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M4 Corridor around Newport

Revised Economic Appraisal Report



Welsh Government
M4 Corridor around Newport
Revised Economic Appraisal
Report

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1 The Project

1.1 Context

- 1.1.1** Since 1989 there have been various studies to identify the problems on the M4 around Newport and to propose possible solutions. The M4 Corridor around Newport WeITAG Stage 1 (Strategy Level) Appraisal concluded that a new section of 3-lane motorway to the south of Newport following a protected (TR111) route, in addition to reclassification measures to the existing M4 to the north of Newport, would best achieve the goals and address the problems of the M4 Corridor around Newport and should be progressed for further appraisal. This option has subsequently formed the basis for the development of the draft Plan, which was published in September 2013 and was the subject of public consultation from September to December 2013.
- 1.1.2** Having taken into account the responses to this participation process, as well as the assessments of the draft Plan, the Welsh Government decided to adopt a Plan for the Scheme in July 2014. Alongside this Plan, the Welsh Government published updated strategy-level reports, including a Strategic Environmental Assessment Statement, to demonstrate how the participation process informed its decision making. It also announced in July 2014 a revised preferred route, which protected a corridor for planning purposes. These documents can be accessed from the website <http://m4newport.com>.
- 1.1.3** The Welsh Government awarded a Professional Services Contract for the next stage of Scheme development and environmental surveys for the M4 Corridor around Newport Project (“the Scheme”) up to publication of draft Orders and an Environmental Statement. The contract was awarded to a Joint Venture of Costain, Vinci and Taylor Woodrow with consultants Arup and Atkins, supported by sub-consultant RPS in March 2015. Draft Orders, an Environmental Statement and associated reporting were published in March 2016, as part of the then Statutory Process. After consideration of the objections received the Cabinet Secretary for Economy and Infrastructure decided that a Public Local Inquiry should be held. The Inquiry process would then have informed the next stage of Ministerial decision making.

1.2 Reasons for Publishing Revised Reports

- 1.2.1** The decision to publish Draft Orders for the Scheme in March 2016 was informed by the Environmental Statement and a number of other associated reports. A number of these reports relate to, or are informed by, forecasts for the future level of traffic on the M4 around Newport. The production of traffic forecasts is governed by guidance published by the UK Department for Transport (DfT), namely WebTAG (Web-based Transport Appraisal Guidance).
- 1.2.2** Following the publication of the March 2016 Forecasting Report, a number of changes to the guidance governing traffic forecasting have been introduced which are material to the future year traffic forecasts. In view of this, the forecasting of the effects of the M4CaN Scheme has been updated and the reports which rely on these forecasts have consequently been revised.
- 1.2.3** These changes are summarised here:

Changes in Guidance Relating to Traffic Forecasts

- 1.2.4** The M4CaN transport model is used to understand and predict current and future traffic conditions in a situation with and without the proposed M4CaN Scheme. The outputs of the transport model are used to inform the design of the Scheme and are applied in various aspects of the economic, social and environmental assessment of the Scheme.
- 1.2.5** In accordance with WebTAG, future year traffic forecasts are derived from a set of growth factors taken from the National Trip End Model (NTEM) which is published by DfT through an interface called the Trip End Model Presentation Program (TEMPRO). At the time of the publication of Draft Orders, the M4CaN transport model and the various assessments of the Scheme were based on the current version of NTEM at that time, namely NTEM6.2 (as published in TEMPRO 6.2).
- 1.2.6** In July 2016, DfT published an updated version of TEMPRO (TEMPRO 7.0) which is in turn based on NTEM 7.0. NTEM 7.0 replaces and supersedes NTEM 6.2 and the Welsh Government took the view that it needed to update the M4CaN transport model such that it is based on the up to date forecasts.
- 1.2.7** The published NTEM 7.0 was reviewed by the Welsh Government. As part of this review, a number of discrepancies were identified between the forecast number of dwellings in Wales contained within NTEM 7.0 and the future housing requirements contained within the latest available Local Development Plans (LDPs) which are produced by the various local authorities in Wales. These discrepancies were brought to the attention of DfT who accepted that the Local Development Plans held by the Welsh Government provide a more up to date and accurate basis upon which to base future traffic forecasts, particularly given the material differences observed for some Local Authorities. Independently, DfT also found a further issue relating to the employment inputs to the NTEM.
- 1.2.8** Subsequently, DfT announced that it intends to undertake further quality assurance checks on the planning data underlying NTEM 7.0 and intends to issue revised trip end forecasts that correct for issues that have occurred in the processing of input data in respect of employment and dwellings in January 2017. This was the subject of a notice published by DfT on 14 November 2016¹.
- 1.2.9** As an interim measure, the Welsh Government have been provided with corrected NTEM forecasts that contain the up to date Wales LDP housing projections, together with the employment correction. It is these forecasts that have been adopted in the revised model, now termed M4CaN transport model (TEMPRO 7 Wales). Therefore, the planning data in the M4CaN transport model is consistent with the data used in LDPs in Wales which are used to support planning decisions. Earlier reports which were based on NTEM/TEMPRO 6.2 are therefore now superseded.
- 1.2.10** Subject to the completion of their quality assurance checks, DfT has advised that the nationwide update of NTEM and TEMPRO to be released in January 2017 will include the revised Welsh planning data and will address other issues identified in NTEM 7.0. It is expected that the updated versions of NTEM/TEMPRO will be generally consistent with TEMPRO 7 Wales. If there are any differences, it is anticipated that they will be marginal and these will be reported in evidence presented at the Public Local Inquiry.

Other Changes in Guidance

- 1.2.11** As part of the updates to WebTAG introduced in July 2016, the DfT has introduced new guidance on the value of travel time savings (or 'values of time'). The new values replace

¹ <http://assets.dft.gov.uk/tempo/version7/ntem-notice/ntem7-status.pdf>
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the previous values of time which were used to inform the reports published in March 2016.

- 1.2.12** Values of time determine the value that travellers place on changes in journey time. Values of time are used in the M4CaN transport model to predict the way travellers will behave in response to changes in travel times or the financial costs of transport. Both the M4CaN transport model and the economic appraisal of the Scheme have been updated such that they are based on the newly published values of time.

The Future of the Severn Crossing Tolls

- 1.2.13** The M4CaN transport model has also been updated to reflect the UK Government's announcement, contained within the Budget 2016, on the future of the Severn Crossing tolls following the end of the current concession arrangement.
- 1.2.14** The concession period is expected to come to an end either late in 2017 or early 2018, at which point the Severn Crossings will return to public ownership and the level of the toll will no longer be determined by the concession agreement. In accordance with the Severn Bridges Act 1992, the March 2016 EAR assumed there would be no tolls on the Severn Crossings when the new section of motorway south of Newport was due to be opened during 2021.
- 1.2.15** In the March 2016 Budget, the Government announced its intention to retain tolls on the Severn Crossings at half their current levels. On this basis, the updated economic appraisal assumes, under the 'Core Scenario', a 'half toll' scenario. In view of the uncertainty over the long term future of the Severn Crossing Tolls, a sensitivity test is included in this EAR under which it is assumed that the tolls are removed. This is the publicly stated position of many Welsh Assembly members who consider the tolls to be a tax on the Welsh economy.

1.3 Scheme objectives and reason for the Scheme

- 1.3.1** The aims of the Welsh Government for the M4 Corridor around Newport are to:
- a) Make it easier and safer for people to access their homes, workplaces and services by walking, cycling, public transport or road.
 - b) Deliver a more efficient and sustainable transport network supporting and encouraging long-term prosperity in the region, across Wales, and enabling access to international markets.
 - c) Produce positive effects overall on people and the environment, making a positive contribution to the over-arching Welsh Government goals to reduce greenhouse gas emissions and to making Wales more resilient to the effects of climate change.
- 1.3.2** The Scheme aims to help to achieve or facilitate these aims as part of a wider transport strategy for South East Wales, as outlined within the Prioritised National Transport Plan.
- 1.3.3** The Transport Planning Objectives (TPOs), or goals, are:
- TPO 1: Safer, easier and more reliable travel east-west in South Wales.
 - TPO 2: Improved transport connections within Wales and to England, the Republic of Ireland and the rest of Europe on all modes on the international transport network.
 - TPO 3: More effective and integrated use of alternatives to the M4, including other parts of the transport network and other modes of transport for local and strategic journeys around Newport.

- TPO 4: Best possible use of the existing M4, local road network and other transport networks.
- TPO 5: More reliable journey times along the M4 Corridor.
- TPO 6: Increased level of choice for all people making journeys within the transport Corridor by all modes between Magor and Castleton, commensurate with demand for alternatives.
- TPO 7: Improved safety on the M4 Corridor between Magor and Castleton.
- TPO 8: Improved air quality in areas next to the M4 around Newport.
- TPO 9: Reduced disturbance to people from high noise levels, from all transport modes and traffic within the M4 Corridor.
- TPO 10: Reduced greenhouse gas emissions per vehicle and/or person kilometre.
- TPO 11: Improved travel experience into South Wales along the M4 Corridor.
- TPO 12: An M4 attractive for strategic journeys that discourages local traffic use.
- TPO 13: Improved traffic management in and around Newport on the M4 Corridor.
- TPO 14: Easier access to local key services and residential and commercial centres.
- TPO 15: A cultural shift in travel behaviour towards more sustainable choices.

1.3.4 The scheme-specific environmental objectives (EO), as set out in the Strategic Environmental Assessment of the Plan, are as follows:

- EO1 - Improved air quality in areas next to the existing M4 around Newport;
- EO2a - Reduce greenhouse gas emissions per vehicle and/or person kilometre;
- EO2b - Ensure that effective adaptation measures to climate change are in place;
- EO3 - Reduce disturbance to people from high noise levels, from all transport modes and traffic within the existing M4 Corridor;
- EO4 - Ensure that biodiversity is protected, valued and enhanced;
- EO5 - Improved access to all services and facilities and reduce severance;
- EO6 - Protect and promote everyone's physical and mental wellbeing and safety;
- EO7 - Reduce transport related contamination and safeguard soil function, quality and quantity;
- EO8 - Minimise transport related effects on surface and groundwater quality, flood plains and areas of flood risk;
- EO9 - Ensure the prudent and sustainable use of natural resources and energy;
- EO10 - Ensure that diversity, local distinctiveness and cultural heritage are valued, protected, celebrated and enhanced;
- EO11 - Ensure that landscape and townscape is properly valued, conserved and enhanced.

1.3.5 In addition, the Wales Transport Strategy includes the following environmental outcomes (WTSEO):

- Outcome 11: The sustainability of the transport infrastructure - Increase the use of more sustainable materials in our country's transport assets and infrastructure;
- Outcome 12: Greenhouse gas emissions - Reduce the impact of transport on greenhouse gas emissions;

- Outcome 13: Adapting to climate change - Adapt to the impacts of climate change;
- Outcome 14: Air pollution and other harmful emissions - Reduce the contribution of transport to air pollution and other harmful emissions;
- Outcome 15: The local environment - Improve the positive impact of transport on the local environment;
- Outcome 16: Our heritage - Improve the effect of transport on our heritage;
- Outcome 17: Biodiversity - Improve the impact of transport on biodiversity.

2 Introduction

2.1 Scope of this Report

- 2.1.1** The Economic Appraisal Report (EAR) sets out the results of the economic appraisal of the Scheme. The economic appraisal (often termed cost-benefit analysis), provides a measure of the value for money of the scheme. The results of the appraisal are summarised in the Net Present Value and Benefit Cost Ratio for the Scheme. This report also outlines the methodology and key assumptions adopted in undertaking the appraisal.
- 2.1.2** The EAR is undertaken in accordance with the Welsh Government's Transport Appraisal Guidance (WeITAG). In relation to data sources and other technical matters, WeITAG refers directly to the UK Department for Transport (DfT) Transport Appraisal Guidance (WebTAG).
- 2.1.3** As set out in Section 1, following the publication of the March 2016 EAR, a number of changes to the guidance governing traffic forecasting and economic appraisal have been introduced which are material to the economic appraisal of the Scheme. In view of this, the economic appraisal of the M4CaN Scheme has been revised and updated. This revised EAR sets out the results of the updated assessment and supersedes the March 2016 EAR.
- 2.1.4** This report should be read in conjunction with the Revised Traffic Forecasting Report (December 2016) and which sets out, in greater detail, the changes applied to the M4CaN Transport Model which forms a key input to the economic appraisal.

2.2 Report Structure

- 2.2.1** Following this introduction, the report is structured as follows:
- Chapter 3 outlines the overall approach taken to the economic appraisal;
 - Chapter 4 details the cost estimates for the Scheme used in the appraisal;
 - Chapter 5 provides an overview of the different categories of benefits assessed for the Scheme;
 - Chapter 6 describes the assessment of Wider Impacts;
 - Chapter 7 presents the results of the economic appraisal for a Core Scenario and for a range of sensitivity tests; and
 - Chapter 8 contains concluding comments.

3 Approach to Economic Appraisal

3.1 Principles of Appraisal

- 3.1.1** The economic appraisal considers the costs and benefits of the Scheme in monetary terms that are accrued over the period from 2016 to a point in time 60 years after the scheme opening year (in this case 2081).
- 3.1.2** Costs and benefits are also discounted to 'present values'. Discounting is a technique used to compare costs and benefits that occur in different time periods. It reflects the fact that people, and society as a whole, prefer to receive goods and services now rather than later. Therefore, the economic appraisal places greater weight on costs and benefits which occur earlier in the appraisal period. The discount rate applied is the HM Treasury Green Book Social Time Preference Rate².
- 3.1.3** The economic appraisal of the Scheme is undertaken in real prices which accounts for the effects of inflation. Costs and benefits are therefore presented in a consistent price base such that they can be directly compared. The price base year for economic appraisals stipulated by the Guidance is 2010.
- 3.1.4** Benefits relating to the 'economic efficiency' of the transport system are presented in the form of a Transport Economic Efficiency (TEE) table. The term 'benefits' is applied to a specific set of impacts and is applied consistently whether such impacts are positive or negative (i.e. dis-benefits). These benefits are made up of the following:
- journey time savings;
 - vehicle operating cost savings;
 - user charges, such as tolls; and
 - additional costs to travellers due to disruption during construction and maintenance works;
 - indirect tax revenues to Central Government through, for example, fuel duty that result from the Scheme.
- 3.1.5** The TEE table also includes private sector impacts, such as revenue, operating and investment costs and any grants or subsidies.
- 3.1.6** The 'public accounts' table relates to the costs faced by Government (either local or central) to implement the Scheme. They include the following:
- revenue (in this case relating to toll revenue);
 - operating costs;
 - investment costs;
 - developer and other contributions (not applicable); and
 - grant/subsidy payments (not applicable).
- 3.1.7** The overall Analysis of Monetised Costs and Benefits table also includes monetised benefits due to changes in greenhouse gas emissions, and changes in the occurrence of accidents. These benefits would be negative if the situation were to worsen.

² In accordance with the HM Treasury Green Book, the social time preference rate is 3.5% for the first 30 years of the appraisal (2016 to 2045), 3.0% for the period 2046 to 2075, and 3.5% thereafter (2076 to 2081).

- 3.1.8** An assessment of wider economic benefits has also been undertaken. In WebTAG 'Wider Impacts' is the term given to a range of quantifiable wider economic impacts of transport improvements. Such impacts occur as an 'indirect' result of the scheme and are additional to the 'direct' transport user benefits captured in the Transport Economic Efficiency analysis.
- 3.1.9** The presence and importance of such wider economic benefits in transport appraisal is widely acknowledged. However, Wider Impacts can be quantified with less certainty than direct transport user benefits and, as such, the overall appraisal results are presented both with and without Wider Impacts.
- 3.1.10** The outputs of the economic appraisal are summarised in the Net Present Value (NPV) for the Scheme – the sum of discounted costs and benefits – and the Benefit Cost Ratio (BCR) – the ratio of benefits to costs. The BCR is typically used as the primary measure of value for money because it summarises the relative scale of costs and benefits. In effect it measures the efficiency of the investment or the value of benefits generated per £ of public funds invested.
- 3.1.11** A BCR (benefits divided by costs) in excess of 1 indicates that the benefits of the scheme outweigh the costs. The higher the BCR, the more efficient the transport investment and the greater the value for money. Where Wider Impacts are excluded from the analysis, the BCR for the Scheme is referred to as the 'Initial BCR'. Where Wider Impacts are included in the analysis, the BCR is referred to as the 'Adjusted BCR'. The assessment of the value for money of the scheme should take into account both the Initial and Adjusted BCR for the scheme.
- 3.1.12** It should be noted that the economic appraisal captures costs and benefits that can be feasibly monetised. The BCR should be interpreted on the basis of the impacts that are captured within it. Therefore, the economic appraisal is only one aspect of the overall case for the Scheme and needs to be balanced against other environmental and social costs and benefits.

3.2 M4CaN Transport Model Inputs

- 3.2.1** The calculation of transport user benefits is based on outputs from the M4CaN transport model. The revised EAR takes inputs from the M4CaN transport model (TEMPRO 7 Wales) which is based on up to date traffic growth assumptions. Details of the model are provided in the Revised Traffic Forecasting Report (December 2016)³.
- 3.2.2** The main economic appraisal is undertaken based on the 'Central' traffic growth scenario, although sensitivity testing is undertaken for the 'Low' and 'High' growth scenarios which are also detailed in the Revised Traffic Forecasting Report. As set out in Section 1, the M4CaN transport model has also been updated to reflect the UK Government's announcement, contained within the Budget 2016, on the future of the Severn Crossing tolls following the end of the current concession arrangement.
- 3.2.3** In accordance with the Severn Bridges Act 1992, the March 2016 EAR assumed there would be no tolls on the Severn Crossings when the new section of motorway south of Newport was due to be opened during 2021. In the March 2016 Budget, the Government announced its intention to retain tolls on the Severn Crossings at half their current levels. On this basis, the revised economic appraisal assumes, under the 'Core Scenario' a 'half toll' scenario⁴. In view of the uncertainty over the long term future of the Severn Crossing

³ M4 Corridor Around Newport Traffic Forecasting Report (December 2016)

⁴ As described in the Traffic Forecasting Report (December 2016) it is also assumed that VAT would be removed from the toll prices when the bridges return to public ownership and that, in line with previous announcements, that the toll charge

Tolls, a sensitivity test is included in this EAR under which it is assumed that the tolls are removed. This is the publicly stated position of many Welsh Assembly members who consider the tolls to be a tax on the Welsh economy.

3.3 Changes to Guidance

- 3.3.1** As noted, the EAR is undertaken in accordance with WeITAG guidance relating to the economic appraisal of transport schemes (Transport Economic Efficiency). In relation to data sources and other technical matters, WeITAG refers users to WebTAG.
- 3.3.2** The overarching WebTAG unit relating to the economic appraisal is TAG Unit A1.1. Values and parameters used in the economic appraisal are given in the TAG Databook.
- 3.3.3** The economic appraisal has been updated to ensure it aligns with changes in DfT guidance and an update to the TAG Databook introduced in July 2016⁵. As part of the update, the DfT has introduced new guidance on the value of travel time savings (or 'values of time'). Both the M4CaN transport model and the economic appraisal have been updated such that they are based on the newly published values of time.

3.4 Software

- 3.4.1** TUBA (Transport User Benefit Appraisal) software (version 1.9.8 Interim) has been used to undertake the economic appraisal of the Scheme. This software has been produced by the DfT to carry out transport scheme economic appraisal using a 'willingness to pay' approach with fixed or variable demand. Version 1.9.8 Interim adopts the new values of time noted above.
- 3.4.2** The economic impacts of a scheme are derived by comparing the future year situation with the Scheme (Do Something scenario) to the situation without the Scheme (Do Minimum).
- 3.4.3** TUBA uses data taken from the traffic model forecasts on the number of trips, average journey times and average distances to calculate the TEE and greenhouse gas impacts in accordance with the WebTAG methodology. The Scheme investment and operating costs are also input to the TUBA software such that an overall comparison of costs and benefits can be made.

Category 2 vehicles (Light Goods Vehicles) is reduced to the level of Category 1 vehicles (cars and minibuses of up to 9 seats).

⁵ TAG Databook: forthcoming change, November 2016

4 Costs

4.1 Investment Costs

4.1.1 The investment costs (i.e. capital costs) are distinguished from ongoing costs (i.e. operating or maintenance costs). The investment costs used in the economic appraisal are given in Table 4.1.

4.1.2 There are three main elements of the Scheme cost estimate:

- the base cost – the basic costs of constructing the Scheme before allowing for risks;
- adjustment for risk – which covers all the identified risks as assessed and quantified through a Quantified Risk Assessment; and
- adjustment for optimism bias – to reflect the tendency for estimated scheme costs to be less than outturn cost.

4.1.3 For the purposes of the economic appraisal, allowance has been made for the costs of the reclassification of the existing route which form part of the M4CaN proposals and which are included in the traffic modelling⁶.

4.1.4 Costs are also included for activities being undertaken as part of Key Stage 4, the current stage of the project.

Table 4.1: Scheme Cost (Q4 2015 prices, £M)

| Component | Scheme Costs |
|--|-----------------|
| Preliminaries including Traffic Management | £212.0 |
| Roadworks | £268.0 |
| Structures | £297.1 |
| Landscaping and environmental works | £44.8 |
| Works by other authorities | £38.3 |
| Land and Compensation costs | £91.9 |
| Risk and Optimism Bias | £141.3 |
| Project Estimate excluding VAT and Inflation | £1,093.2 |
| Key Stage 4 Costs | £22.0 |
| Reclassification and reconfiguration of Caerleon Junction ⁷ (including Optimism Bias) | £16.2 |
| Total Costs for Economic Appraisal | £1,131.3 |

4.1.5 In order to adjust the base cost for the risks associated with the cost of the Scheme, a Quantified Risk Assessment has been undertaken and an allowance for risk included in the Scheme costs. In the context of the appraisal, there may be some difference between what is expected and what actually happens. This may be due to bias, which may be

⁶ Under the proposed reclassification measures, the existing M4 between Junction 23 (Magor) and Junction 26 (Malpas) would become a two lane dual carriageway. Reclassification would include works to reopen the west facing slip roads of Junction 25 (Caerleon), improving access to Caerleon and St. Julians. This would improve accessibility to Caerleon and St Julians along the northern fringe of Newport. The existing Variable Speed Limit up to 70mph would continue to operate along the existing M4 between Junction 24 (Coldra) and Junction 28 (Tredegar), but with a maximum speed limit of 60 miles per hour imposed at the Brynglas Tunnels.

⁷ These costs are not being delivered as part of the contract to construct the proposed new motorway.

unwittingly inherent in the appraisal, as well as unanticipated risks that might materialise during the course of the project. To account for this, an allowance is also included for “optimism bias”.

4.1.6 An assessment of the appropriate level of optimism bias for the Scheme has been undertaken in accordance with WebTAG (Unit A1-2) and the HMT Green Book Supplementary Guidance on Optimism Bias. The resultant optimism bias level for the new motorway is an uplift of 5% which equates to approximately £52m. In addition to this, the costs of reclassification measures – for which only early stage cost estimates (excluding risk) are available – are subject to an optimism bias adjustment of 44%.

4.1.7 Since publication of the draft Statutory Orders, a number of changes have been made to the scope of the project. These include the following:

- Increased height of the River Usk Crossing;
- Decreased height of Magor junction and simplified Bencroft Lane crossing; and
- Decreased size of the Caldicot Moor mitigation area.

4.1.8 The cost implications of the above changes have been considered within the context of the overall Scheme cost estimate. The net effect of the increases and decreases results in the reallocation of £6m from the risk allowance to the construction cost. The overall Scheme cost remains the same as the March 2016 EAR.

4.1.9 For the purposes of the economic appraisal, investment costs are input to the TUBA software according to the following components:

- **Construction costs**, including main works, ancillary works, statutory undertakings, site supervision and testing;
- **Land and property costs**, including compensation; and
- **Preparation and Supervision costs**, including project management, design, public consultation, Public Inquiry, gaining statutory powers, surveys, compensation, supervision and testing.

4.1.10 The cost estimates that are input to the appraisal software are shown in Table 4.2.

Table 4.2: Scheme Cost Inputs (2015 Prices, £M)

| Item | | Cost (£m) | Optimism Bias (£m) | Total (£m) |
|-------------------------|--------------|----------------|--------------------|----------------|
| New section of motorway | Construction | 941.5 | 45.8 | 987.3 |
| | Land | 91.9 | 4.5 | 96.3 |
| | Preparation | 22.0 | 1.1 | 23.1 |
| | Supervision | 8.0 | 0.4 | 8.4 |
| | Total | 1,063.4 | 51.8 | 1,115.2 |
| Reclassification Works | Construction | 10.7 | 4.7 | 15.4 |
| | Land | - | - | - |
| | Preparation | 0.5 | 0.2 | 0.7 |
| | Supervision | 0.1 | 0.0 | 0.1 |
| | Total | 11.2 | 4.9 | 16.2 |
| Total Scheme Costs | Construction | 952.2 | 50.5 | 1,002.7 |
| | Land | 91.9 | 4.5 | 96.3 |
| | Preparation | 22.5 | 1.3 | 23.8 |
| | Supervision | 8.1 | 0.4 | 8.5 |
| | Total | 1,074.6 | 56.7 | 1,131.3 |

4.2 Maintenance Costs

4.2.1 In addition to the investment costs, it is necessary for the economic appraisal to take account of the cost of maintaining both the new section of motorway and the existing M4 during the 60-year assessment period.

4.2.2 Following discussions with the Welsh Government, a draft maintenance schedule has been devised for two scenarios:

- Do Minimum: the cost of maintaining the existing M4 between Junction 23 and Junction 29 in the absence of the scheme; and
- Do Something: the cost of maintaining both the existing M4 and the proposed scheme.

4.2.3 The maintenance schedules include a recurring cycle of resurfacing, overlay, and reconstruction of different sections of the motorway, together with major maintenance of structures and annual routine maintenance. Maintenance assumptions and costs have been provided by the Welsh Government.

4.2.4 The costs of maintaining the existing M4 differs slightly between the 'Do Minimum' and 'Do Something' scenarios. This is due to the fact that the presence of the new motorway would offer the opportunity to undertake maintenance works in a different way. For example, with the Scheme in place, future refurbishment of the Brynglas Tunnels would likely be undertaken over a shorter time period involving daytime closure of the carriageway, rather than over an extended period of night time closures. Maintenance assumptions are further detailed in Section 5.

4.2.5 Additional allowance has also been included to account for the future costs of monitoring and maintaining areas that have been identified to provide mitigation for the loss of

habitats. This includes land management of the SSSI (Sites of Special Scientific Interest) Mitigation Areas as described in the SSSI Mitigation Strategy⁸, woodland and saltmarsh⁹.

4.2.6 The maintenance costs included in the economic appraisal are shown in Table 4.3.

Table 4.3: Estimated 60-Year Maintenance Costs (2014 Prices, £Ms)

| | Maintenance Costs (£m) | | |
|--------------|------------------------|-----------------|-------|
| | Existing M4 | Proposed Scheme | Total |
| Do Minimum | 309.8 | NA | 309.8 |
| Do Something | 279.9 | 250.3 | 530.3 |

4.3 Present Value Costs

4.3.1 As noted, the costs of the Scheme are calculated over a period from the current year (2016) to the final year of the appraisal (2081) and then converted to a present value in 2010 prices. The Present Value Costs (investment and maintenance costs) of the Scheme are given in the Table 4.4. It should be noted that the values given in Table 4.4 exclude the impacts on Government finances relating to changes in user charges (Severn Crossing toll revenue) which are included in final Public Accounts table and the overall economic appraisal result.

4.3.2 Investment and operating costs amount to around £1.0bn (2010 prices and values).

Table 4.4: Present Value Costs (excluding user charges)

| | Results (£m) (2010 prices, discounted to 2010) |
|---|---|
| Investment Costs | 904.9 |
| Maintenance Costs | 66.4 |
| Present Value of Costs, PVC (£000) | 971.3 |

⁸ Environmental Statement, Appendix 10.35

⁹ Environmental Statement, Chapter 10

5 Estimation of Benefits

5.1 Economic Parameters

5.1.1 The WebTAG databook contains the default economic data that should be adopted for the economic appraisal of transport schemes. This data is included in the economics file within the TUBA software used to undertake the appraisal. Relevant economic data and parameters include the following:

- Rates of inflation to convert monetary values to a consistent price base;
- Discount rates to convert future values to present values;
- Values of time and estimated rates of change;
- Trip purpose proportions by time period;
- Vehicle occupancies;
- Parameters for fuel consumption (related to travel distances and times);
- Proportion of petrol and diesel within vehicle fleet and estimated rates of change;
- Fuel costs and estimated rates of change;
- Rates of change in fuel efficiency;
- Tax rates and estimated rates of change;
- Non fuel vehicle operating cost parameters (related to travel distance and times) and estimated changes;
- Carbon dioxide emission rates; and
- Monetary values of carbon dioxide emissions.

5.1.2 TUBA version 1.9.8 Interim is based on the most up to date WebTAG databook. As noted, this adopts new values of time for car travel. For the employer's business user class, values of time are now assumed to vary with trip distances such that those travelling on longer distance trips have a higher value of time than those travelling on shorter distance trips. A continuous function is provided in the WebTAG databook (and included in TUBA version 1.9.8) which describes the relationship between trip distance and value of time for this user class. In accordance with WebTAG, the continuous function has been employed in the economic appraisal of the M4CaN Scheme.

5.2 Transport Model Inputs

5.2.1 TUBA requires matrices to be input containing data from the Do Minimum and Do Something traffic forecasts, to enable the software to calculate benefits to transport users. The following matrices are extracted from the M4CaN transport model:

- trip matrices, which give the number of trips travelling between each origin and destination zone in the traffic assignment model;
- time matrices, which represent the average time for travel between each of the origin and destination zones; and
- distance matrices, which represent the average distance of trips travelled between each of the origin and destination zones.

5.2.2 The traffic assignment model has five user classes:

- Car – employer's business;

- Car – other;
- Car – commute;
- Light Goods Vehicles; and
- Heavy Goods Vehicles.

5.2.3 Matrices are extracted from the transport model for each of the above user classes. Benefits are estimated for each user class separately.

5.2.4 The traffic model represents typical operational conditions on the highway network in terms of average flows and speeds on a normal day of operation. The model does not reflect those occasions when a major incident may have occurred, which results in severe reduction in network performance. In such instances, congestion and increased journey times will impose additional costs to the travelling public.

5.2.5 As a result, benefits of the Scheme that relate to improvements in journey time reliability or network resilience do not form part of the quantified benefits of the Scheme. On this basis, the economic appraisal is likely to substantially underestimate the benefits of the Scheme for users of the M4 around Newport.

5.3 Appraisal Period and Modelled Years

5.3.1 Scheme benefits are calculated over a 60 year period from 2022 to 2081. Matrices are extracted from the traffic assignment model for the years 2022, 2037 and 2051 and used as input to TUBA. The year 2051 represents the last year for which NTEM traffic growth forecasts are available. TUBA calculates the benefits for each of the modelled forecast years and then interpolates to calculate the benefits for the intervening years. From 2051 onwards, the economic appraisal assumes no change in traffic flows, journey times or distances.

5.4 Annualisation Factors

5.4.1 Annualisation factors have been calculated to convert the traffic model outputs from the modelled time periods up to annual values. The annualisation factors were calculated from traffic count data on the M4 motorway and are shown in Table 5.1. Annualising the benefits of the scheme using traffic count data ensures that the modelled traffic volumes in each peak hour are expanded to represent traffic flows over the full three hour AM and PM peak periods. A similar process has been applied to convert Interpeak model outputs to represent off-peak and weekend periods.

Table 5.1: Annualisation Factors

| Description | Annualisation Factor | Modelled Time Period |
|---|----------------------|----------------------|
| AM peak hour to total annual hours during AM peak | 719 | AM Peak Hour |
| Interpeak hour to total annual hours during interpeak | 1518 | Interpeak Hour |
| PM peak hour to total annual hours during PM peak | 708 | PM Peak Hour |
| Interpeak hour to total annual hours during weekends | 1503 | Interpeak Hour |
| Interpeak hour to total annual off-peak hours | 915 | Interpeak Hour |

5.5 Benefits During Construction and Maintenance

5.5.1 Traffic management measures put in place during construction and maintenance works tend to result in changes in journey times and vehicle operating costs. These impacts need to be taken into account in the economic appraisal for a scheme. Generally, the presence of roadworks results in increased travel costs and hence the benefits due to construction and maintenance works are normally negative. However, in the case of the M4CaN, the presence of the new motorway will reduce the impact on users of maintenance works on the existing M4. The economic appraisal attempts to take both benefits and disbenefits into account.

5.6 Impacts During Scheme Construction

5.6.1 The Scheme construction will be primarily off-line. However, traffic management measures will be required during the construction of the tie-ins between the new and existing M4 motorway corridor to the west of junction 28 and to the east of junction 23. The traffic management associated with the construction of these tie-ins would result in dis-benefits to traffic travelling on these sections of the highway network.

5.6.2 TUBA has been used to assess the cost of the disruption to road users during the construction of the tie-ins. Traffic forecasts have been prepared by coding the traffic management works into the 2022 Do Minimum network and assigning a trip matrix for the year relating to each construction phase. Table 5.2 outlines the assumed traffic management arrangements that were coded into the model network.

Table 5.2: Traffic Management Schedule During Construction

| Phase | Months | Castleton | Magor |
|-------|--------|---|--|
| A | 15 | (1) M4, west of J29 to west of J28:- 50mph speed limit (2) A48(M) near J29:- 50 mph speed limit (3) A48 at Pound Hill:- 1 lane each way , 40mph speed limit | (1) M4, J23A to mainline railway bridge:- 50mph speed limit (2) M48, east of J23:- 1 lane each way, 50mph speed limit (3) A4810, J23A to Llandeenny rbt:- 30mph speed limit (4) B4245, Undy to Rogiet:- 30mph speed limit |
| B | 4 | (1) M4 e/b diversion onto new link, with 5 lanes between J29 and J28, 50mph speed limit (2) M4 w/b, J28 to west of J29, 50mph speed limit (3) A48(M) e/b near J29:- 50 mph speed limit (4) A48(M) w/b diverge at J29 relocated, 1 lane, 50mph speed limit (5) A48 at Pound Hill:- 1 lane each way , 40mph speed limit | (1) M4, J23A to mainline railway bridge:- 50mph speed limit (2) M48, east of J23:- diversion onto new link and new rbt, 1 lane each way, 50mph speed limit (3) A4810, J23A to Llandeenny rbt:- 30mph speed limit |

| Phase | Months | Castleton | Magor |
|-------|--------|--|---|
| C | 11 | (1) M4 e/b diversion onto new link, with 5 lanes between J29 and J28, 50mph speed limit (2) M4 w/b, J28 to west of J29, 50mph speed limit (3) A48(M) e/b near J29:- 50 mph speed limit (4) A48(M) w/b diverge at J29 relocated, 1 lane, 50mph speed limit | (1) M4, J23A to mainline railway bridge:- 50mph speed limit (2) M48, east of J23:- diversion onto new link and new rbt, 1 lane each way, 50mph speed limit |
| D | 9 | (1) M4 e/b diversion onto new link, with 5 lanes between J29 and J28, 50mph speed limit (2) M4 w/b, diversion onto new link, 3 lanes between J28 to west of J29, 50mph speed limit (3) A48(M) e/b near J29:- 50 mph speed limit (4) A48(M) w/b:- 2 lane diverge from new w/b M4 link, 50mph speed limit | (1) M4, J23A to mainline railway bridge:- 50mph speed limit (2) M48, east of J23:- diversion onto new link and new rbt, 1 lane each way, 50mph speed limit |

5.6.3 For the purposes of the appraisal, indicative traffic forecasts have been prepared for each phase between 2018 and 2021, with the trip matrices being interpolated between the 2014 base year matrices and the 2022 forecast matrices. The model results were input to TUBA, and the resulting dis-benefits were factored from the four-year appraisal period to the duration assumed for each phase as shown in Table 5.2. The output from this TUBA appraisal of the impact of the construction works was then incorporated into the overall results of the appraisal.

5.7 Impacts During Maintenance

5.7.1 In addition to the cost of construction, it is necessary for the economic appraisal to take account of disruption during maintenance of both the new road and the existing M4 during the 60-year appraisal period.

5.7.2 As noted in Section 4, a draft maintenance schedule was devised for two scenarios following discussions with the Welsh Government:

- Do Minimum: the cost of maintaining the existing M4 between Junction 23 and Junction 29; and
- Do Something: the cost of maintaining both the existing M4 and the proposed scheme.

5.7.3 Table 5.3 summarises the assumed maintenance schedule used to calculate overall benefits in the Do Minimum Scenario, and the equivalent for the Do Something scenario.

5.7.4 Future year traffic forecasts have been used to estimate the impact of each maintenance schedule. The Do Minimum maintenance model results were input to TUBA for comparison with the standard Do Minimum model results, and the resulting disbenefits were factored down to the duration assumed for each maintenance scenario as shown in Table 5.3.

5.7.5 Similarly, the Do Something maintenance model results were compared with the standard Do Something model in TUBA, and the Do Something maintenance disbenefits factored to the duration assumed for each maintenance scenario, also shown in Table 5.3.

5.7.6 The Do Something maintenance disbenefits were then subtracted from the Do Minimum maintenance disbenefits to give the net impact on maintenance arising from the Scheme. The output from this TUBA assessment of the impact of the maintenance works was then incorporated into the overall results for the economic appraisal.

5.7.7 For the appraisal of the maintenance effects for the purposes of sensitivity tests, the results of the central growth tests have been factored on a pro-rata basis using the results from the operational phase assessment.

Table 5.3: Traffic Management Maintenance Schedule

| Description | Year | Do Minimum Scenario Traffic Management | Do Something Scenario Traffic Management |
|---|--------------------------------------|--|--|
| Waterproofing of River Usk Bridge and Malpas Viaduct | 2025 2065 | Complete closure of eastbound carriageway between J26 and J25a for 6 weeks followed by complete closure of westbound carriageway between J25a and J26 for 6 weeks. | Complete closure of eastbound carriageway between J26 and J25a for 6 weeks followed by complete closure of westbound carriageway between J25a and J26 for 6 weeks. |
| Major refurbishment of Brynglas Tunnels | 2047 2077 | 18 months of overnight closures (not modelled) | Complete closure of eastbound carriageway between J26 and J25a for 2 months followed by complete closure of westbound carriageway between J25a and J26 for 2 months. |
| Structural maintenance at Magor Junction | 2032 2042 2052 2062 2072 | N/A | Complete closure of eastbound on-slip from Magor junction to M4 eastbound for 1 month. |
| Structural maintenance to Usk Bridge and Viaduct | 2032 2042 2052 2062 2072 | N/A | 2 lanes @ 50mph between Glanllyn and Docks Way junctions for 3 months. |
| Structural maintenance to Duffryn rail, Ebbw River and Castleton Structures | 2032 2042 2052 2062 2072 | N/A | 2 lanes @ 50mph between Docks Way Junction and Castleton Interchange for 1 month. |
| Structural maintenance to Llandeenny rail structure | 2032 2042 2052 2062 2072 | N/A | 2 lanes @ 50mph between Magor Junction and Glan Llyn Interchange for 1 month. |

5.8 Accident Benefits

5.8.1 The safety impacts of the Scheme have been assessed quantitatively and monetised to be incorporated into the overall economic appraisal. Accident impacts have been calculated separately using Cost and Benefit to Accidents – Light Touch (COBA-LT¹⁰), a

¹⁰ COBALT (COst and Benefit to Accidents – Light Touch)
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spreadsheet application developed by the DfT to undertake the analysis of the impacts on accidents as part of the economic appraisal of road schemes.

5.8.2 COBA-LT compares accidents by severity and associated costs across the network in the Do Minimum Scenario with those in the Do Something scenario, using details of link and junction characteristics and forecast traffic volumes. The assessment covers both the construction and operational phases of the scheme. Monetised impacts are calculated based on the average costs of accidents by severity and road class. With the exception of the existing M4 between Junction 23 and Junction 29, the accident rates (accidents per million vehicle kilometres) used in COBA-LT are consistent with those defined in the WebTAG databook¹¹.

5.8.3 For the existing M4 around Newport, accident rates are based on observed accident rates derived from data collected over the most recently available five year period. In the 'do something' scenario, accident rates are assumed to remain constant on the existing M4 although, in practice, there may be some reduction in accident rates as a result of safety improvements resulting from the reclassification of the existing M4.

5.8.4 For the proposed new section of motorway, accident rates are based on average rates for a 3 lane motorway. In reality, it might be expected that a new motorway, designed to modern standards, would deliver better safety performance compared with the motorway network on average. However, in the absence of accident rates specifically relating to modern motorways it is not possible to reflect this in the analysis.

5.9 Present Value Benefits

5.9.1 The total discounted benefits of the Scheme are set out in Table 5.4 for the 'Core Scenario' for the M4CaN. The transport and economic benefits set out in Table 5.4 relate only to the direct user benefits and exclude consideration of wider economic benefits ('Wider Impacts') which is considered in Section 6 of this report.

5.9.2 User benefits (lower generalised journey costs for users) during normal operations account for the vast majority of the benefits of the Scheme. The Scheme offers further benefits to users by providing an alternative route for users during periods of maintenance, although these benefits are offset by negative impacts during the construction phase. Accident benefits are positive reflecting a slight reduction in accident rates during the operational phase. Greenhouse gas emissions are also reduced, albeit the monetised benefits resulting from this change is relatively minor.

5.9.3 In overall terms, the Scheme is expected to deliver benefits amounting to approximately £1.5bn (2010 prices and values) over the 60 year appraisal period.

¹¹ COBALT 2016.1 WebTAG 2016 parameters
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Table 5.4: Summary of Economic Appraisal (Core Scenario)

| | | Results (£m) (2010 prices, discounted to 2010) |
|--|-----------|---|
| User Benefits During Operation | Consumers | 850.7 |
| | Business | 696.7 |
| Construction Phase Impacts | Consumers | -21.0 |
| | Business | -14.4 |
| Maintenance Impacts | Consumers | 27.7 |
| | Business | 10.1 |
| Accident Benefits | | 4.2 |
| Greenhouse Gas Benefits | | 5.7 |
| Indirect Tax Revenues | | -18.7 |
| Present Value of Benefits, PVB (£000) | | 1,541.0 |

6 Wider Impacts

6.1 Overview

- 6.1.1** In WebTAG 'Wider Impacts' is the term given to a range of quantifiable 'wider economic benefits' of transport improvements. The inclusion of Wider Impacts in the economic appraisal of transport schemes recognises that transport improvements can result in economic impacts that are additional to the transport user benefits that are set out in Table 5.4.
- 6.1.2** A framework for the calculation of Wider Impacts has been established by the DfT and is formalised in WebTAG¹². Wider Impacts are relevant to the assessment of the overall value for money of the Scheme. However, as noted, Wider Impacts can be quantified with less certainty than user benefits and therefore the results of the economic appraisal are shown both with and without Wider Impacts.
- 6.1.3** It should be noted that the Wider Impacts framework in WebTAG is specifically aimed at capturing quantifiable economic impacts that are net additional at a UK level, in a manner that can be replicated across different transport interventions. The Wider Impacts assessment does not represent the 'total' economic impact of a transport improvement, nor does it take account of specific types of impact, such as changes in business location and investment, which may be of interest to policy makers. The wider economic benefits of the Scheme in a broader sense are considered, from both a quantitative and qualitative perspective, in the Revised Wider Economic Impact Assessment Report (December 2016).
- 6.1.4** There are three types of Wider Impacts which are assessed:
- **Wider Impact 1 – Agglomeration effects:** The term agglomeration refers to the density of economic activity in an area. Firms derive productivity benefits from being located close to other firms and from being located in large labour markets. Transport improvements can increase the 'effective density' of an economy by reducing transport costs, thereby improving accessibility between firms in an area, and between firms and the workforce. Therefore, transport schemes that improve accessibility can deliver productivity benefits over and above the direct user benefits.
 - **Wider Impact 2 – Output change in imperfectly competitive markets:** Transport improvements can result in lower transport costs for firms. Firms tend to respond to lower costs by reducing prices and increasing output of goods and services. This results in a welfare benefit to consumers that is not captured in the assessment of user benefits. This is because, under conditions of imperfect competition (which is the prevailing state of the economy), consumer's willingness to pay for the additional output will exceed the cost of producing it.
 - **Wider Impact 3 – Labour market impacts:** Transport costs can act as a barrier to entry into the labour market, given that individuals will weight up the costs of travelling to work against the wages they will earn. Lowering transport costs can improve access to employment opportunities and increase the overall level of employment in an economy. While some of these benefits are captured in the main economic appraisal (in the form of user benefits for commuters) the changes in tax revenues resulting from increased employment are not. Wider Impact 3 is calculated by estimating the impact of changes in the labour market on tax revenues.

¹² Transport Analysis Guidance Unit A2.1 Wider Impacts, Department for Transport, January 2014
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6.1.5 A Wider Impacts model has been constructed for the assessment of Wider Impact 1 (agglomeration effects) and Wider Impact 3 (labour market effects). This is based on a study area comprising 22 zones covering South Wales and the West of England. Zones correspond to local authority areas, whilst in closer proximity to the Scheme, local authority areas have been split in two to provide additional detail. For the purposes of the agglomeration impacts assessment, the model includes a 'buffer area' comprising 13 zones (corresponding to local authority areas) surrounding the study area. Agglomeration benefits within these zones are not assessed but the buffer areas serve to provide a more accurate assessment of the 'effective density' of zones within the study area.

6.1.6 The Wider Impacts model takes outputs from the M4CaN traffic model. Calculations are based on the economic data provided in the WebTAG Wider Impacts Dataset. This has been supplemented by more disaggregated employment statistics from the Business Register and Employment Survey.

6.2 Wider Impact 1: Agglomeration Impacts

6.2.1 The calculation of agglomeration effects is a two stage process. Firstly, the 'effective density' of each zone is calculated – under do minimum and do something scenarios – based on the average generalised costs of travel between zones. Effective density is measured in each modelled year for each of four sectors (manufacturing, construction, consumer services, and producer services). The change in effective density resulting from the Scheme is calculated on the basis of fixed land use. Therefore, the assessment does not take into account agglomeration effects resulting from changes in business location resulting from the scheme which are likely to stimulate further agglomeration benefits.

6.2.2 The overall weighted average changes in effective density across the Wider Impact model area are given in Table 6.1. Results are presented at a local authority level.

Table 6.1: Modelled Changes in Effective Density

| Local Authority | Weighted Average Change in Effective Density (Do Something vs Do Minimum) | | |
|-----------------------|---|------|------|
| | 2022 | 2037 | 2051 |
| Newport | 0.7% | 2.3% | 2.5% |
| Cardiff | 0.7% | 1.0% | 1.0% |
| The Vale of Glamorgan | 0.6% | 0.9% | 1.0% |
| Swansea | 0.3% | 0.4% | 0.4% |
| Neath Port Talbot | 0.3% | 0.5% | 0.5% |
| Bridgend | 0.6% | 0.9% | 1.0% |
| Rhondda, Cynon, Taff | 0.6% | 0.9% | 1.0% |
| Merthyr Tydfil | 0.1% | 0.3% | 0.3% |
| Caerphilly | 0.2% | 0.6% | 0.6% |
| Blaenau Gwent | -0.2% | 0.1% | 0.1% |
| Torfaen | -0.4% | 0.2% | 0.3% |
| Monmouthshire | 1.3% | 2.6% | 2.7% |
| Bristol | 0.4% | 0.4% | 0.4% |
| South Gloucestershire | -0.2% | 0.9% | 0.5% |
| North Somerset | 0.0% | 0.1% | 0.9% |
| Bath & NE Somerset | 0.2% | 0.1% | 0.1% |

6.2.3 The second stage is to calculate changes in GDP per worker across the four sectors, for employment in each zone based on empirical relationships between effective density and productive (GDP per worker).

6.2.4 GDP impacts are calculated by multiplying the change in GDP worker by the number of employees in each sector. Across the study area, the total agglomeration benefits are predicted to be £8.1m in 2022 and £23.8m in 2037 (2010 prices).

Table 6.2: Changes in GDP

| Local Authority | Change in GDP £m (Do Something vs Do Minimum) 2010 Prices (Undiscounted) | | |
|-----------------------|---|-------------|-------------|
| | 2022 | 2037 | 2051 |
| Newport | 1.0 | 4.7 | 7.3 |
| Cardiff | 2.9 | 5.8 | 8.3 |
| The Vale of Glamorgan | 0.3 | 0.5 | 0.8 |
| Swansea | 0.2 | 0.4 | 0.6 |
| Neath Port Talbot | 0.1 | 0.3 | 0.3 |
| Bridgend | 0.3 | 0.7 | 0.9 |
| Rhondda, Cynon, Taff | 0.5 | 0.8 | 1.1 |
| Merthyr Tydfil | 0.0 | 0.1 | 0.1 |
| Caerphilly | 0.2 | 0.7 | 1.1 |
| Blaenau Gwent | 0.0 | 0.0 | 0.0 |
| Torfaen | -0.1 | 0.2 | 0.4 |
| Monmouthshire | 0.6 | 1.8 | 2.9 |
| Bristol | 2.5 | 3.6 | 6.1 |
| South Gloucestershire | -0.7 | 4.0 | 3.0 |
| North Somerset | 0.0 | 0.1 | 4.0 |
| Bath & NE Somerset | 0.3 | 0.0 | 0.0 |
| TOTAL | 8.1 | 23.8 | 36.9 |

6.2.5 GDP impacts for the overall 60 year appraisal period are calculated by interpolating the results of the 2022, 2037 and 2051 assessments. From 2051 onwards, GDP impacts are assumed to grow in line with growth rates for values of time provided in the WebTAG databook.

6.2.6 Over the 60 year appraisal period, agglomeration impacts are estimated to generate a GDP impact and net economic benefit of £503.5m (2010 prices and values).

6.3 Wider Impact 2: Output Change in Imperfectly Competitive Markets

6.3.1 As noted, this benefit arises through the cost savings experienced by business users. WebTAG guidance recommends that this wider impact is calculated by applying a 10% uplift to the business user benefits.

6.3.2 Over the 60 year appraisal period, Wider Impact 2 results in additional benefits of £69.2m (2010 prices and values).

6.4 Wider Impact 3: Labour Market Impacts

6.4.1 Impacts on labour supply (individuals entering the labour market as a result of reduced costs of commuting) have been calculated. Tax revenues arising from these impacts are expected to result in additional benefits of £4.6m (2010 prices and values) over the 60 year appraisal period.

6.5 Summary of Wider Impacts Assessment

6.5.1 A summary of the economic appraisal results, including Wider Impacts, are shown in Table 6.3 for the Core Scenario. The Wider Impacts of the Scheme are calculated as £0.6bn (2010 prices). This represents an increased in scheme benefits of 37%. This result is within the normally expected range for Wider Impacts assessments of major transport schemes in urban or inter-urban areas that result in a decrease in travel times.

Table 6.3: Summary of Wider Impacts Assessment (Central Growth)

| | Results (£m) (2010 prices, discounted to 2010) |
|---|---|
| Wider Impact 1: Agglomeration Impacts | 503.5 |
| Wider Impact 2: Increased Output in Imperfectly Competitive Markets | 69.2 |
| Wider Impact 3: Labour Market Impacts | 4.6 |
| Total Wider Impacts, PVB (£000) | 577.4 |

7 Economic Appraisal Results

7.1 Results

7.1.1 This Chapter presents the results of the economic appraisal. Results are provided for the central traffic growth forecasts as well as for sensitivity tests in relation to future traffic growth and a 'no toll' scenario for the Severn Crossings.

7.2 Core Scenario

7.2.1 A summary of the economic appraisal results for the Scheme are shown in Tables 7.1 and 7.2 for the Core Scenario, while the full results are given in the tables set out in Appendix A. The Core Scenario is based on the central (or most likely) traffic growth scenario and assumes half toll levels on the Severn Crossings.

7.2.2 The Analysis of Monetised Costs and Benefits compares the PVB and the PVC to give the Net Present Value (NPV) and Benefit to Cost Ratio (BCR) for the Scheme. The NPV is calculated by subtracting the present value of costs (PVC) from the total present value of benefits (PVB). The BCR is calculated by dividing the PVB by the PVC.

7.2.3 A positive NPV and a BCR greater than unity indicate that the benefits due to the Scheme outweigh its costs and so it is positive in economic terms. The higher the NPV and BCR, the better the value for money of the Scheme.

7.2.4 The results presented in Table 7.1 are based only on direct transport benefits and do not take account of the expected wider economic benefits that are an indirect impact of the scheme. The BCR calculated on this basis is referred to as the 'Initial BCR' for the Scheme.

Table 7.1: Summary of Economic Appraisal: Core Scenario (Excluding Wider Impacts)

| | | Results (£m) (2010 prices, discounted to 2010) |
|---|-----------|---|
| User Benefits | Consumers | 850.7 |
| | Business | 696.7 |
| Construction Phase Impacts | Consumers | -21.0 |
| | Business | -14.4 |
| Maintenance Impacts | Consumers | 27.7 |
| | Business | 10.1 |
| Accident Benefits | | 4.2 |
| Greenhouse Gas Benefits | | 5.7 |
| Indirect Tax Revenues | | -18.7 |
| Initial Present Value of Benefits, PVB | | 1,541.0 |
| Present Value of Costs, PVC | | 952.0 |
| Initial Net Present Value, NPV | | 589.0 |
| Initial Benefit-to-Cost Ratio, BCR | | 1.62 |

7.2.5 The results indicate that, assuming central growth predictions, the Scheme has a positive NPV of £0.6bn and a BCR of 1.62. This indicates that the Scheme would represent value

for money as the Scheme costs will be more than offset by the improvements in transport economic efficiency, safety and carbon emissions.

7.2.6 Table 7.2 sets out the results of the appraisal if Wider Impacts are included in the analysis to give an ‘Adjusted BCR’ for the scheme. If assessed on this basis, the NPV increases to £1.2bn and the BCR increases to 2.23. This demonstrates that the benefits of the scheme outweigh costs by a ratio in excess of two to one.

Table 7.2: Summary of Economic Appraisal (Central Growth)

| | Results (£m) (2010 prices, discounted to 2010) |
|---|---|
| Initial Present Value Benefits, PVB | 1,541.0 |
| Wider Impact 1: Agglomeration Impacts | 503.5 |
| Wider Impact 2: Increased Output in Imperfectly Competitive Markets | 69.2 |
| Wider Impact 3: Labour Market Impacts | 4.6 |
| Total Wider Impacts, PVB | 577.4 |
| Adjusted Present Value of Benefits, PVB | 2,118.4 |
| Present Value of Costs, PVC | 952.0 |
| Adjusted Net Present Value, NPV | 1,166.4 |
| Adjusted Benefit-to-Cost Ratio, BCR | 2.23 |

7.3 Sensitivity Analysis – Low and High Growth

7.3.1 In addition to the central growth forecasts, sensitivity tests were carried out for low and high growth scenarios. The derivation of these forecasts is detailed in the Traffic Forecasting Report. The results of the economic appraisal for these forecasts are summarised in Table 7.3.

7.3.2 Under a low traffic growth scenario, the benefits of the scheme are reduced such that the initial BCR for the scheme falls slightly below one to 0.94. However, if Wider Impacts are included, the low growth BCR remains above one at 1.38. The high growth BCR is 2.81 if Wider Impacts are excluded, or 3.64 including Wider Impacts.

Table 7.3: Economic Appraisal, Low and High Growth Forecasts

| | | Results (£m) 2010 Prices, Discounted to 2010 | |
|--|---------------------------------------|---|--------------------|
| | | Low Growth | High Growth |
| Direct Transport Economic Benefits | Present Value of Benefits, PVB (£000) | 897.8 | 2,671.5 |
| | Present Value of Costs, PVC (£000) | 951.1 | 952.3 |
| | Net Present Value, NPV (£000) | -53,240 | 1,719.2 |
| | Benefit-to-Cost Ratio, BCR | 0.94 | 2.81 |
| Direct and Wider Transport Economic Benefits | Present Value of Benefits, PVB (£000) | 1,310.4 | 3,464.1 |
| | Present Value of Costs, PVC (£000) | 951.1 | 952.3 |
| | Net Present Value, NPV (£000) | 359.3 | 2,512.8 |
| | Benefit-to-Cost Ratio, BCR | 1.38 | 3.64 |

7.4 Sensitivity Analysis – Severn Crossing Tolls

7.4.1 The future of the Severn Crossing tolls is a factor which will influence future traffic flows on the M4 corridor around Newport. The Core Scenario for the M4CaN scheme is based on a half toll scenario in line with the UK Government's stated intention regarding the future of the toll following the end of the current concession arrangement.

7.4.2 However, in view of the uncertainty over the long term future of the Severn Crossing Tolls, a sensitivity test has been undertaken which assumes that the tolls are removed. This is the publicly stated position of many Welsh Assembly members who consider the tolls to be a tax on the Welsh economy.

7.4.3 If tolls are removed, the Initial BCR for the scheme increases to 1.83. If Wider Impacts are then included, the Adjusted BCR for the scheme would be 2.46.

Table 7.4: Economic Appraisal, No Severn Crossing Tolls

| | | Results (£m) |
|--|---------------------------------------|---------------------------------|
| | | 2010 Prices, Discounted to 2010 |
| | | No Severn Crossing Tolls |
| Direct Transport Economic Benefits | Present Value of Benefits, PVB (£000) | 1,778.4 |
| | Present Value of Costs, PVC (£000) | 971.3 |
| | Net Present Value, NPV (£000) | 807.1 |
| | Benefit-to-Cost Ratio, BCR | 1.83 |
| Direct and Wider Transport Economic Benefits | Present Value of Benefits, PVB (£000) | 2,393.8 |
| | Present Value of Costs, PVC (£000) | 971.3 |
| | Net Present Value, NPV (£000) | 1,422.8 |
| | Benefit-to-Cost Ratio, BCR | 2.46 |

8 Summary and Conclusions

- 8.1.1** This report sets out the results of the economic appraisal of the M4CaN Scheme. The economic appraisal (often termed cost-benefit analysis), provides a measure of the value for money of the Scheme.
- 8.1.2** The economic appraisal has been revised to take account of changes to the M4CaN transport model (as detailed in the Revised Traffic Forecasting Report) and is based on the most recent guidance published by the DfT (WebTAG). The results set out in this report supersede the economic appraisal results set out in the EAR published in March 2016.
- 8.1.3** The economic appraisal has been undertaken using TUBA software in order to take account of the effects of the variable demand modelling. As TUBA does not calculate accident benefits, these have been estimated separately using COBA-LT. The assessments have been carried out over a 60-year period, in accordance with the WebTAG Unit A1-1. An assessment of Wider Impacts (also termed wider economic benefits) has also been undertaken in accordance with WebTAG Unit A2.1.
- 8.1.4** The assessment of user benefits is based on outputs from the M4CaN transport model. The model represents typical operational conditions on the highway network in terms of average flows and speeds on a normal day of operation. The model does not reflect those occasions when a major incident may have occurred, which results in severe reduction in network performance. In such instances, the improved network resilience and capacity offered by the M4CaN scheme would minimise the disruption caused by the incident and reduce the additional costs imposed on the travelling public, resulting in a net economic benefit. As a result, the benefits of the Scheme in relation to improved reliability and resilience are not included in the economic appraisal of the Scheme.
- 8.1.5** The results have indicated that the Scheme would provide value for money. The core scenario for the Scheme is based on the central (or most likely) traffic growth forecasts and assumes that the tolls on the Severn Crossings are half their current level. Under this scenario, the Scheme has an initial benefit to cost ratio (Initial BCR) of 1.62. The initial BCR takes into account only the direct economic benefits of the scheme. If Wider Impacts (indirect economic benefits) are included in the assessment, the BCR for the Scheme is 2.23. In other words, the benefits of the scheme outweigh its costs by a ratio of over 2 to 1.
- 8.1.6** Sensitivity tests have also been undertaken which consider the effect on the economic appraisal of lower or higher than anticipated traffic growth. Between the low and high traffic growth forecasts, the adjusted BCR for the scheme (including Wider Impacts) ranges from 1.38 to 3.64.
- 8.1.7** A further sensitivity test has been undertaken in which it is assumed that tolls on the Severn Crossings are removed. Under a no toll scenario (assuming central growth forecasts) the adjusted BCR for the Scheme increases from 2.23 to 2.46.
- 8.1.8** In conclusion, this assessment has shown that, for a range of assumed future conditions, the provision of a new section of motorway to the south of Newport represents value for money in respect of the investment needed to deliver the Scheme.

Appendix A

A1 Results for Core Scenario

A1.1 TEE Table

| Non-business: Commuting | ALL MODES | ROAD | BUS and COACH RAIL | | OTHER | |
|---|------------------|--------------------------------|---------------------------------|-------------------|-------------------|-------------------|
| <u>User benefits</u> | TOTAL | Private Cars and LGVs | Passengers | Passengers | | |
| Travel time | 249,955 | 249,955 | | | | |
| Vehicle operating costs | -5,376 | -5,376 | | | | |
| User charges | -261 | -261 | | | | |
| During Construction & Maintenance | 5,210 | 5210 | | | | |
| NET NON-BUSINESS BENEFITS: COMMUTING | 249,528 | 249,528 | | | | |
| | | (1a) | | | | |
| Non-business: Other | ALL MODES | ROAD | BUS and COACH RAIL | | OTHER | |
| <u>User benefits</u> | TOTAL | Private Cars and LGVs | Passengers | Passengers | | |
| Travel time | 604,967 | 604,967 | | | | |
| Vehicle operating costs | 3,060 | 3,060 | | | | |
| User charges | -1,672 | -1,672 | | | | |
| During Construction & Maintenance | 1,543 | 1,543 | | | | |
| NET NON-BUSINESS BENEFITS: OTHER | 607,898 | 607,898 | | | | |
| | | (1b) | | | | |
| Business | | Goods Vehicles | Business Cars & LGVs | Passengers | Freight | Passengers |
| <u>User benefits</u> | | | | | | |
| Travel time | 572,731 | 88,652 | 484,079 | | | |
| Vehicle operating costs | 127,047 | 98,468 | 28,579 | | | |
| User charges | -3,077 | -2,144 | -933 | | | |
| During Construction & Maintenance | -4,295 | -1,029 | -3,266 | | | |
| Subtotal | 692,406 | 183,947 | 508,459 | | | |
| | | (2) | | | | |
| Private sector provider impacts | | | | Freight | Passengers | |
| Revenue | 0 | | | | | |
| Operating costs | 0 | | | | | |
| Investment costs | 0 | | | | | |
| Grant/subsidy | 0 | | | | | |
| Subtotal | 0 | | | | | |
| | | (3) | | | | |
| Other business impacts | | | | | | |
| Developer contributions | 0 | | | | | |
| | | (4) | | | | |
| NET BUSINESS IMPACT | 692,406 | (5) = (2) + (3) + (4) | | | | |
| TOTAL | | | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,549,832 | (6) = (1a) + (1b) + (5) | | | | |

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

A1.2 Public Accounts Table

| | ALL MODES | ROAD | BUS and COACH | RAIL | OTHER |
|--|--------------------------|-----------------------|---------------|------|-------|
| Local Government Funding | TOTAL | INFRASTRUCTURE | | | |
| Revenue | 0 | 0 | | | |
| Operating Costs | 0 | 0 | | | |
| Investment Costs | 0 | 0 | | | |
| Developer and Other Contributions | 0 | 0 | | | |
| Grant/Subsidy Payments | 0 | 0 | | | |
| NET IMPACT | 0 (7) | 0 | | | |
| Central Government Funding: Transport | | | | | |
| Revenue | -19,248 | -19,248 | | | |
| Operating costs | 66,363 | 66,363 | | | |
| Investment Costs | 904,920 | 904,920 | | | |
| Developer and Other Contributions | 0 | 0 | | | |
| Grant/Subsidy Payments | 0 | 0 | | | |
| NET IMPACT | 952,035 (8) | 952,035 | | | |
| Central Government Funding: Non-Transport | | | | | |
| Indirect Tax Revenues | 18,667 (9) | 18,667 | | | |
| TOTALS | | | | | |
| Broad Transport Budget | 952,035 (10) = (7) + (8) | | | | |
| Wider Public Finances | 18,667 (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.

A1.3 Analysis of Monetised Costs and Benefits

| Analysis of Monetised Costs and Benefits: M4 CaN Core Scenario | |
|--|---|
| Noise | 0 (12) |
| Local Air Quality | 0 (13) |
| Greenhouse Gases | 5,716 (14) |
| Journey Quality | 0 (15) |
| Physical Activity | 0 (16) |
| Accidents | 4,155 (17) |
| Economic Efficiency: Consumer Users (Commuting) | 249,528 (1a) |
| Economic Efficiency: Consumer Users (Other) | 607,898 (1b) |
| Economic Efficiency: Business Users and Providers | 692,406 (5) |
| Wider Public Finances (Indirect Taxation Revenues) | -18,667 - (11) - sign changed from PA table, as PA table represents costs, not benefits |
| Present Value of Benefits (see notes) (PVB) | 1,541,036 (PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11) |
| Broad Transport Budget | 952,035 (10) |
| Present Value of Costs (see notes) (PVC) | 952,035 (PVC) = (10) |
| OVERALL IMPACTS | |
| Net Present Value (NPV) | 589,001 NPV=PVB-PVC |
| Benefit to Cost Ratio (BCR) | 1.62 BCR=PVB/PVC |

A2 Results for Low Growth scenario

A2.1 TEE Table

| Non-business: Commuting | ALL MODES | ROAD | BUS and COACH | RAIL | OTHER | |
|---|--------------------------------------|------------------------------|---------------------------------|-------------------|-------------------|-------------------|
| User benefits | TOTAL | Private Cars and LGVs | Passengers | Passengers | | |
| Travel time | 125,404 | 125,404 | | | | |
| Vehicle operating costs | -9,990 | -9,990 | | | | |
| User charges | -248 | -248 | | | | |
| During Construction & Maintenance | -2,198 | -2,198 | | | | |
| NET NON-BUSINESS BENEFITS: COMMUTING | 112,968 (1a) | 112,968 | | | | |
| Non-business: Other | ALL MODES | ROAD | BUS and COACH | RAIL | OTHER | |
| User benefits | TOTAL | Private Cars and LGVs | Passengers | Passengers | | |
| Travel time | 365,270 | 365,270 | | | | |
| Vehicle operating costs | -3,274 | -3,274 | | | | |
| User charges | -1,851 | -1,851 | | | | |
| During Construction & Maintenance | -4,022 | -4,022 | | | | |
| NET NON-BUSINESS BENEFITS: OTHER | 356,123 (1b) | 356,123 | | | | |
| Business | | Goods Vehicles | Business Cars & LGVs | Passengers | Freight | Passengers |
| User benefits | | | | | | |
| Travel time | 333,309 | 26,665 | 306,644 | | | |
| Vehicle operating costs | 113,115 | 85,639 | 27,476 | | | |
| User charges | -3,115 | -1,926 | -1,189 | | | |
| During Construction & Maintenance | -7,881 | -1,927 | -5,954 | | | |
| Subtotal | 435,428 (2) | 108,451 | 326,977 | | | |
| Private sector provider impacts | | | | Freight | Passengers | |
| Revenue | 0 | | | | | |
| Operating costs | 0 | | | | | |
| Investment costs | 0 | | | | | |
| Grant/subsidy | 0 | | | | | |
| Subtotal | 0 (3) | | | | | |
| Other business impacts | | | | | | |
| Developer contributions | 0 (4) | | | | | |
| NET BUSINESS IMPACT | 435,428 (5) = (2) + (3) + (4) | | | | | |
| TOTAL | | | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 904,519 (6) = (1a) + (1b) + (5) | | | | | |

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

A2.2 Public Accounts Table

| | ALL MODES | ROAD | BUS and COACH | RAIL | OTHER |
|--|--------------------------|-----------------------|---------------|------|-------|
| Local Government Funding | TOTAL | INFRASTRUCTURE | | | |
| Revenue | 0 | 0 | | | |
| Operating Costs | 0 | 0 | | | |
| Investment Costs | 0 | 0 | | | |
| Developer and Other Contributions | 0 | 0 | | | |
| Grant/Subsidy Payments | 0 | 0 | | | |
| NET IMPACT | 0 (7) | 0 | | | |
| Central Government Funding: Transport | | | | | |
| Revenue | -20,224 | -20,224 | | | |
| Operating costs | 66,363 | 66,363 | | | |
| Investment Costs | 904,920 | 904,920 | | | |
| Developer and Other Contributions | 0 | 0 | | | |
| Grant/Subsidy Payments | 0 | 0 | | | |
| NET IMPACT | 951,059 (8) | 951,059 | | | |
| Central Government Funding: Non-Transport | | | | | |
| Indirect Tax Revenues | 13,661 (9) | 13,661 | | | |
| TOTALS | | | | | |
| Broad Transport Budget | 951,059 (10) = (7) + (8) | | | | |
| Wider Public Finances | 13,661 (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.

A2.3 Analysis of Monetised Costs and Benefits

| Analysis of Monetised Costs and Benefits: M4 CaN Low Traffic Growth | |
|---|---|
| Noise | 0 (12) |
| Local Air Quality | 0 (13) |
| Greenhouse Gases | 2,806 (14) |
| Journey Quality | 0 (15) |
| Physical Activity | 0 (16) |
| Accidents | 4,155 (17) |
| Economic Efficiency: Consumer Users (Commuting) | 112,968 (1a) |
| Economic Efficiency: Consumer Users (Other) | 356,123 (1b) |
| Economic Efficiency: Business Users and Providers | 435,428 (5) |
| Wider Public Finances (Indirect Taxation Revenues) | -13,661 - (11) - sign changed from PA table, as PA table represents costs, not benefits |
| Present Value of Benefits (see notes) (PVB) | 897,819 (PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11) |
| Broad Transport Budget | 951,059 (10) |
| Present Value of Costs (see notes) (PVC) | 951,059 (PVC) = (10) |
| OVERALL IMPACTS | |
| Net Present Value (NPV) | -53,240 NPV=PVB-PVC |
| Benefit to Cost Ratio (BCR) | 0.94 BCR=PVB/PVC |

A3 Results for High Growth scenario

A3.1 TEE Table

| Non-business: Commuting | | ALL MODES | ROAD | BUS and COACH | RAIL | OTHER | |
|---|------------------|-------------------------|------------------------------|---------------------------------|-------------------|-------------------|-------------------|
| <u>User benefits</u> | | TOTAL | Private Cars and LGVs | Passengers | Passengers | | |
| Travel time | 451,356 | 451,356 | 451,356 | | | | |
| Vehicle operating costs | -2,732 | -2,732 | -2,732 | | | | |
| User charges | -174 | -174 | -174 | | | | |
| During Construction & Maintenance | 16,920 | 16,920 | 16,920 | | | | |
| NET NON-BUSINESS BENEFITS: COMMUTING | 465,370 | (1a) 465,370 | 465,370 | | | | |
| Non-business: Other | | ALL MODES | ROAD | BUS and COACH | RAIL | OTHER | |
| <u>User benefits</u> | | TOTAL | Private Cars and LGVs | Passengers | Passengers | | |
| Travel time | 1,039,771 | 1,039,771 | 1,039,771 | | | | |
| Vehicle operating costs | 6,111 | 6,111 | 6,111 | | | | |
| User charges | -1,196 | -1,196 | -1,196 | | | | |
| During Construction & Maintenance | 11,451 | 11,451 | 11,451 | | | | |
| NET NON-BUSINESS BENEFITS: OTHER | 1,056,137 | (1b) 1,056,137 | 1,056,137 | | | | |
| Business | | | Goods Vehicles | Business Cars & LGVs | Passengers | Freight | Passengers |
| <u>User benefits</u> | | | | | | | |
| Travel time | 1,001,869 | 1,001,869 | 208,801 | 793,068 | | | |
| Vehicle operating costs | 159,346 | 159,346 | 123,454 | 35,892 | | | |
| User charges | -2,816 | -2,816 | -1,640 | -1,176 | | | |
| During Construction & Maintenance | 2,012 | 2,012 | 653 | 1,359 | | | |
| Subtotal | 1,160,411 | (2) 1,160,411 | 331,268 | 829,143 | | | |
| Private sector provider impacts | | | | | Freight | Passengers | |
| Revenue | 0 | 0 | | | | | |
| Operating costs | 0 | 0 | | | | | |
| Investment costs | 0 | 0 | | | | | |
| Grant/subsidy | 0 | 0 | | | | | |
| Subtotal | 0 | (3) 0 | | | | | |
| Other business impacts | | | | | | | |
| Developer contributions | | (4) | | | | | |
| NET BUSINESS IMPACT | 1,160,411 | (5) = (2) + (3) + (4) | | | | | |
| TOTAL | | | | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 2,681,918 | (6) = (1a) + (1b) + (5) | | | | | |

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

A3.2 Public Accounts Table

| | ALL MODES | ROAD | BUS and COACH | RAIL | OTHER |
|--|--------------------------|-----------------------|---------------|------|-------|
| Local Government Funding | TOTAL | INFRASTRUCTURE | | | |
| Revenue | 0 | 0 | | | |
| Operating Costs | 0 | 0 | | | |
| Investment Costs | 0 | 0 | | | |
| Developer and Other Contributions | 0 | | | | |
| Grant/Subsidy Payments | 0 | 0 | | | |
| NET IMPACT | 0 (7) | 0 | | | |
| Central Government Funding: Transport | | | | | |
| Revenue | -18,997 | -18,997 | | | |
| Operating costs | 66,363 | 66,363 | | | |
| Investment Costs | 904,920 | 904,920 | | | |
| Developer and Other Contributions | 0 | 0 | | | |
| Grant/Subsidy Payments | 0 | 0 | | | |
| NET IMPACT | 952,286 (8) | 952,286 | | | |
| Central Government Funding: Non-Transport | | | | | |
| Indirect Tax Revenues | 22,828 (9) | 22,828 | | | |
| TOTALS | | | | | |
| Broad Transport Budget | 952,286 (10) = (7) + (8) | | | | |
| Wider Public Finances | 22,828 (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.

A3.3 Analysis of Monetised Costs and Benefits

| Analysis of Monetised Costs and Benefits: M4 CaN High Traffic Growth | |
|--|---|
| Noise | 0 (12) |
| Local Air Quality | 0 (13) |
| Greenhouse Gases | 8,270 (14) |
| Journey Quality | 0 (15) |
| Physical Activity | 0 (16) |
| Accidents | 4,155 (17) |
| Economic Efficiency: Consumer Users (Commuting) | 465,370 (1a) |
| Economic Efficiency: Consumer Users (Other) | 1,056,137 (1b) |
| Economic Efficiency: Business Users and Providers | 1,160,411 (5) |
| Wider Public Finances (Indirect Taxation Revenues) | -22,828 - (11) - sign changed from PA table, as PA table represents costs, not benefits |
| Present Value of Benefits (see notes) (PVB) | 2,671,514 (PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11) |
| Broad Transport Budget | 952,286 (10) |
| Present Value of Costs (see notes) (PVC) | 952,286 (PVC) = (10) |
| OVERALL IMPACTS | |
| Net Present Value (NPV) | 1,719,228 NPV=PVB-PVC |
| Benefit to Cost Ratio (BCR) | 2.81 BCR=PVB/PVC |

A4 Results for No Severn Crossing Tolls scenario

A4.1 TEE Table

| Non-business: Commuting | ALL MODES | ROAD | BUS and COACH | RAIL | OTHER | |
|---|--|------------------------------|---------------------------------|-------------------|-------------------|-------------------|
| <u>User benefits</u> | TOTAL | Private Cars and LGVs | Passengers | Passengers | | |
| Travel time | 283,442 | 283,442 | | | | |
| Vehicle operating costs | -13,092 | -13,092 | | | | |
| User charges | 0 | 0 | | | | |
| During Construction & Maintenance | 6,704 | 6,704 | | | | |
| NET NON-BUSINESS BENEFITS: COMMUTING | 277,054 (1a) | 277,054 | | | | |
| Non-business: Other | ALL MODES | ROAD | BUS and COACH | RAIL | OTHER | |
| <u>User benefits</u> | TOTAL | Private Cars and LGVs | Passengers | Passengers | | |
| Travel time | 713,928 | 713,928 | | | | |
| Vehicle operating costs | -9,526 | -9,526 | | | | |
| User charges | 0 | 0 | | | | |
| During Construction & Maintenance | 3,759 | 3,759 | | | | |
| NET NON-BUSINESS BENEFITS: OTHER | 708,161 (1b) | 708,161 | | | | |
| Business | | Goods Vehicles | Business Cars & LGVs | Passengers | Freight | Passengers |
| <u>User benefits</u> | | | | | | |
| Travel time | 670,935 | 120,713 | 550,222 | | | |
| Vehicle operating costs | 133,488 | 105,838 | 27,650 | | | |
| User charges | 0 | 0 | 0 | | | |
| During Construction & Maintenance | -2,974 | -606 | -2,368 | | | |
| Subtotal | 801,449 (2) | 225,945 | 575,504 | | | |
| Private sector provider impacts | | | | Freight | Passengers | |
| Revenue | 0 | | | | | |
| Operating costs | 0 | | | | | |
| Investment costs | 0 | | | | | |
| Grant/subsidy | 0 | | | | | |
| Subtotal | 0 (3) | | | | | |
| Other business impacts | | | | | | |
| Developer contributions | 0 (4) | | | | | |
| NET BUSINESS IMPACT | 801,449 (5) = (2) + (3) + (4) | | | | | |
| TOTAL | | | | | | |
| Present Value of Transport Economic Efficiency Benefits (TEE) | 1,786,664 (6) = (1a) + (1b) + (5) | | | | | |

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

A4.2 Public Accounts Table

| | ALL MODES | ROAD | BUS and COACH | RAIL | OTHER |
|--|--------------------------|-----------------------|---------------|------|-------|
| Local Government Funding | TOTAL | INFRASTRUCTURE | | | |
| Revenue | 0 | 0 | | | |
| Operating Costs | 0 | 0 | | | |
| Investment Costs | 0 | 0 | | | |
| Developer and Other Contributions | 0 | 0 | | | |
| Grant/Subsidy Payments | 0 | 0 | | | |
| NET IMPACT | 0 (7) | 0 | | | |
| Central Government Funding: Transport | | | | | |
| Revenue | 0 | 0 | | | |
| Operating costs | 66,363 | 66,363 | | | |
| Investment Costs | 904,920 | 904,920 | | | |
| Developer and Other Contributions | 0 | 0 | | | |
| Grant/Subsidy Payments | 0 | 0 | | | |
| NET IMPACT | 971,283 (8) | 971,283 | | | |
| Central Government Funding: Non-Transport | | | | | |
| Indirect Tax Revenues | -2,274 (9) | -2,274 | | | |
| TOTALS | | | | | |
| Broad Transport Budget | 971,283 (10) = (7) + (8) | | | | |
| Wider Public Finances | -2,274 (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.

A4.3 Analysis of Monetised Costs and Benefits

| Analysis of Monetised Costs and Benefits: M4 CaN No Toll Scenario | |
|---|---|
| Noise | 0 (12) |
| Local Air Quality | 0 (13) |
| Greenhouse Gases | -14,727 (14) |
| Journey Quality | 0 (15) |
| Physical Activity | 0 (16) |
| Accidents | 4,155 (17) |
| Economic Efficiency: Consumer Users (Commuting) | 277,054 (1a) |
| Economic Efficiency: Consumer Users (Other) | 708,161 (1b) |
| Economic Efficiency: Business Users and Providers | 801,449 (5) |
| Wider Public Finances (Indirect Taxation Revenues) | 2,274 - (11) - sign changed from PA table, as PA table represents costs, not benefits |
| Present Value of Benefits (see notes) (PVB) | 1,778,365 (PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11) |
| Broad Transport Budget | 971,283 (10) |
| Present Value of Costs (see notes) (PVC) | 971,283 (PVC) = (10) |
| OVERALL IMPACTS | |
| Net Present Value (NPV) | 807,082 NPV=PVB-PVC |
| Benefit to Cost Ratio (BCR) | 1.83 BCR=PVB/PVC |