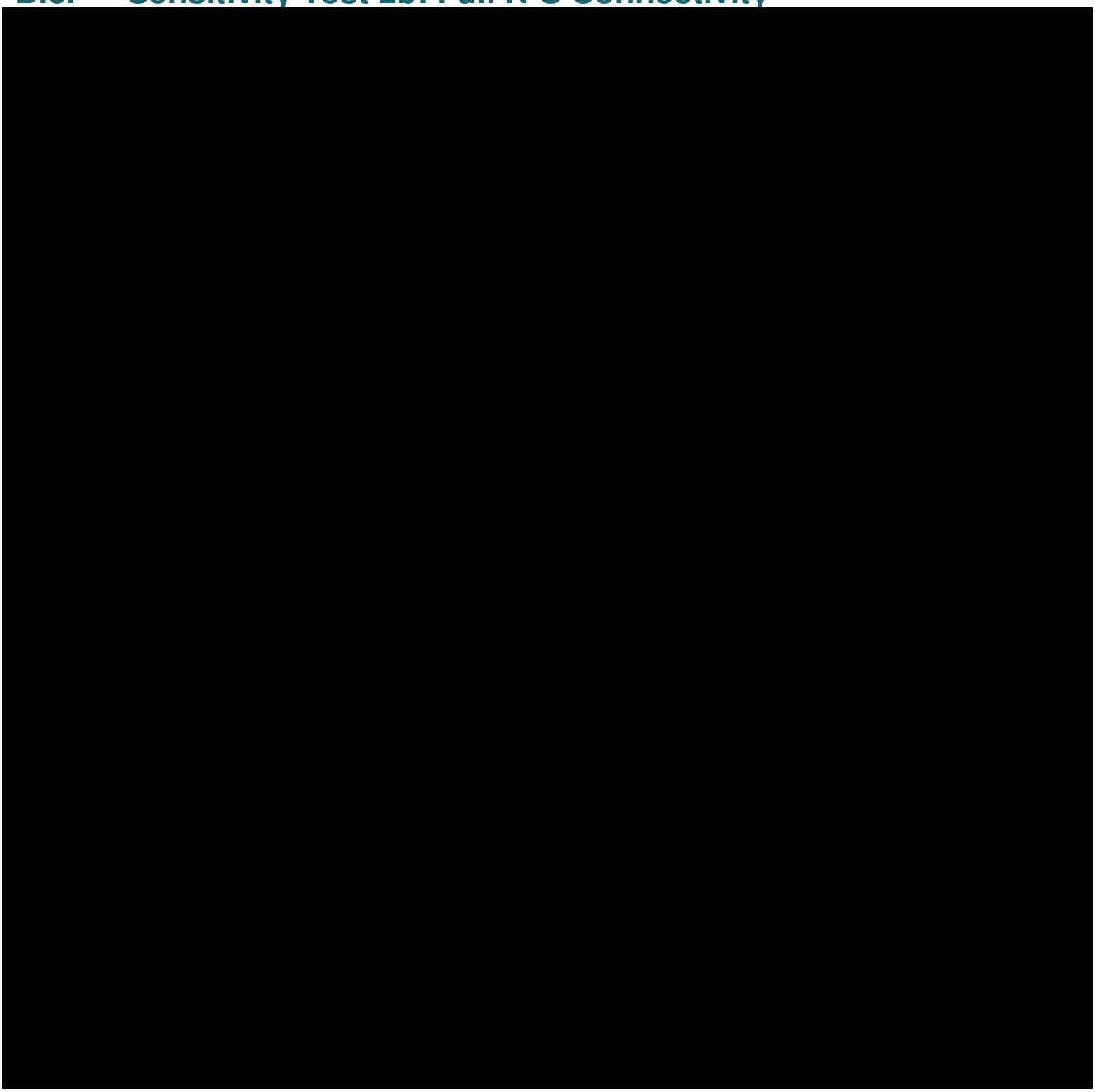


## B.4. Option 1: Fixed Formation (8-car 125mph EMU)

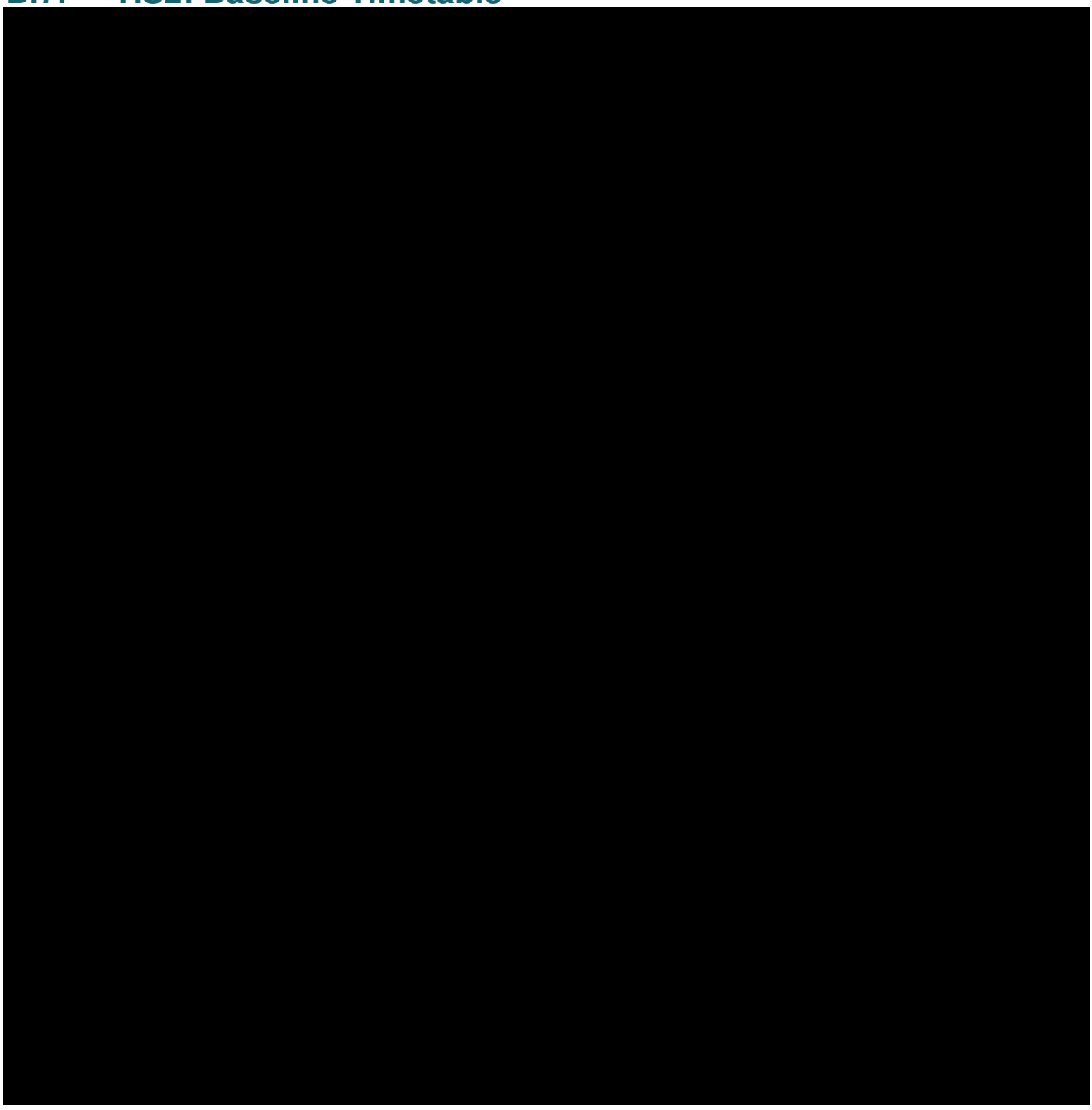
## B.5. Option 3 Homogenous Fleet



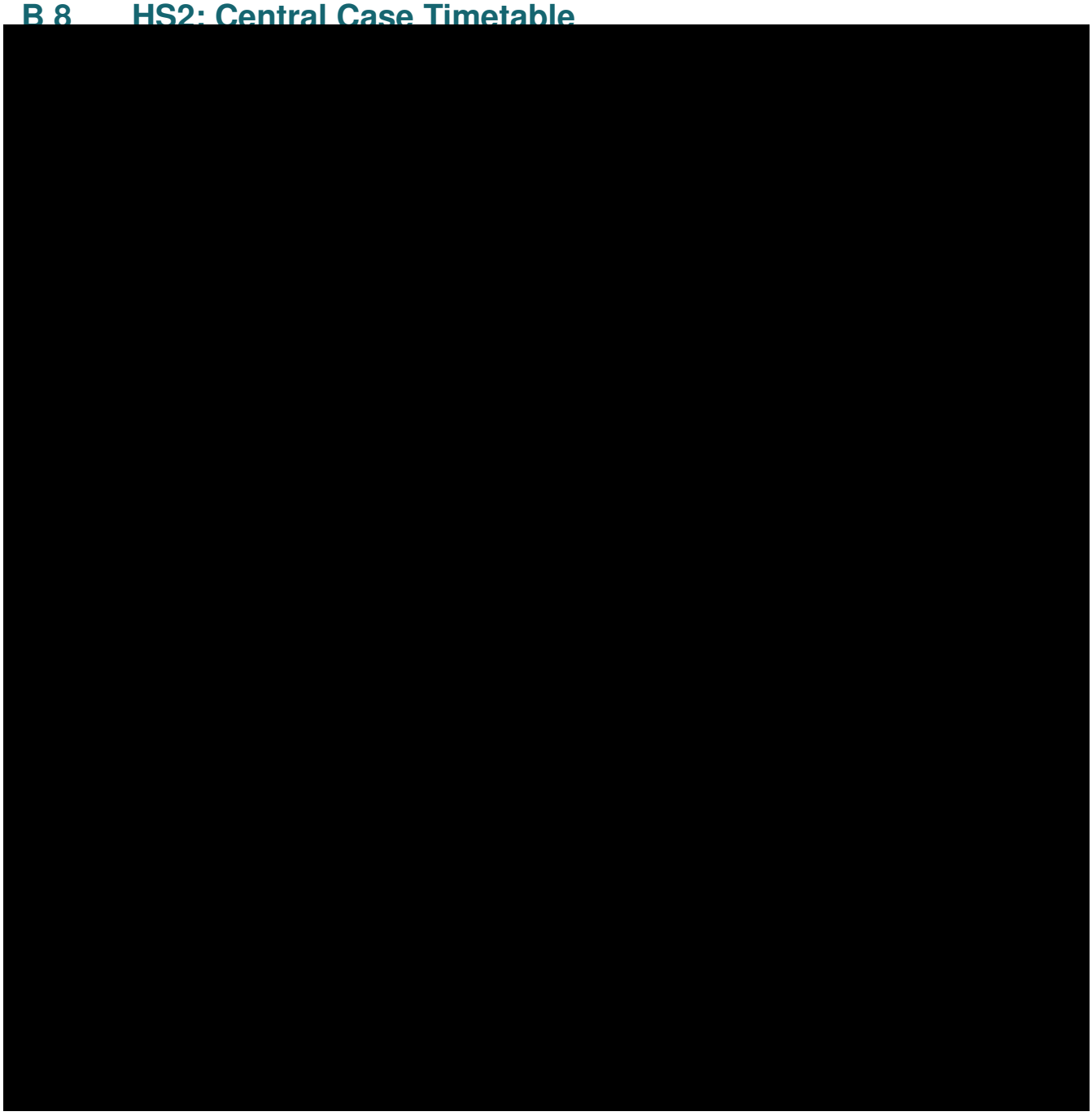
## B.6. Sensitivity Test 2b: Full N-S Connectivity



## B.7. HS2: Baseline Timetable



## B.8 HS2: Central Case Timetable



# Appendix C. TEE Tables

# C.1. Central Case

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting** | | | | |
| **User Benefits** | | | | |
| Travel Time | 328,347 | | 269,638 | 58,710 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 328,347 | (1a) | 269,638 | 58,710 |
| **Non-business: Other** | | | | |
| **User Benefits** | | | | |
| Travel Time | 414,859 | | 299,553 | 115,306 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 414,859 | (1b) | 299,553 | 115,306 |
| **Business** | | | | |
| **User Benefits** | | | | |
| Travel Time | 876,376 | | 140,652 | 735,724 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 876,376 | (2) | 140,652 | 735,724 |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 1,806,710 | | | 1,806,710 |
| Operating Costs | -103,541 | | | -103,541 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -1,703,169 | | | -1,703,169 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 876,376 | (5) = (2) + (3) + (4) | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,619,582 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -4,353 | | -4,353 | 0 |
| Investment Costs | 1,950,698 | | 0 | 1,950,698 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -1,703,169 | | 0 | -1,703,169 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | 243,177 | *(8)* | -4,353 | 247,530 |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 362,481 | *(9)* | 87,365 | 275,116 |
| **TOTALS** | | | | |
| **Broad Transport Budget** | 243,177 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 362,481 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 4,568 | *(12)* |
| Local Air Quality | 36,065 | *(13)* |
| Greenhouse Gases | 442,690 | *(14)* |
| Journey Quality | 492,674 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 58,660 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 328,347 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 414,859 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 876,376 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -362,481 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| Present Value of Benefits (see notes) (PVB) | 2,291,758 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| Broad Transport Budget | 243,177 | *(10)* |
| Present Value of Costs (see notes) (PVC) | 243,177 | *(PVC) = (10)* |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 2,048,582 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | 9.42 | BCR=PVB/PVC |

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# C.2. Option 1: Fixed Formation (7-car 125mph EMU)

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting User Benefits** | | | | |
| Travel Time | 301,619 | | 243,338 | 58,281 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 301,619 | (1a) | 243,338 | 58,281 |
| **Non-business: Other User Benefits** | ALL MODES TOTAL | | ROAD | RAIL |
| Travel Time | 385,237 | | 270,336 | 114,901 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 385,237 | (1b) | 270,336 | 114,901 |
| **Business User Benefits** | | | | |
| Travel Time | 849,505 | | 126,933 | 722,572 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 849,505 | (2) | 126,933 | 722,572 |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 1,579,246 | | | 1,579,246 |
| Operating Costs | 74,777 | | | 74,777 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -1,654,023 | | | -1,654,023 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 849,505 | (5) = (2) + (3) + (4) | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,536,362 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -3,923 | | -3,923 | 0 |
| Investment Costs | 1,950,698 | | 0 | 1,950,698 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -1,654,023 | | 0 | -1,654,023 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | 292,752 | *(8)* | -3,923 | 296,675 |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 339,202 | *(9)* | 79,127 | 260,075 |
| **TOTALS** | | | | |
| **Broad Transport Budget** | 292,752 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 339,202 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 4,122 | *(12)* |
| Local Air Quality | 36,065 | *(13)* |
| Greenhouse Gases | 440,473 | *(14)* |
| Journey Quality | 378,053 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 53,004 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 301,619 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 385,237 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 849,505 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -339,202 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| Present Value of Benefits (see notes) (PVB) | 2,108,875 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| Broad Transport Budget | 292,752 | *(10)* |
| Present Value of Costs (see notes) (PVC) | 292,752 | *(PVC) = (10)* |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 1,816,123 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | 7.20 | BCR=PVB/PVC |

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# C.3. Option 2: Fixed Formation (8-car 125mph EMU)

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting** | | | | |
| **User Benefits** | | | | |
| Travel Time | 327,647 | | 269,104 | 58,543 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 327,647 | (1a) | 269,104 | 58,543 |
| **Non-business: Other** | | | | |
| **User Benefits** | | | | |
| Travel Time | 414,400 | | 298,960 | 115,439 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 414,400 | (1b) | 298,960 | 115,439 |
| **Business** | | | | |
| **User Benefits** | | | | |
| Travel Time | 875,701 | | 140,373 | 735,328 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 875,701 | (2) | 140,373 | 735,328 |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 1,767,094 | | | 1,767,094 |
| Operating Costs | -136,103 | | | -136,103 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -1,630,991 | | | -1,630,991 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 875,701 | (5) = (2) + (3) + (4) | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,617,748 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -4,346 | | -4,346 | 0 |
| Investment Costs | 1,950,698 | | 0 | 1,950,698 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -1,630,991 | | 0 | -1,630,991 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | 315,362 | *(8)* | -4,346 | 319,708 |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 361,329 | *(9)* | 87,125 | 274,203 |
| **TOTALS** | | | | |
| **Broad Transport Budget** | 315,362 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 361,329 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 4,559 | *(12)* |
| Local Air Quality | 36,065 | *(13)* |
| Greenhouse Gases | 442,643 | *(14)* |
| Journey Quality | 462,673 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 58,529 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 327,647 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 414,400 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 875,701 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -361,329 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| Present Value of Benefits (see notes) (PVB) | 2,260,889 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| Broad Transport Budget | 315,362 | *(10)* |
| Present Value of Costs (see notes) (PVC) | 315,362 | *(PVC) = (10)* |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 1,945,527 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | 7.17 | BCR=PVB/PVC |

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# C.4. Option 3: Homogeneous Fleet

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting** | | | | |
| **User Benefits** | | | | |
| Travel Time | 279,220 | | 233,720 | 45,500 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 279,220 | (1a) | 233,720 | 45,500 |
| | | | | |
| **Non-business: Other** | **ALL MODES TOTAL** | | **ROAD** | **RAIL** |
| **User Benefits** | | | | |
| Travel Time | 379,747 | | 259,650 | 120,097 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 379,747 | (1b) | 259,650 | 120,097 |
| | | | | |
| **Business** | | | | |
| **User Benefits** | | | | |
| Travel Time | 857,680 | | 121,916 | 735,765 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 857,680 | (2) | 121,916 | 735,765 |
| | | | | |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 1,558,982 | | | 1,558,982 |
| Operating Costs | -96,141 | | | -96,141 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -1,462,842 | | | -1,462,842 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| | | | | |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 857,680 | (5) = (2) + (3) + (4) | | |
| | | | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,516,648 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| | | | | |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -3,776 | | -3,776 | 0 |
| Investment Costs | 1,950,698 | | 0 | 1,950,698 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -1,462,842 | | 0 | -1,462,842 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | 484,081 | *(8)* | -3,776 | 487,857 |
| | | | | |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 319,284 | *(9)* | 75,807 | 243,477 |
| | | | | |
| **TOTALS** | | | | |
| **Broad Transport Budget** | 484,081 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 319,284 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 3,959 | *(12)* |
| Local Air Quality | 36,065 | *(13)* |
| Greenhouse Gases | 439,664 | *(14)* |
| Journey Quality | 314,899 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 50,865 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 279,220 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 379,747 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 857,680 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -319,284 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| | | |
| Present Value of Benefits (see notes) (PVB) | 2,042,816 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| | | |
| Broad Transport Budget | 484,081 | *(10)* |
| | | |
| Present Value of Costs (see notes) (PVC) | 484,081 | *(PVC) = (10)* |
| | | |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 1,558,735 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | 4.22 | BCR=PVB/PVC |

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# C.5. Option 4: Bi-Mode

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting** | | | | |
| **User Benefits** | | | | |
| Travel Time | 328,347 | | 269,638 | 58,710 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 328,347 | (1a) | 269,638 | 58,710 |
| **Non-business: Other** | **ALL MODES TOTAL** | | **ROAD** | **RAIL** |
| **User Benefits** | | | | |
| Travel Time | 414,859 | | 299,553 | 115,306 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 414,859 | (1b) | 299,553 | 115,306 |
| **Business** | | | | |
| **User Benefits** | | | | |
| Travel Time | 876,376 | | 140,652 | 735,724 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 876,376 | (2) | 140,652 | 735,724 |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 1,806,710 | | | 1,806,710 |
| Operating Costs | -396,011 | | | -396,011 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -1,410,699 | | | -1,410,699 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 876,376 | (5) = (2) + (3) + (4) | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,619,582 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -4,353 | | -4,353 | 0 |
| Investment Costs | 1,950,698 | | 0 | 1,950,698 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -1,410,699 | | 0 | -1,410,699 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | 535,646 | *(8)* | -4,353 | 539,999 |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 362,481 | *(9)* | 87,365 | 275,116 |
| **TOTALS** | | | | |
| **Broad Transport Budget** | 535,646 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 362,481 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 4,568 | *(12)* |
| Local Air Quality | 36,065 | *(13)* |
| Greenhouse Gases | 442,690 | *(14)* |
| Journey Quality | 492,674 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 58,660 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 328,347 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 414,859 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 876,376 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -362,481 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| Present Value of Benefits (see notes) (PVB) | 2,291,758 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| Broad Transport Budget | 535,646 | *(10)* |
| Present Value of Costs (see notes) (PVC) | 535,646 | *(PVC) = (10)* |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 1,756,112 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | 4.28 | BCR=PVB/PVC |

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# C.6. Sensitivity Test 1: 6th Path to Leicester

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting** | | | | |
| **User Benefits** | | | | |
| Travel Time | 319,191 | | 264,120 | 55,071 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 319,191 | (1a) | 264,120 | 55,071 |
| | | | | |
| **Non-business: Other** | **ALL MODES TOTAL** | | **ROAD** | **RAIL** |
| **User Benefits** | | | | |
| Travel Time | 419,919 | | 293,423 | 126,496 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 419,919 | (1b) | 293,423 | 126,496 |
| | | | | |
| **Business** | | | | |
| **User Benefits** | | | | |
| Travel Time | 882,722 | | 137,773 | 744,949 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 882,722 | (2) | 137,773 | 744,949 |
| | | | | |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 1,765,206 | | | 1,765,206 |
| Operating Costs | -249,993 | | | -249,993 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -1,515,212 | | | -1,515,212 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| | | | | |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 882,722 | (5) = (2) + (3) + (4) | | |
| | | | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,621,832 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| | | | | |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -4,265 | | -4,265 | 0 |
| Investment Costs | 1,950,698 | | 0 | 1,950,698 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -1,515,212 | | 0 | -1,515,212 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | 431,221 | *(8)* | -4,265 | 435,486 |
| | | | | |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 355,279 | *(9)* | 85,528 | 269,751 |
| | | | | |
| **TOTALS** | | | | |
| **Broad Transport Budget** | 431,221 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 355,279 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 4,475 | *(12)* |
| Local Air Quality | 36,065 | *(13)* |
| Greenhouse Gases | 442,222 | *(14)* |
| Journey Quality | 426,697 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 57,449 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 319,191 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 419,919 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 882,722 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -355,279 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| | | |
| Present Value of Benefits (see notes) (PVB) | 2,233,460 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| | | |
| Broad Transport Budget | 431,221 | *(10)* |
| | | |
| Present Value of Costs (see notes) (PVC) | 431,221 | *(PVC) = (10)* |
| | | |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 1,802,239 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | 5.18 | BCR=PVB/PVC |

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# C.7. Sensitivity Test 2a: Maintaining Connectivity (Wellingborough)

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting** | | | | |
| **User Benefits** | | | | |
| Travel Time | 355,343 | | 267,726 | 87,617 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 355,343 | (1a) | 267,726 | 87,617 |
| **Non-business: Other** | **ALL MODES TOTAL** | | **ROAD** | **RAIL** |
| **User Benefits** | | | | |
| Travel Time | 422,677 | | 297,429 | 125,248 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 422,677 | (1b) | 297,429 | 125,248 |
| **Business** | | | | |
| **User Benefits** | | | | |
| Travel Time | 831,901 | | 139,654 | 692,246 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 831,901 | (2) | 139,654 | 692,246 |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 1,774,541 | | | 1,774,541 |
| Operating Costs | -103,541 | | | -103,541 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -1,671,000 | | | -1,671,000 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 831,901 | (5) = (2) + (3) + (4) | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,609,920 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -4,321 | | -4,321 | 0 |
| Investment Costs | 1,950,698 | | 0 | 1,950,698 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -1,671,000 | | 0 | -1,671,000 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | 275,377 | *(8)* | -4,321 | 279,699 |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 364,747 | *(9)* | 86,812 | 277,935 |
| **TOTALS** | | | | |
| **Broad Transport Budget** | 275,377 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 364,747 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 4,535 | *(12)* |
| Local Air Quality | 36,065 | *(13)* |
| Greenhouse Gases | 442,530 | *(14)* |
| Journey Quality | 473,067 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 58,260 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 355,343 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 422,677 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 831,901 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -364,747 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| Present Value of Benefits (see notes) (PVB) | 2,259,630 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| Broad Transport Budget | 275,377 | *(10)* |
| Present Value of Costs (see notes) (PVC) | 275,377 | *(PVC) = (10)* |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 1,984,253 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | 8.21 | BCR=PVB/PVC |

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# C.8. Sensitivity Test 2b: Full N-S Connectivity

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting** | | | | |
| **User Benefits** | | | | |
| Travel Time | 358,372 | | 216,774 | 141,598 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 358,372 | (1a) | 216,774 | 141,598 |
| | | | | |
| **Non-business: Other** | **ALL MODES TOTAL** | | **ROAD** | **RAIL** |
| **User Benefits** | | | | |
| Travel Time | 393,782 | | 240,824 | 152,958 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 393,782 | (1b) | 240,824 | 152,958 |
| | | | | |
| **Business** | | | | |
| **User Benefits** | | | | |
| Travel Time | 724,749 | | 113,076 | 611,673 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 724,749 | (2) | 113,076 | 611,673 |
| | | | | |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 1,383,223 | | | 1,383,223 |
| Operating Costs | -103,541 | | | -103,541 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -1,279,682 | | | -1,279,682 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| | | | | |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 724,749 | (5) = (2) + (3) + (4) | | |
| | | | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,476,902 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| | | | | |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -3,494 | | -3,494 | 0 |
| Investment Costs | 1,950,698 | | 0 | 1,950,698 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -1,279,682 | | 0 | -1,279,682 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | 667,522 | *(8)* | -3,494 | 671,017 |
| | | | | |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 314,323 | *(9)* | 70,542 | 243,781 |
| | | | | |
| **TOTALS** | | | | |
| **Broad Transport Budget** | 667,522 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 314,323 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 3,671 | *(12)* |
| Local Air Quality | 36,065 | *(13)* |
| Greenhouse Gases | 438,226 | *(14)* |
| Journey Quality | 301,120 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 47,230 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 358,372 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 393,782 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 724,749 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -314,323 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| | | |
| Present Value of Benefits (see notes) (PVB) | 1,988,891 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| | | |
| Broad Transport Budget | 667,522 | *(10)* |
| | | |
| Present Value of Costs (see notes) (PVC) | 667,522 | *(PVC) = (10)* |
| | | |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 1,321,369 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | 2.98 | BCR=PVB/PVC |

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# C.9. KO1 Minus Electrification

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting** | | | | |
| **User Benefits** | | | | |
| Travel Time | 261,151 | | 218,740 | 42,411 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 261,151 | (1a) | 218,740 | 42,411 |
| **Non-business: Other** | | | | |
| **User Benefits** | | | | |
| Travel Time | 335,754 | | 243,008 | 92,746 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 335,754 | (1b) | 243,008 | 92,746 |
| **Business** | | | | |
| **User Benefits** | | | | |
| Travel Time | 761,052 | | 114,102 | 646,950 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 761,052 | (2) | 114,102 | 646,950 |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 1,473,266 | | | 1,473,266 |
| Operating Costs | -655,341 | | | -655,341 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -817,924 | | | -817,924 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 761,052 | (5) = (2) + (3) + (4) | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,357,957 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -3,534 | | -3,534 | 0 |
| Investment Costs | 469,630 | | 0 | 469,630 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -817,924 | | 0 | -817,924 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | -351,828 | *(8)* | -3,534 | -348,294 |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 159,579 | *(9)* | 70,805 | 88,774 |
| **TOTALS** | | | | |
| **Broad Transport Budget** | -351,828 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 159,579 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 3,706 | *(12)* |
| Local Air Quality | -6,199 | *(13)* |
| Greenhouse Gases | -93,182 | *(14)* |
| Journey Quality | 335,785 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 47,572 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 261,151 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 335,754 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 761,052 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -159,579 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| Present Value of Benefits (see notes) (PVB) | 1,486,059 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| Broad Transport Budget | -351,828 | *(10)* |
| Present Value of Costs (see notes) (PVC) | -351,828 | *(PVC) = (10)* |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 1,837,887 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | -4.22 | BCR=PVB/PVC |

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# C.10. KO1: Electrification to Corby

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting** | | | | |
| **User Benefits** | | | | |
| Travel Time | 282,667 | | 239,357 | 43,311 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 282,667 | (1a) | 239,357 | 43,311 |
| **Non-business: Other** | | | | |
| **User Benefits** | | | | |
| Travel Time | 359,086 | | 265,912 | 93,174 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 359,086 | (1b) | 265,912 | 93,174 |
| **Business** | | | | |
| **User Benefits** | | | | |
| Travel Time | 772,189 | | 124,856 | 647,333 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 772,189 | (2) | 124,856 | 647,333 |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 1,609,711 | | | 1,609,711 |
| Operating Costs | -480,646 | | | -480,646 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -1,129,065 | | | -1,129,065 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 772,189 | (5) = (2) + (3) + (4) | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,413,942 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -3,865 | | -3,865 | 0 |
| Investment Costs | 971,700 | | 0 | 971,700 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -1,129,065 | | 0 | -1,129,065 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | -161,229 | *(8)* | -3,865 | -157,364 |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 224,123 | *(9)* | 77,596 | 146,527 |
| **TOTALS** | | | | |
| **Broad Transport Budget** | -161,229 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 224,123 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 4,055 | *(12)* |
| Local Air Quality | 2,633 | *(13)* |
| Greenhouse Gases | 30,669 | *(14)* |
| Journey Quality | 412,725 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 52,082 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 282,667 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 359,086 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 772,189 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -224,123 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| Present Value of Benefits (see notes) (PVB) | 1,691,984 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| Broad Transport Budget | -161,229 | *(10)* |
| Present Value of Costs (see notes) (PVC) | -161,229 | *(PVC) = (10)* |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 1,853,213 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | -10.49 | BCR=PVB/PVC |

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# C.11. KO1: 2019 Timetable

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting** | | | | |
| **User Benefits** | | | | |
| Travel Time | 170,775 | | 160,113 | 10,663 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 170,775 | (1a) | 160,113 | 10,663 |
| | | | | |
| **Non-business: Other** | **ALL MODES TOTAL** | | **ROAD** | **RAIL** |
| **User Benefits** | | | | |
| Travel Time | 235,948 | | 177,876 | 58,071 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 235,948 | (1b) | 177,876 | 58,071 |
| | | | | |
| **Business** | | | | |
| **User Benefits** | | | | |
| Travel Time | 568,290 | | 83,520 | 484,770 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 568,290 | (2) | 83,520 | 484,770 |
| | | | | |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 1,116,118 | | | 1,116,118 |
| Operating Costs | -215,851 | | | -215,851 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -900,266 | | | -900,266 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| | | | | |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 568,290 | (5) = (2) + (3) + (4) | | |
| | | | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 975,013 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| | | | | |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -2,579 | | -2,579 | 0 |
| Investment Costs | 971,700 | | 0 | 971,700 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -900,266 | | 0 | -900,266 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | 68,855 | *(8)* | -2,579 | 71,434 |
| | | | | |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 162,790 | *(9)* | 52,278 | 110,512 |
| | | | | |
| **TOTALS** | | | | |
| **Broad Transport Budget** | 68,855 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 162,790 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 2,711 | *(12)* |
| Local Air Quality | 2,633 | *(13)* |
| Greenhouse Gases | 23,974 | *(14)* |
| Journey Quality | 345,711 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 34,925 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 170,775 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 235,948 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 568,290 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -162,790 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| | | |
| Present Value of Benefits (see notes) (PVB) | 1,222,177 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| | | |
| Broad Transport Budget | 68,855 | *(10)* |
| | | |
| Present Value of Costs (see notes) (PVC) | 68,855 | *(PVC) = (10)* |
| | | |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 1,153,322 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | 17.75 | BCR=PVB/PVC |

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# C.12. HS2 Central Case

**Table 1: Economic Efficiency of the Transport System (TEE)**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Non-business: Commuting** | | | | |
| **User Benefits** | | | | |
| Travel Time | 177,951 | | 115,584 | 62,367 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 177,951 | (1a) | 115,584 | 62,367 |
| **Non-business: Other** | | | | |
| **User Benefits** | | | | |
| Travel Time | 194,052 | | 128,407 | 65,645 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | 194,052 | (1b) | 128,407 | 65,645 |
| **Business** | | | | |
| **User Benefits** | | | | |
| Travel Time | 424,651 | | 60,292 | 364,359 |
| Vehicle Operating Costs | 0 | | | |
| User Charges | 0 | | | |
| During Construction & Maintenance | 0 | | | |
| **Subtotal** | 424,651 | (2) | 60,292 | 364,359 |
| **Private Sector Provider Impacts** | | | | |
| Revenue | 891,909 | | | 891,909 |
| Operating Costs | 60,350 | | | 60,350 |
| TOC Profit | 0 | | | 0 |
| Investment Costs | 0 | | | 0 |
| Grant/Subsidy Payments | -952,260 | | | -952,260 |
| Revenue Transfer | 0 | | | 0 |
| **Subtotal** | 0 | (3) | 0 | 0 |
| **Other Business Impacts** | | | | |
| Developer Contributions | 0 | (4) | 0 | 0 |
| **NET BUSINESS IMPACT** | 424,651 | (5) = (2) + (3) + (4) | | |
| **TOTAL** | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 796,654 | (6) = (1a) + (1b) + (5) | | |

Notes: **Benefits** appear as **positive** numbers, while **costs** appear as **negative** numbers

**Table 2: Public Accounts**

| | ALL MODES TOTAL | | ROAD | RAIL |
|---|---|---|---|---|
| **Local Government Funding** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating Costs | 0 | | 0 | 0 |
| Investment Costs | 0 | | 0 | 0 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | 0 | | 0 | 0 |
| **NET IMPACT** | 0 | *(7)* | 0 | 0 |
| **Central Government Funding: Transport** | | | | |
| Revenue | 0 | | 0 | 0 |
| Operating costs | -1,759 | | -1,759 | 0 |
| Investment Costs | 1,950,698 | | 0 | 1,950,698 |
| Developer and Other Contributions | 0 | | 0 | 0 |
| Grant/(Subsidy) Payments | -952,260 | | 0 | -952,260 |
| Revenue Transfer | 0 | | 0 | 0 |
| **NET IMPACT** | 996,680 | *(8)* | -1,759 | 998,439 |
| **Central Government Funding: Non-Transport** | | | | |
| Indirect Tax Revenues | 243,748 | *(9)* | 41,793 | 201,956 |
| **TOTALS** | | | | |
| **Broad Transport Budget** | 996,680 | *(10) = (7) + (8)* | | |
| **Wider Public Finances** | 243,748 | *(11) = (9)* | | |

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

**Table 3: Analysis of Monetised Costs and Benefits**

| | | |
|---|---|---|
| Noise | 1,964 | *(12)* |
| Local Air Quality | 36,065 | *(13)* |
| Greenhouse Gases | 429,701 | *(14)* |
| Journey Quality | 158,461 | *(15)* |
| Physical Activity | 0 | *(16)* |
| Accidents | 26,145 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | 177,951 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | 194,052 | *(1b)* |
| Economic Efficiency: Business Users and Providers | 424,651 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | -243,748 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| Present Value of Benefits (see notes) (PVB) | 1,205,241 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)* |
| Broad Transport Budget | 996,680 | *(10)* |
| Present Value of Costs (see notes) (PVC) | 996,680 | *(PVC) = (10)* |
| OVERALL IMPACTS | | |
| **Net Present Value (NPV)** | 208,561 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | 1.21 | BCR=PVB/PVC |

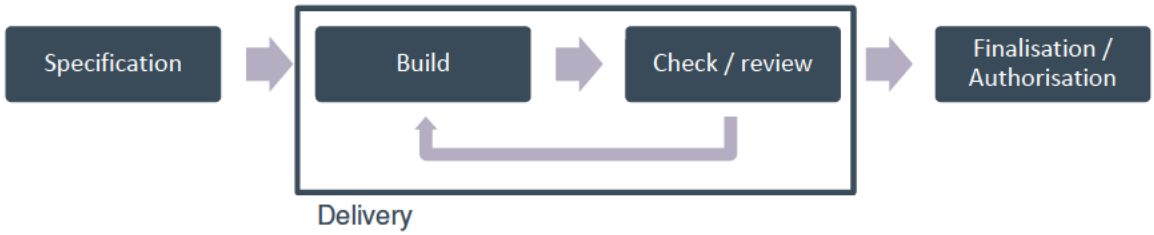
Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

# Appendix D. Quality Assurance

This appendix sets out our approach to Quality Assurance of the technical work undertaken for the MML Business Case and documents the checks undertaken as part of this process.

**Analytical Assurance Processes**

The figure below illustrates the technical development environment for the modelling work undertaken to support the MML Business Case. Following agreement of a specification with the Department, technical work was then completed prior to a check stage which was focused primarily on the mechanical application i.e. checking calculations or the transfer of data. Subsequently a review stage was completed by a peer or above of the original developer. The intention of the review was to confirm the work is fit for purpose, appropriate and in line with the specification. Atkins adopts a proportional review stage based on an assessment of the criticality of analysis.




In all cases Atkins records the audit trail and outcomes of assurance activities within standalone check and review logs. These logs capture amendments or responses to review comments received internally and externally and the eventual resolution of issues. A summary of the logs compiled for this work is provided at the end of this appendix.

Atkins also understands that our internal assurance processes follow comparable principles to the DfT analytical assurance framework[11] including the following principles:

- Proportionality based on impact and downstream use of work;
- Approaches beyond checking i.e. the use of peer review;
- Differentiation of approaches between development and application phases.

**Modelling Framework**

The modelling framework utilised in this study was based on the Comparator Model Suite developed for the East Midlands Franchise competition. In turn, this suite was developed from the Comparator suite produced by Atkins for the Department for the ongoing ICWC Franchise competition. Although the East Midlands comparator has not yet been subject to detailed external assurance, the ICWC suite has undergone extensive assurance by the Department's external financial advisor on the ICWC project, Grant Thornton. We note that the suite itself has undergone limited change between the ICWC and East Midlands projects, and as such consider that mechanically the suite can be categorised as having a '**high**' degree of assurance from a functionality point of view. For the MML study, the focus of our assurance has therefore been on:

- By exception, areas of mechanical change to the Comparator Suite required to conduct the appraisal of the Midland Mainline Upgrade Programme over a 64 year appraisal period –

[11] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/350904/qa-modelling-guidance_pdf.pdf

noting that the Comparator suite did not contain the functionality to model beyond 2039/40; and
- Checking and review of inputs to the modelling scenarios and resulting appraisal outputs.

Note that the modelling framework is designed to conform to spreadsheet modelling best practice guidance, the key principles of which are summarised as follows:

- Modularity – inputs kept separate from calculations, and calculations kept separate from outputs;
- Consistency - through consistent formatting across all spreadsheet models, with shared cell colourings and labelling ensuring that users can quickly understand (and develop) a colleagues' work;
- Transparency – the model is simple to follow and easily understandable;
- Linearity – the model is logically laid out and 'reads like a book', i.e. from left to right and top to bottom;
- Integrity – the inclusion of error checks throughout the model, and the checking of validity of inputs; and
- Protection – prevention of errors, for example the use of the data validation feature in Excel to restrict the values that users can input into input cells.

**Table 7: Framework model checks**

| Check# | Model Name | Description | Checker | Date | ok/issue | Comments | Closed? |
|---|---|---|---|---|---|---|---|
| 1 | Mileage Model KO2_CP1 | Check that model could be matched back to original East Midlands one and that MML services only were left in | [redacted] | 19/09/16 | ok | | |
| 2 | Mileage Model KO2_CP2 | Spot check that Corby/Sheffield services match back to timetable | [redacted] | 19/09/16 | Issue_001 | Issue_001 | Y (ok) |
| 3 | Mileage Model KO2_CP3 | Spot check that Corby/Sheffield services match back to timetable | [redacted] | 19/09/16 | Issue_001 | Issue_001 | Y (ok) |
| 4 | Infrastructure KO2 | Check that mileage outputs had been copied through correctly from the three mileage models | [redacted] | 19/09/16 | ok | | |
| 5 | Financial Model V1.11 (Opt 1 - Central Case (KO2)) | Check that the incremental mileage (base+opt 1) matches back to the infrastructure model | [redacted] | 19/09/16 | ok | Comment - VTAC for new RS types, diesel consumption only added in within the FM itself, not the infra model | |
| 6 | Financial Model V1.11 (Base_Inp) | Check over lines which have been left in the Financial Model - relate to MML and are variable elements (dependent on revenue/mileage) | [redacted] | 19/09/16 | Issue 002 | Issue 002. Seems there are new staff pay assumptions- do these need to be checked against a source? | Y (ok) |
| 7 | Financial Model V1.11 (Base_Inp) | Check indexation rates | [redacted] | 19/09/16 | ok | Mostly as before, but with staff by AEI and EC4T/Diesel by GDP deflator - do I need to check this in WebTAG? | |
| 8 | Financial Model V1.11 | Check that the 14 option tabs are being combined correctly into the later tabs | [redacted] | 19/09/16 | ok | Have checked the total sum of the tabs against Opt_Nom with flat indexation rates, which matches | |
| 9 | Financial Model V1.11 (Opt 1 - Central Case (KO2)) | Check incremental changes made in central case | [redacted] | 19/09/16 | | 17 drivers from 19/20 | |
| 10 | Appraisal Model | Do the 'Revenue Inputs' in the appraisal model match the outputs form the revenue model? | [redacted] | 19/09/16 | Issue 03, 04 | | Y (ok) |
| 11 | Appraisal Model | Do the 'FM Inputs' in the appraisal model match the outputs form the financial model? | [redacted] | 19/09/16 | Issue_05 | | Y (ok) |
| 12 | Appraisal Model | General overview of other tabs | [redacted] | 19/09/16 | Issue 06, 07 | Is there a traceable source for the rolling stock inputs? Do I need to be checking back against anything? | Y (ok) |

| Check# | Model Name | Description | Checker | Date | ok/issue | Comments | Closed? |
|---|---|---|---|---|---|---|---|
| 13 | Revenue Model | Checks on Baseline EMRF Franchise Model. The revenue model is an adapted version of the ICWC model developed in the first instance to match results from the EMDA model. Within the version tab does the initial replication of revenue and journeys match the original model and are subsequent changes transparent and reasonable? | [redacted] | | ok | | |
| 14 | Revenue Model | Confirm status of timetable mapping processing spreadsheet and correct transferal to the revenue model | [redacted] | 19/09/16 | ok | | |
| 15 | Revenue Model | Confirm that VOT mapping is picking up the correct inputs and the values are transferred correctly to the revenue model | [redacted] | 19/09/16 | Issue_07 | | Y (ok) |
| 16 | Revenue Model | Confirm scenario is set correctly to 2023 Central Case. Baseline timetable change from December 2018, Central Case timetable change from December 2023 | [redacted] | 19/09/16 | ok | | |
| 17 | Revenue Model | Checked that RS Ambiance "Hours Saved" row 13 matches "Economic Inputs" row 36 | [redacted] | 19/09/16 | ok | | |
| 18 | Revenue Model | Checks on Baseline EMRF Franchise Model. The crowding model is developed alongside an earlier EMDA crowding model to give increased functionality of modelling crowding outside of London St Pancras and Nottingham. Do the checks showing crowding levels (1) show consistency between crowding levels (2) Have a reasonable explanation where one-off results are inconsistent? | [redacted] | | ok | | |
| 19 | MOIRA Coding | | [redacted] | 19/09/16 | ok | Spot checks carried out on MOIRA coding | |

**Table 8: Framework model issue log and actions**

| Issue | Model | Raised By | Description | Reviewer | Actions | Follow on Check By | Follow on Check Date | Status |
|---|---|---|---|---|---|---|---|---|
| 1 | Mileage Model KO2_CP2/CP3 | [redacted] | Why do some Corby services terminate at Kettering, when Public TT Version 0.6 shows them continuing to London. In CP2, there are services at either end of the day which aren't in the TT (00:50, 21:50, 22:50,23:20, 23:50). Am I comparing to the right workbook? | [redacted] | Corby - London services are sometimes represented separately as Corby - Kettering and Kettering - London in the diagrams, as splitting/joining occur at Kettering. The diagrams sometimes contain journeys additional to what's in the MOIRA timetable to balance units (these can be considered as depot journeys). | [redacted] | 20/09/16 | Closed |
| 2 | Financial Model V1.11 (Opt 1 - Central Case (KO2)) | [redacted] | "Schedule 4 Cost Compensation" and disruption have been greyed out- looks like these should have been deleted? | [redacted] | There are numbers in the base but not in the options. Although ideally the base numbers should be removed, this does not affect the incremental costs of the options. | [redacted] | 20/09/16 | Closed |
| 3 | Appraisal Model | [redacted] | The scenario inputs match with scenario "2018 Baseline (2)", apart from the 2014/15 crowding benefits - why are these so high? | [redacted] | The final revenue numbers can be found in the revenue model: P:\GBMRB\TP\HA\Projects\5134744 - EMRF - WHIT6739\40 - Technical\05 Comparator\MML Final Models for Submission QA\08_QA\Revenue Inputs Baseline numbers can be reproduced by switching the scenario to '2018 Baseline' in 'FRONT' Cell L2. | [redacted] | 20/09/16 | Closed |
| 4 | Appraisal Model | [redacted] | Can't seem to match the baseline numbers | | | [redacted] | 20/09/16 | Closed |
| 5 | Appraisal Model | [redacted] | Passenger Revenue number technically not correct in FM inputs, though doesn't go anywhere. Diesel fuel consumed listed as being 0 | [redacted] | Diesel fuel consumed corrected in v1.22 Appraisal Models and v1.13 Financial Model | [redacted] | 20/09/16 | Closed |
| 6 | Appraisal Model | [redacted] | The current year is listed as being 2016/17, but the output year of the financial model is 15/16. Is this ok? | [redacted] | The 'Output Base Year' drives the real outputs of the financial model. The appraisal model takes the nominal outputs from the financial model | [redacted] | 20/09/16 | Closed |
| 7 | VOT Mapping | [redacted] | Row 33 downwards of the VOT mapping tool, MTxxxx_PM_EMT, matches back to the PaxM_EMT Moira output, but the "Chnge" columns and "Loss/Gain" rows don't? | [redacted] | None | [redacted] | 20/09/16 | Closed |

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| 8 | Appraisal Model | [redacted] | The formulas seem to be applying the commute VoT to leisure hours and leisure VoT to commute hours due to the VoT and the hours inputs being in a different order. See Ben Rev Appraisal tab, rows 131 and 132. It doesn't seem to be very material to the results but will be worth correcting. | [redacted] | Order of commute, leisure time corrected in latest version of the financial model. | [redacted] | 21/09/16 | Closed |
| 9 | Appraisal Model | [redacted] | The model is applying market price adjustment to the carbon values. I always assumed these were already in market prices (and this is how other models I have seen have treated them). However, given the non-traded values are technically abatement costs I can certainly see you logic for applying the adjustment. I have asked TASM to confirm both way and I will pass this on when I have it. | [redacted] | The model is applying market price adjustments to carbon benefits. The Department have advised to retain this adjustment in the appraisal model. DfT seeking confirmation on the approach from TASM. | [redacted] | 21/09/16 | n/a |
| 10 | Appraisal Model | [redacted] | Are the MECC values straight from WebTAG A5.4? Ideally these would apply VoT consistent with those used for the rail passenger time savings. | [redacted] | the appraisal values are using MECC values from WebTAG A5.4, this has been confirmed with the Department | [redacted] | 21/09/16 | n/a |
| 11 | Appraisal Model | [redacted] | It doesn't matter for the BCR but the split of MECC benefits takes the total benefit and then multiplies by a journey purpose split. However, should this calculation not be weighted by the VoT for the different purposes splits (Business may have low JP split but supply a greater percentage of the benefits)? | [redacted] | Issue discussed with the DfT. The issue does not impact on the BCR reported although does impact on the split attributed between Business\Commute\Other for MECC benefits. | [redacted] | 21/09/16 | n/a |

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