

## 7. Freight

- 7.1 As a general strategic transport study, GBSTS was not designed to examine specific freight issues in detail. Nevertheless, there are some aspects of the study which have implications on freight operations and these are brought together in this chapter.
- 7.2 Many of the measures examined within GBSTS are designed to cater for general transport problems across the study area involving a wide range of transport users. For example, improvements to the capacity of the highway network will reduce the journey time and improve reliability for all users, irrespective of whether the user is driving a private car or a heavy goods vehicle. Similarly, the removal of potential blockages on the rail network by capacity enhancements will increase general capacity levels and hence improve the operational efficiency of both passenger and freight services.
- 7.3 Although this is true for many of the measures within the GBSTS transport strategy, there are, of course, specific measures of direct relevance to the movement of freight to, from and within the study area. At the same time, there are particular locations where freight related movements are the dominant activity (e.g. in the neighbourhood of Bristol Port) and hence changes to the form and content of developments in these locations are important to the future levels of demand for freight across the study area; these aspects were examined in Chapter 2.

### FREIGHT ACTIVITY

- 7.4 Chapter 2 examined the growth in travel across the study area to 2031 and the relationship to the transport network. Compared with car trips, a much higher proportion of HGV trips have at least one trip end external to the study area. Nevertheless, around 40% of HGV trips are travelling entirely within the study area in the morning peak period. The inter-peak period has a slightly larger proportion of trips travelling outside the study area and its hinterland than in the peak period. As would be expected, the predominant freight movements are on the motorways and the local strategic network.
- 7.5 Over the period between 2003 and 2031, the forecast growth in HGV trips is 55%. There is a general increase in HGV vehicle-kilometres on all road types between 2003 and the 2031 Do Minimum. In built-up areas, the higher levels of congestion lead to a larger increase in HGV vehicle-hours than in other areas.
- 7.6 With the GBSTS strategy, there is a transfer of HGV traffic onto local strategic roads from more minor local roads. This is largely due to the improvements to the local strategic road network with the addition of new links within this category, such as the South Bristol Ring Road and the Second Avon Crossing.
- 7.7 In the 2031 morning peak period, there is a reduction in HGV vehicle-hours across all road types with the transport strategy compared with the Do Minimum. In the inter-

peak, increased usage of non built-up strategic roads by HGVs leads to a slight increase in total vehicle-hours on this type of road, but there are reductions in vehicle-hours on the other road types.

### **FREIGHT CONSOLIDATION**

- 7.8 As part of an EU project (VIVALDI), a freight consolidation scheme has been trialled in Bristol. The scheme was developed to reduce the number of delivery vehicles operating in the area, especially the city centre, and thus contribute to an improvement in air quality. The scheme started in May 2004 and makes use of a warehouse located outside the retail area at Emersons Green which acts as a consolidation and distribution point for different products intended for a range of retail outlets within the central Broadmead shopping area. The warehouse receives multiple deliveries bound for the shops and consolidates them into a single load on one vehicle which then delivers to the retail area at pre-arranged times.
- 7.9 The consolidation scheme is most relevant to medium sized businesses dealing in non-perishable high value goods – larger firms have their own delivery networks. It now serves more than 50 retail outlets mainly dealing in specific types of goods such as men’s and women’s fashions, shoes, mobile phones, household goods and gifts.
- 7.10 The scheme has cut delivery vehicle movements by 65% for participating retailers, resulting in a reduction of over 20,000 HGV kms with associated savings in environmental emissions.
- 7.11 A range of further developments is being explored, including:
- ◆ introducing additional value-added services for the retailers, such as remote stock rooms, storage of peak or seasonal items, and the collection and recycling of waste/packaging;
  - ◆ catering for the expansion of Broadmead as a result of which there is expected to be a 40% increase in retail space over the next five years;
  - ◆ introducing a charging regime for retailers so that there can be a progressively falling level of financial support by the local authority; and
  - ◆ exploring a broader range of activities where the benefits of consolidation would arise.
- 7.12 Although the local authority would need to provide some financial support to the scheme, it is expected that the level of funding will be reduced over time.
- 7.13 In view of the success of the scheme in a relatively short period of time, there would be further benefits from extending it further, in particular by:
- ◆ expanding the range of outlets in the Broadmead area – this might require an extension to the type of service, for example by the use of refrigerated vehicles for use with specific perishable products;
  - ◆ extend the area covered beyond Broadmead, firstly to other areas in central Bristol, and then to central Bath and local centres such as Clifton; and

- ◆ although it may be difficult to involve them, examine the possibility of including some of the major retailers which have their own distribution networks.
- 7.14 Although GBSTS has not been in a position to appraise these potential developments in detail, they represent the types of enhancement which will be necessary if the initial benefits of consolidation are to be expanded to a scale where they have a significant impact on the movement of goods vehicles in the city centre.

### FREIGHT ROUTES

- 7.15 A Regional Freight Map (RFM) has been produced for the Regional Assembly setting out the regional road-based freight network in the South West. The map gives guidance to the haulage industry as to suitable routes, and aims to influence the signing of routes undertaken by the Highways Agency and Department for Transport.
- 7.16 A revised draft 'Policy' RFM has been produced based on the policies and aspirations of the different Local Highway Authorities (LHAs) in the region with inputs of the observed volumes of HGV flows in the South West. The reclassification of routes results in some changes in the designation of roads. The draft 'Policy' RFM has had input from all of the LHAs as well as the haulage industry, and is awaiting acceptance by the South West Regional Assembly.
- 7.17 The 'Policy' RFM defines freight routes as national, regional or county routes:
- ◆ National Freight Routes – longer distance freight routes from other parts of the country.
  - ◆ Regional Freight Routes – routes used for inter-regional travel where national routes are not appropriate and to provide access to major distribution centres from the national routes.
  - ◆ County Freight Routes – routes used to provide access to freight facilities not served by either national or regional routes.
- 7.18 A particular issue in relation to freight activity is the location of routes followed by heavy goods vehicles particularly through sensitive areas. The activity within Bath is especially sensitive, given the city's status as a World Heritage Site. The Bath Package Major Scheme Bid, being prepared by B&NES within the Local Transport Plan process, has examined measures designed to restrict the level of through movements by HGVs across the city. These could include the designation of specific main roads through the city centre as lorry routes – A36, A4 and A367; all other roads would be restricted to HGV movements apart from access. In addition, consideration is being given to transshipment facilities on similar lines to the Broadmead scheme in Bristol described above.
- 7.19 However, to be effective, there will need to be significant levels of enforcement to ensure that HGV drivers adhere to designated routes. In the long term, the introduction of an area-wide congestion charging scheme would help to control HGV movements, by varying the charge payable to selected vehicle types on specific routes so that the problems of enforcement are covered by the technical capability of the charging system. Originally the government planned to introduce satellite-based charging for goods vehicles by 2008. However, the delay to the government's plans for the national charging scheme for goods vehicles until after the medium term

means that a potentially powerful policy tool for the local area is not available. Hence, it will be necessary to await the introduction of satellite-based charging before the full benefit of the effective control of lorry routeing can be achieved.

### **Greater Bristol Freight Atlas**

- 7.20 Within the Greater Bristol area, the Freight Quality Partnership was established in 2003 with the aim of bringing together representatives from both the public and private sectors with an interest in freight transport. An early output from the Partnership has been the creation of a Commercial Vehicle Drivers' Atlas which provides guidance on the appropriate routes to be followed through the area, together with details of height, weight and access restrictions across the area.
- 7.21 The revised RFM has been submitted as a draft document and the consultants are currently awaiting feedback before attempting to finalise a revised copy. This stage needs to be completed so that an unambiguous position may be reached to guide vehicle hauliers, other government bodies and transportation studies in the area.
- 7.22 The revision of the RFM will also need to feed through to other documents such as Bristol's Commercial Drivers' Atlas. It is also recommended that, if possible, the Atlas be made available on-line through Bristol City Council's own website.
- 7.23 With the increasing use of on-board satellite route guidance systems, the information contained within the Atlas will need to be included within the software of these systems. Commercial drivers are likely to be early adopters of this technology and failure to reflect the information and recommended routes within the satellite navigation systems will result in a dilution of the possible benefits of producing the RFM and the Atlas.

### **RAIL FREIGHT FACILITIES**

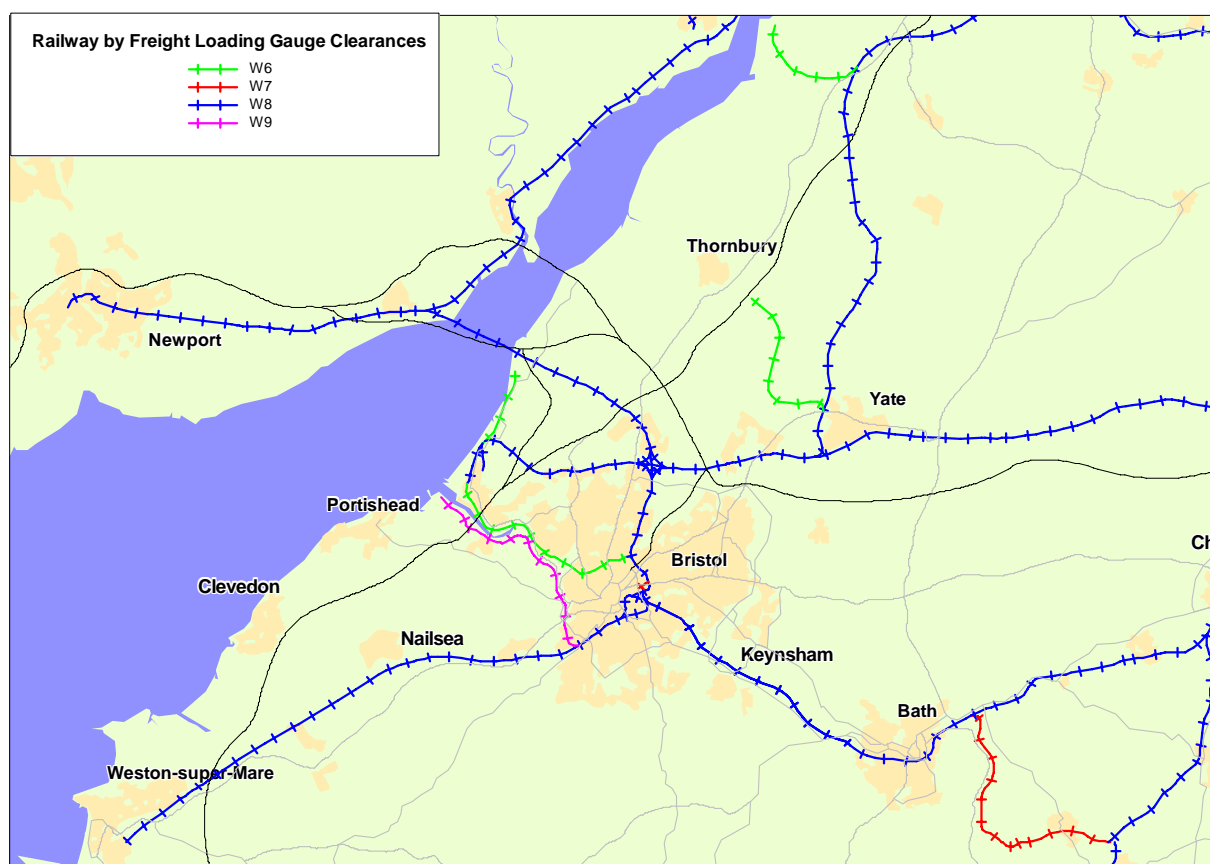
- 7.24 The Greater Bristol area has a moderate amount of rail freight traffic with some originating traffic and passing freight over the Great Western Main Line. Rail terminals on the River Severn at Avonmouth and Royal Portbury Dock continue to generate a number of bulk train movements and there are limited movements from the specialist waste terminals in the area, though all mail traffic by rail has now ceased.
- 7.25 The main freight routes and key points in the Bristol area are:
- ◆ Avonmouth – Filton West Junction. Avonmouth is the principal rail freight focus for the sub-region. Traffic to and from Avonmouth is mainly imported coal for power stations.
  - ◆ Bristol Parkway. As a key junction point on the rail network in the Bristol area, a number of through freight services pass Bristol Parkway each day.
  - ◆ Portbury – Parson Street Junction. Royal Portbury Dock is served by a short spur off the branch of the former passenger line to Portishead. The new link was opened in 2001 and the branch refurbished for freight traffic. Traffic is mainly imported coal and automobiles.

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- ◆ Bristol City Council Waste Terminal, Barrow Road, and B&NES Waste Terminal, Westmoreland.
  - ◆ Great Western Main Line between Worle Junction and Narroways Hill Junction (Bristol) via Bristol Temple Meads.
- 7.26 Freight from the South West such as china clay and cement traffic from the North travels via Bristol, as does nuclear flask traffic from Bridgwater. Rail freight traffic from South Wales to London and the South East also crosses at Bristol Parkway.

### Route Constraints

- 7.27 The loading gauge reflects the height and width restriction across the rail network taking into account line-side and overhead structures (see Figure 7.1). Most main lines through Bristol, including the line to Avonmouth from Filton, are cleared to W8 loading gauge – for inter-modal traffic, this means that most routes can accept 8' 6" containers. The restored freight branch to Royal Portbury Dock is cleared to the larger W9 (i.e. it accepts 9' containers). However, there are some routes which are loading gauge restricted and would require further gauge enhancement work to accept most types of inter-modal traffic (loading gauges W6 and W7 restrict the maximum container height to 8 feet). These include:
- ◆ Avonmouth via Clifton Down and the Severn Beach branch – W6;
  - ◆ Tytherington Branch from Yate – W6; and
  - ◆ Bathampton Junction to Trowbridge – W7.
- 7.28 There are no significant plans to increase rail freight facilities or activity in the Bristol area. The Great Western Main Line through Bristol and the routes to the Midlands and to South Wales will continue to be core strategic routes for rail freight traffic and thus there will be an on-going requirement for capacity to be maintained at least to current levels. As noted below, any expansion of the gauge above W9 will need to reflect the gauges throughout the region and in the neighbouring regions, taking into account the likely future markets. Such an analysis should therefore form part of national policy.
- 7.29 As highlighted in Chapter 2, Bristol Port is considering the construction of a new deep water container facility at Avonmouth which would increase the port's capacity from 150,000 to 850,000 container movements a year. Although the scheme is at a very early stage, if implemented about 25% of the containers could be transported by rail to/from the rest of the country, thereby significantly increasing the level of rail freight from Avonmouth. However, it is anticipated that the capacity of the rail freight would be in a position to accommodate this level of growth.

Figure 7.1 – Rail loading gauges in the Greater Bristol area



7.30 The SWARMMS study included the following specific recommendations for inter-modal freight:

- ◆ Enhancements to loading gauges to allow containers on international rail wagons, including a W12 gauge to be provided on the Great Western Line at Avonmouth. However, GBSTS analysis indicates that there is little need to increase the loading gauge in the Avonmouth area until it has been achieved along the main lines to the South East and the Midlands, which is not likely within the medium term.
- ◆ Improved rail access to Royal Portbury Dock – this has now been implemented with the opening of the freight line.
- ◆ New road to rail Intermodal Freight Facility at Cabot Park (Avonmouth) – this would seem to have potential as a means of attracting increased transfer from road to rail, although its success may be linked to the scale of development within the Severnside area.
- ◆ Daily trains to the Cabot Park development, which will increase the volume of rail traffic through Bristol Parkway station. This could be accommodated with the proposed increase in capacity to three platforms at Bristol Parkway in the medium term and four platforms in the long term.

**SUMMARY**

7.31 Although the movement of freight was not identified as a major feature of the GBSTS, measures designed to relieve particular congestion locations will also generally benefit goods traffic whether on the road or rail network. Other measures with a specific freight interest have been identified within the study, although a detailed appraisal has not been undertaken:

- ◆ review of the consolidation trial for goods deliveries to Broadmead area, with potential expansion in terms of types of goods covered and the extent of the area served;
- ◆ increased publicity for freight routes within and through the area and the facilities available to HGV drivers; and
- ◆ accommodation of potential expansion in rail freight opportunities from Royal Portbury and Avonmouth Docks.





## 8. Appraisal of the Strategy

### INTRODUCTION

- 8.1 A key aspect of the development of the GBSTS transport strategy was the appraisal of its performance against a range of key criteria. In this appraisal, the attention is concentrated on the impacts of the transport measures in the GBSTS strategy; it does not take account of the other changes underlying the transport strategy, principally the growth in population and employment and the impact of new construction necessary to achieve this.
- 8.2 The appraisal was carried out in accordance with the Government’s Transport Analysis Guidance (TAG), which follows the principles of the New Approach to Appraisal (NATA). The strategy has been appraised against the national criteria set out in TAG, arranged within five over-arching transport objectives:
- ◆ **environmental impact** – to protect the built and natural environment;
  - ◆ **safety** – to improve safety;
  - ◆ **economy** – to support sustainable economic activity and get good value for money;
  - ◆ **accessibility** – to improve access to facilities for those without a car and to reduce severance; and
  - ◆ **integration** – to ensure that all decisions are taken in the context of the Government’s integrated transport policy.
- 8.3 The five over-arching objectives are sub-divided into further national sub-objectives. In addition, several local objectives have been defined for GBSTS which were placed under the five over-arching criteria. The GBSTS strategy has therefore been appraised at two levels:
- ◆ against the Government’s national transport objectives; and
  - ◆ against the study’s local objectives.
- 8.4 The objectives are set out in Table 8.1

**Table 8.1 – National and Local Sub-Objectives**

| Objective   | National Sub-Objective   | Local Sub-Objective            |
|-------------|--|--------------------------------|
| ENVIRONMENT | Reduce noise<br>Improve local air quality<br>Reduce greenhouse gases<br>Protect and enhance landscape<br>Protect and enhance townscape<br>Protect the heritage of historic resources<br>Support biodiversity | Reduce key pollutants in AQMAs |

| Objective     | National Sub-Objective  | Local Sub-Objective  |
|---------------|---|--|
|               | Protect the water environment<br>Encourage physical fitness<br>Improve journey ambience   |  |
| SAFETY        | Reduce accidents<br>Improve security  |  |
| ECONOMY       | Minimise cost to public accounts<br>Improve transport economic efficiency<br>Improve reliability<br>Provide beneficial wider economic impacts | Improve strategic transport movements into, out of and through the study area<br>Improve access to BIA<br>Reduce dependence on the car |
| ACCESSIBILITY | Increase option values<br>Reduce severance<br>Improve access to the transport system  | Easier local, national and international travel  |
| INTEGRATION   | Improve transport interchange<br>Integrate transport policy with land use policy<br>Integrate transport policy with other government policies |  |

8.5 The GBSTS transport strategy formed the centre of the appraisal process. However, at the same time, two notable variations were appraised to explore the impact of changes to the strategy:

- ◆ the addition of area-wide road user charging – it was felt that the main strategy could not be based on measures that would probably require a national policy initiative and hence the introduction of area-wide charging was appraised as an addition to the core strategy; and
- ◆ removal of ‘Smarter Choices’ – the impact on the full strategy of excluding this package of measures was appraised to assess the importance of Smarter Choices within the overall strategy.

8.6 The appraisal of the strategy is described in the following sections dealing with each of the over-arching aspects in turn – environment, safety, economics, accessibility and integration. The overall appraisal for each of the three strategies is summarised in the Appraisal Summary Tables, Transport Economic Efficiency Tables and Public Accounts Tables in Appendix A. The assessment of site-specific factors is included in Appendix B concentrating on environment and accessibility issues.

## ENVIRONMENT

- 8.7 This section appraises the 2031 GBSTS strategy against the Government's environmental objectives for transport, dealing with impacts on both the built and natural environment and on people.

### Noise

- 8.8 Transport is a key source of noise 'annoyance' – the feeling of displeasure evoked by noise. However, it should be recognised that, in many situations, significant changes in traffic flows are required to bring about perceptible changes in noise levels. For freely flowing traffic, a difference of about 3dB(A) is required before there is a perceptible change in the noise level. As a guide, a 25% increase or 20% decrease in traffic flow, if speed and other factors (such as the composition of traffic in terms of vehicle types) remain unaltered, only results in a 1dB(A) change in noise level.
- 8.9 In the appraisal process, it is the location of the noise changes, and hence the number of people affected, which is most important. The impact of noise changes on the population 'annoyed' by noise is given in Table 8.2. This has been calculated using DfT guidance, based on locations where changes in noise of at least 3dB(A) occur. Hence, with the strategy, in 77 of the model's 187 zones, there is a reduction in the population annoyed by noise, while in 82 there is no change, and in 28 there is an increase in the population annoyed. Overall, taking into account the population in the vicinity of each link of the highway network, there is a net reduction of around 17,000 in the number of people annoyed by noise as a result of the strategy.

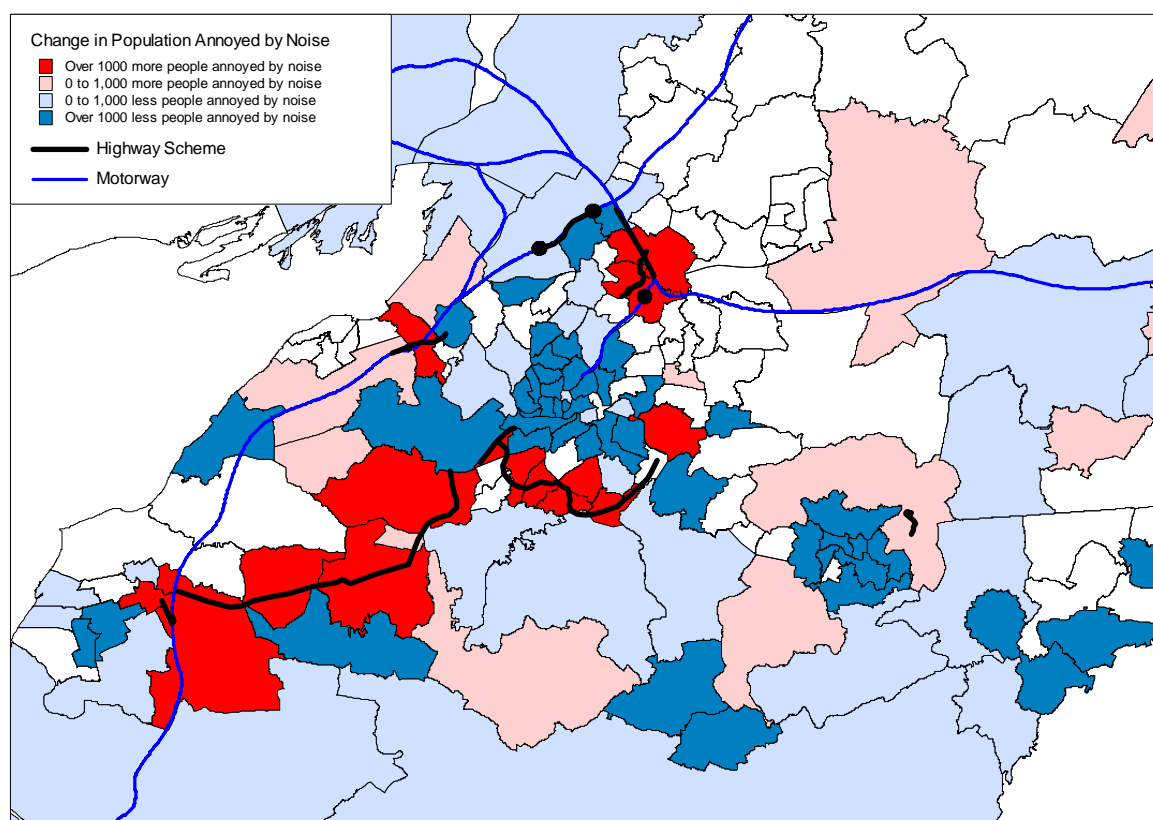
**Table 8.2 – Change in Population Annoyed by Noise (based on changes > 3dB(A))**

| Changes in Population Annoyed Compared with Do Minimum       | Strategy | Strategy with RUC | Strategy without Smarter Choices |
|--|----------|-------------------|----------------------------------|
| Net change in number of people annoyed by noise              | -16,800  | -125,300          | 79,500                           |
| Number of zones experiencing increase in population annoyed  | 28       | 29                | 30                               |
| Number of zones experiencing no change in population annoyed | 82       | 74                | 94                               |
| Number of zones experiencing decrease in population annoyed  | 77       | 84                | 63                               |

- 8.10 Figure 8.1 shows the zones where in the number of people annoyed by noise changes as a result of the GBSTS strategy. This indicates that large increases in the population annoyed by noise are located on or near the routes of new highway links. Reductions in the population annoyed by noise are concentrated particularly within the urban areas, where the strategy achieves the highest reduction in traffic volumes. Mitigation measures will therefore need to be incorporated in the design of the new road schemes to minimise the impact of noise in adjoining areas.

- 8.11 Overall, there is a small reduction in the number of people across the Greater Bristol area who are annoyed by noise, and the strategy therefore has a **slight beneficial** effect on noise. If area-wide road user charging is included in the strategy, the impact is much greater, with 125,000 fewer people (some 10% of the total study area population in 2031) annoyed by traffic noise, as shown in Table 8.2. The strategy with road user charging therefore has a **moderate beneficial** effect on noise. With no Smarter Choices, more people in urban areas are affected by noise, and there is an overall net increase in the population annoyed by noise and the strategy therefore has a **moderate adverse** effect on noise.

**Figure 8.1 – Change in Population Annoyed by Noise**



### Local Air Quality

- 8.12 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland sets Government targets for eight pollutants. Transport, especially the operation of road vehicles, is an important source of several of these pollutants, most notably oxides of nitrogen ( $\text{NO}_x$ ) and particulate matter ( $\text{PM}_{10}$ ), for which stringent targets have been set. The local air quality sub-objective focuses on these two pollutants.
- 8.13 The impact of the GBSTS strategy on emissions of  $\text{PM}_{10}$  and  $\text{NO}_x$  has been estimated following DfT guidance. Table 8.3 shows annual emissions of  $\text{NO}_x$  and  $\text{PM}_{10}$  in 2031, comparing the impact of the GBSTS strategy with the Do Minimum situation and showing variations in the impact with the addition of road user charging and exclusion of Smarter Choices.

8.14 Table 8.3 shows reductions in emissions of NO<sub>x</sub> and PM<sub>10</sub> of 45% and 53% respectively between 2003 and 2031 as a result of the increasing use of cleaner, more efficient engines and improved fuels. These are based on standard DfT projections about future changes in the characteristics of the vehicle fleet. In comparison, the GBSTS strategy in 2031 achieves a further 2% reduction in NO<sub>x</sub> emissions and a 4% reduction in PM<sub>10</sub>. Thus, the impact of the strategy is small compared with the changes already taking place between 2003 and 2031. There are some variations in the results according to whether area-wide road user charging and Smarter Choices are included in the strategy, with greater reductions with area-wide road user charging and lower reductions in the absence of Smarter Choices.

**Table 8.3 – Changes in Annual Emission Levels (tonnes)**

|                                    | 2003  | 2031 Do Minimum | 2031 Strategy | 2031 Strategy with RUC | 2031 Strategy without Smarter Choices |
|------------------------------------|-------|-----------------|---------------|------------------------|---------------------------------------|
| NO <sub>x</sub>                    | 13033 | 7150            | 6980          | 6874                   | 7117                                  |
| PM <sub>10</sub>                   | 416   | 196             | 188           | 184                    | 194                                   |
| <b>Change from 2003 Base</b>       |       |                 |               |                        |                                       |
| NO <sub>x</sub>                    | -     | -5883<br>-45%   | -6054<br>-46% | -6159<br>-47%          | -5916<br>-45%                         |
| PM <sub>10</sub>                   | -     | -220<br>-53%    | -228<br>-55%  | -232<br>-56%           | -222<br>-53%                          |
| <b>Change from 2031 Do Minimum</b> |       |                 |               |                        |                                       |
| NO <sub>x</sub>                    | -     | -               | -171<br>-2%   | -276<br>-4%            | -33<br>0%                             |
| PM <sub>10</sub>                   | -     | -               | -8<br>-4%     | -12<br>-6%             | -2<br>-1%                             |

8.15 The geographical spread of the changes in emissions is shown in Figures 8.2 and 8.3 for NO<sub>x</sub> and PM<sub>10</sub> respectively. These figures show that, as would be expected, the increases in emissions are focused on the new road links and on the approaches to the new links where changes in traffic levels are significant.

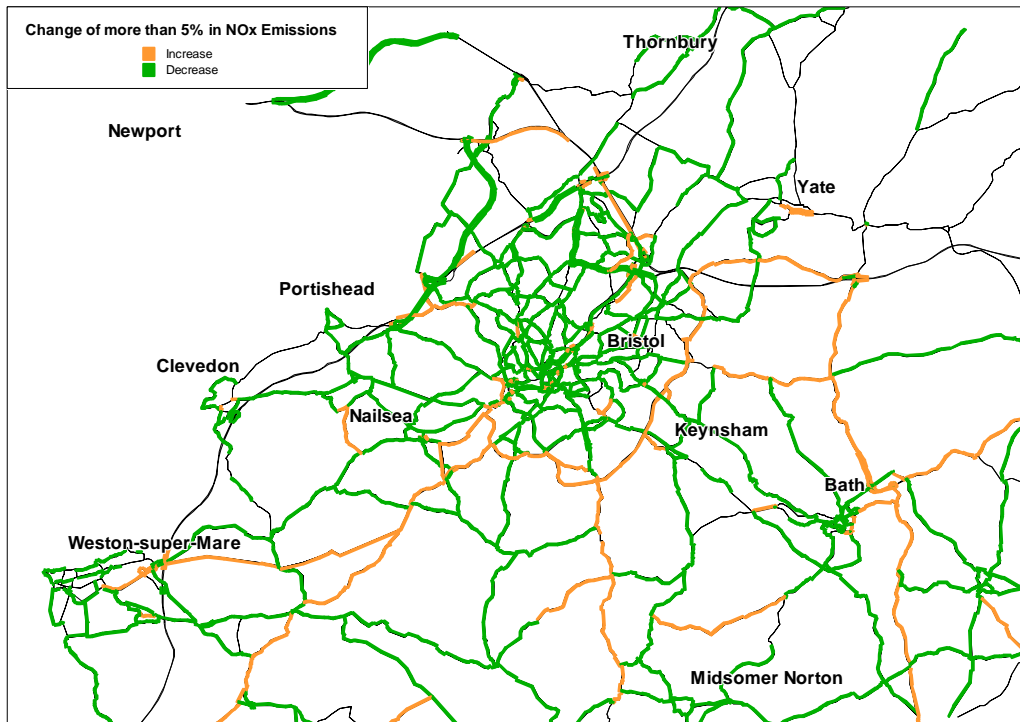
8.16 Overall, the strategy has a **slight beneficial** impact on local air quality with similar impacts for the inclusion of area-wide charging in the strategy and exclusion of Smarter Choices.

### Key Pollutants in AQMAs

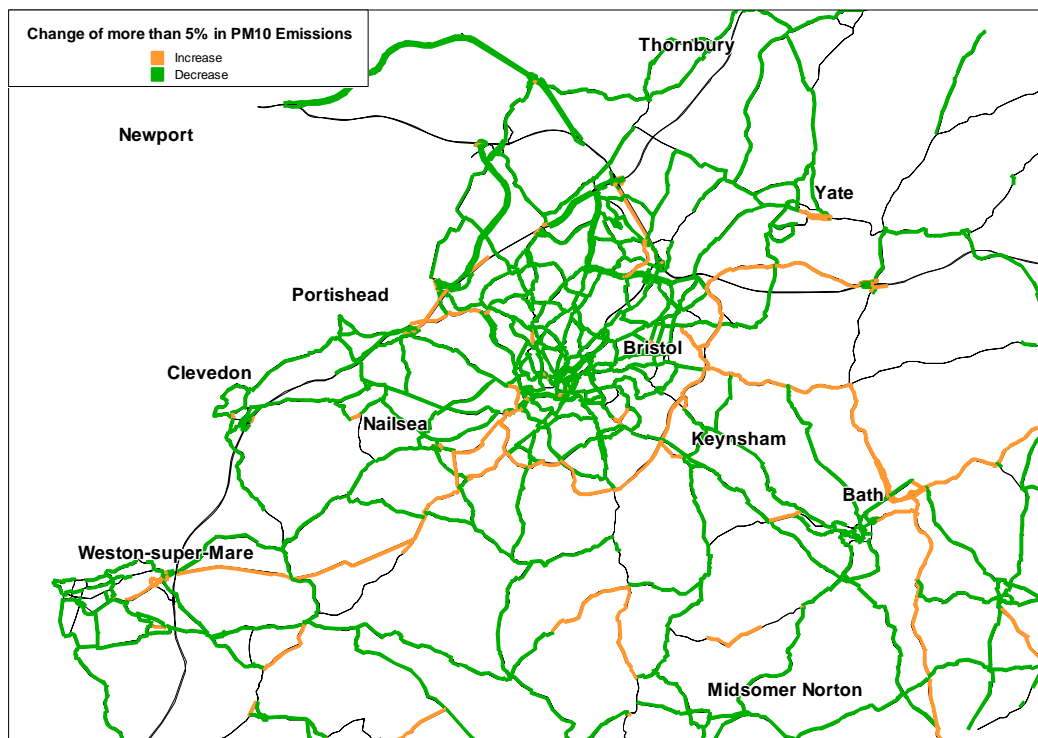
8.17 Large parts of Bristol, along with Bath's London Road corridor, do not meet current national air quality targets and have been declared Air Quality Management Areas

(AQMAs) by the appropriate unitary authority with Air Quality Action Plans setting out what measures need to be undertaken to improve the position. The AQMAs cover:

**Figure 8.2 – Location of Changes in NO<sub>x</sub> Emissions – 2031 Strategy vs Do Minimum**



**Figure 8.3 – Location of Changes in PM<sub>10</sub> Emissions – 2031 Strategy vs Do Minimum**



- ◆ the M5 corridor in Avonmouth;
- ◆ Bristol city centre plus most major radial routes and the M32 corridor; and
- ◆ the London Road corridor in Bath with a proposed extension covering Cleveland Bridge and Bathwick Street.

8.18 Table 8.4 shows the estimated changes in emissions of NO<sub>x</sub> and PM<sub>10</sub> within AQMAs between 2003 and 2031. In the Do Minimum situation, there are large reductions in emissions within the AQMAs due to the assumptions about the increasing use of cleaner vehicles. The GBSTS strategy further reduces emissions of NO<sub>x</sub>, but has less impact on emissions of PM<sub>10</sub>. Incorporating road user charging in the strategy would give further reductions within the Bristol and Bath AQMAs, while excluding Smarter Choices would mean the impact on emission levels is diminished slightly.

**Table 8.4 – Changes in Emissions within AQMAs Compared with 2003**

| AQMA      | NO <sub>x</sub> |               |                        |                                       | PM <sub>10</sub> |               |                        |                                       |
|-----------|-----------------|---------------|------------------------|---------------------------------------|------------------|---------------|------------------------|---------------------------------------|
|           | 2031 Do Min     | 2031 Strategy | 2031 Strategy with RUC | 2031 Strategy with no Smarter Choices | 2031 Do Min      | 2031 Strategy | 2031 Strategy with RUC | 2031 Strategy with no Smarter Choices |
| Avonmouth | -40%            | -43%          | -43%                   | -43%                                  | -52%             | -51%          | -52%                   | -51%                                  |
| Bristol   | -49%            | -56%          | -59%                   | -54%                                  | -61%             | -61%          | -65%                   | -59%                                  |
| Bath      | -51%            | -59%          | -60%                   | -57%                                  | -66%             | -70%          | -72%                   | -69%                                  |

8.19 Overall the strategy has a **slight beneficial** effect on air quality in AQMAs. As may be seen from Table 8.4, this impact is maintained with the introduction of area-wide road user charging and the exclusion of Smarter Choices.

### Greenhouse Gases

8.20 Global warming is an important international environmental issue and transport is a major source of UK greenhouse gas emissions, in particular carbon dioxide (CO<sub>2</sub>). The UK government has committed to reducing CO<sub>2</sub> emissions as part of the international programme to stabilise global warming. The UK is currently on track to meet its Kyoto obligation to reduce overall greenhouse gas emissions by 12.5% below 1990 levels by 2008-12. In addition, the Energy White Paper stated that the UK should put itself on a path to a reduction in carbon dioxide emissions of some 60% from current levels (i.e. 2003 levels) by about 2050 with real progress by 2020.

8.21 Since 1970, total UK emissions of CO<sub>2</sub> have fallen by 22%, with significant falls in emissions from industry and power stations, but those from road transport increased by 92% and this sector now accounts for around 21% of the UK's total CO<sub>2</sub> emissions. CO<sub>2</sub> emissions from road transport were 10% higher in 2004 than in 1990; by 2010 they are expected to be around 20% higher than in 1990. Measures to slow this increase in road transport emissions are therefore necessary.

8.22 The DfT appraisal methodology uses the change in emissions of CO<sub>2</sub> to assess the impact of transport measures upon global warming. The net change in transport



emissions of CO<sub>2</sub> within the study area in 2031 is shown in Table 8.5, along with changes from the current (2003) situation.

**Table 8.5 – Changes in CO<sub>2</sub> Emissions**

| Measure  | 2003 | 2031 Do Min | 2031 Strategy | 2031 Strategy + RUC | 2031 No Smarter Choices |
|--|------|-------------|---------------|---------------------|-------------------------|
| Annual CO <sub>2</sub> Emissions ('000 tonnes) | 2028 | 2695        | 2559          | 2480                | 2650                    |
| % Change from 2003                             |      | 33%         | 26%           | 22%                 | 31%                     |
| Daily CO <sub>2</sub> Emission per Person (kg) | 5.8  | 6.4         | 6.0           | 5.8                 | 6.3                     |
| % Change from 2003                             |      | 9%          | 3%            | 0%                  | 7%                      |

8.23 In the 2031 Do Minimum situation, there is a 33% increase in transport emissions of carbon dioxide within the study area between 2003 and 2031. This is due to two main factors:

- ◆ increasing wealth leading to a growth in the demand for travel, particularly for travel by car; and
- ◆ a large rise in the study area population (25%) and employment (20%) as a result of the land use changes assumed under Spatial Scenario F.

8.24 The GBSTS strategy reduces CO<sub>2</sub> emissions in 2031 by 6% compared with the Do Minimum situation, and by 9% if area-wide congestion-based road user charging is included. Nevertheless, even with road user charging, this still represents an increase in transport emissions of carbon dioxide of over 20% in the period from 2003 to 2031. Stripping out the effects of the population growth, the GBSTS strategy with congestion-based road user charging limits CO<sub>2</sub> emissions **per person** to 2003 levels. The results presented in Table 8.5 also show that 'Smarter Choices' are an essential element of the overall GBSTS strategy in terms of reducing emissions of carbon dioxide; if they are excluded, then there is a significant impact on greenhouse gas emissions.

8.25 Overall, the strategy slows the increase in emissions of carbon dioxide and hence has a **slight beneficial** impact on greenhouse gases.

8.26 CO<sub>2</sub> emissions could be reduced further by measures outside the scope of GBSTS, including the more widespread use of alternative road transport fuels and improvements to the efficiency of conventionally fuelled vehicles. In addition, it is possible that the UK government could require measures such as the use of 5% biodiesel in diesel blends which, together with any other changes in alternative fuel use, may reduce CO<sub>2</sub> emissions still further.

## Landscape

8.27 The assessment of the impact of the GBSTS strategy on the landscape considers both the physical and cultural aspects of the land itself and the way in which these characteristics are perceived. As a consequence, the appraisal is qualitative.



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- 8.28 In appraising the impact of the strategy on the landscape, the starting point was to identify where the principal designations are located. In line with the Strategic Environmental Appraisal approach, the location of the designations was an important input in the design of measures, although it was not necessarily possible to design measures which completely avoid all designations.
- 8.29 The relationships between the principal landscape designations and measures in the GBSTS transport strategy are summarised in Appendix B (Figures B.1 to B.3). The major areas of importance for landscape at a regional level are the Cotswolds to the north-east of the study area, the Mendips to the south and the Severn Estuary to the west. Within these major areas there are a number of locally designated areas, with particular attention being given to the Areas of Outstanding Natural Beauty (AONB), Woodland Grant Schemes and Countryside Character Areas. Individual tranquil areas were also included in the appraisal although these are closely related to AONB sites and are not shown separately on the maps in Appendix B.
- 8.30 The appraisal highlights the following major potential impacts of measures on landscape designations:
- ◆ at the western and eastern ends of the South Bristol Ring Road, there are potential landscape impacts which will need to be resolved in the detailed design of the scheme, in particular on the section between A38 and A370 and to the east of Stockwood;
  - ◆ the Airport Link Road has potentially significant impacts on the landscape designations in the Wrington area – the initial alignment provides an indicative view of the potential route for the scheme and, on this basis, there are potentially significant impacts on the inclines north of Wrington which will need to be taken into account in the identification of a preferred alignment if the scheme is taken forward; and
  - ◆ the A36 – A46 Link is located within an AONB and hence has a potentially significant impact on the landscape in the area, which will need to be recognised in future development of the scheme.
- 8.31 Given that some of the components of the strategy have a direct and significant impact on the landscape, the conclusion of the appraisal would be that the strategy has a **large adverse effect**, although the precise alignment of individual schemes can be designed to reduce the impact on landscape and thus the overall effect. As each scheme is included within the strategies with area-wide road user charging and without Smarter Choices, the landscape issues also occur in these strategies.

### Townscape

- 8.32 Townscape is defined as the physical and social characteristics of the built and unbuilt urban environment and the way in which they are perceived. The majority of the schemes included in the strategy are located outside the urban areas, although there are some sections which lie relatively close to urban areas. The appraisal of the townscape features is essentially qualitative.
- 8.33 Since few of the major schemes within the strategy are located within urban areas, separate maps were not produced specifically to cover the townscape issues on their

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own and the maps shown in Appendix B (Figures B.4 to B.6), which include the heritage designations, form the basis of the assessment.

8.34 Potential impacts on townscape include:

- ◆ the Second Avon Crossing has an impact on the north bank of the river at the point where the bridge would link with the existing road network (particularly the A4) but, although the precise alignment of the route and the design of the bridge have yet to be determined, given the current urban development in the area, it is unlikely that the scheme will have a major negative impact;
- ◆ the South Bristol Ring Road runs for part of its length through urban areas of south Bristol, particularly the Hartcliffe and Withywood areas of the city and, although the final path for the road will be finalised during its detailed design, it is expected that there will be some significant impact in these areas including the potential acquisition of existing residential properties, the removal of mature trees and existing green space, and increased visual intrusion for residents. These aspects will need to be taken actively into account in the consideration of the alignment and in the detailed design of the scheme. The South Bristol Ring Road will also provide relief to several areas of south Bristol through reduced traffic levels, particularly along the A4, A37 and A4174 corridors and hence would have a positive effect on the townscape in these areas;
- ◆ the Stoke Gifford Bypass includes sections of the existing highway network together with new construction within areas that are planned for development. As it currently stands, the impact of the scheme on the urban townscape will be small, although its design will need to take into account, and be planned alongside, the design of the new developments in the area, especially in Harry Stoke; and
- ◆ the A36-A46 Link Road runs outside the urban area and hence does not have a direct impact on the townscape of the area. However, the extent to which the scheme provides relief to the urban area of Bath through the diversion of traffic (especially Heavy Goods Vehicles) away from the urban area, it will have a positive impact on the townscape particularly those areas with a frontage on the major traffic routes.

8.35 Across the urban areas of Bristol and Bath, the introduction of the rapid transit system will have some localised impacts on the townscape. In general, the rapid transit services run along existing public transport, and mainly bus, corridors. However, where the rapid transit network operates along new, or segregated, alignments there will be a potential impact on townscape, for example through the harbourside area between Ashton Vale and Bristol city centre, at the junction of Coldharbour Lane and the M32, along the Severn Beach line (depending on the choice of alignment for this section of route), across the second Avon Crossing and through Portishead.

8.36 Similarly, new or expanded Park and Ride sites could potentially have impacts on the townscape in the immediate neighbourhood of the sites, with new or extended areas of hard surfacing and additional lighting.

8.37 On the other hand, the combined aspects of 'Smarter Choices', enhanced public transport measures and demand management/road user charging will reduce overall traffic levels and hence enhance the impact on the general townscape in the study

area. This benefit will be further increased in areas such as central Bath where the townscape is of particular value, demonstrated by its designation as a World Heritage Site. Extended pedestrianisation schemes in the area, together with other measures designed to reduce traffic levels and especially the number of HGVs, will generate potential additional townscape benefits.

- 8.38 Overall, the strategy could have a **moderate adverse** impact on townscape and the detailed design and alignment of schemes will need to take specific potential impacts into account. To the extent that it reduces overall traffic levels in areas of townscape importance, the introduction of area-wide road user charging will have some effect in reducing the impact although not to a significant extent overall.

### Heritage of Historic Resources

- 8.39 The man-made environment comprises buildings of architectural or historic significance (including Bath World Heritage Site), areas such as parks and other designated landscapes or public spaces, historic landscapes and architectural complexes and sites (e.g. Scheduled Ancient Monuments, places with historical associations such as battlefields, preserved evidence of human effects on the landscape, etc).

- 8.40 The effects of schemes on heritage designations are summarised in maps in Appendix B (Figures B.4 to B.6) which highlight the following impacts in relation to the indicative alignments of schemes in the area:

- ◆ the Nailsea Bypass passes close to, but does not directly impact on, one Scheduled Ancient Monument at Wraxall and a Grade II\* garden at Tyntesfield;
- ◆ the Airport Link Road alignment passes through the Conservation Area at Wrington and runs very close to a number of Scheduled Ancient Monuments, including sites at Nye, north of Redhill on the A38 and near Felton, with burial chambers, barrows and tumuli – to avoid the impact on the sites variations in the alignment might be possible and will need to be established in the detailed development of the scheme;
- ◆ the South Bristol Ring Road does not have a direct impact any Scheduled Ancient Monuments but runs through the Conservation Area in the Highridge and Witywood areas;
- ◆ the widening of the A370 is close to a Scheduled Ancient Monument and runs through a narrow Conservation Area to the south of Long Ashton;
- ◆ improvements to M32 Junction 1 could potentially have a negative impact on the Conservation Area if they are located on the north-east corner of the junction; and
- ◆ the A36 to A46 Link reduces traffic levels, especially goods vehicles, through the Bath World Heritage site, and hence would have a significant positive impact on the heritage characteristics of the city.

- 8.41 Across much of the study area, the general effect of reduced traffic levels brought about by a combination of 'Smarter Choices', public transport enhancements and demand management/road user charging will have positive impact on heritage features.

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- 8.42 Overall, the strategy could have a **moderate adverse** impact on heritage and the detailed design and alignment of schemes will need to take specific potential impacts into account. The inclusion of area-wide road user charging and Smarter Choice would not significantly affect the appraisal.

### Biodiversity

- 8.43 The examination of the transport strategy's impact on the biodiversity and earth heritage areas in the study area covers a wide range of designations, including:
- ◆ Sites of Special Scientific Interest (SSSI);
  - ◆ National Nature Reserves;
  - ◆ Special Protection Areas;
  - ◆ Special Areas of Conservation;
  - ◆ Ramsar sites;
  - ◆ Local Nature Reserves;
  - ◆ Ancient Woodland (distinguishing between replanted and semi-natural);
  - ◆ coastal sand dunes; and
  - ◆ important bird areas.
- 8.44 Maps in Appendix B (Figures B.7 to B.9) summarise the impact on sites of importance for biodiversity. The main conclusions are:
- ◆ the Airport Link Road potentially affects a number of designations in that it skirts the south of the SSSI between Nye and Congresbury, it crosses the local nature reserve which runs along the disused rail line between Congresbury and Winscombe, and it runs through ancient woodlands to the north of Wrington – while a revision to the scheme's alignment could reduce the impact on the sites, it is unlikely that it would be possible to avoid some negative effects on the biodiversity designations;
  - ◆ the Nailsea Bypass skirts the northern boundary of a SSSI across Tickenham Moor – the detailed design of the scheme would need to minimise the impact on the SSSI, although there is little scope for major changes to the alignment due to the proximity of developments along the existing B3130;
  - ◆ the South Bristol Ring Road and the widening of the A370 south of Long Ashton do not have an effect on specific biodiversity designations, although the section of the South Bristol Ring Road between the A38 and A370 runs close to a small ancient woodland;
  - ◆ the second crossing of the River Avon runs close to an important bird area as it crosses the river and hence, if the scheme is taken forward, care will need to be taken in the choice of the alignment and the need for mitigation measures, particularly during the construction period;
  - ◆ there are some areas of ancient woodland to the west of the M5 between Junctions 16 and 17 and hence any changes at these junctions or on the link between them would need to recognise the potential impacts, although it should be feasible to design schemes which do not affect the woodlands; and

- ◆ the A36 to A46 Link could potentially affect a small SSSI near to the River Avon crossing which would therefore need to be reflected in the detailed design.
- 8.45 Overall, the strategy could have a **moderate adverse** impact on biodiversity and the detailed design and alignment of schemes will need to take specific impacts into account. The inclusion of area-wide road user charging and the exclusion of Smarter Choices from the strategy will not have a significant impact on this assessment.

### Water Environment

- 8.46 The assessment of the strategy's impact on the water environment is based on the Environment Agency's definition as 'the fresh, marine, surface and underground water in England and Wales'. The appraisal of these issues is summarised in maps in Appendix B (Figure B.10 to B.12) which present the following attributes in relation to the water environment:
- ◆ indicative tidal flood plain;
  - ◆ indicative fluvial flood plain;
  - ◆ landfill sites, distinguishing between high risk, not gassing and unknown characteristics;
  - ◆ source protection zones, by category; and
  - ◆ integrated pollution prevention and control site buffers.
- 8.47 The principal impacts of measures on the water environment in the vicinity of the schemes are summarised below:
- ◆ the Airport Link Road from the M5 at Junction 21 to the A38 and A370 crosses an area of fluvial flood plain between Nye and Congresbury and the plain of the River Yeo to the south of Wrington – the design and construction of the scheme would therefore take these features into account;
  - ◆ in the neighbourhood of the airport, the Airport Link Road crosses Source Protection Zones while, north of the airport, the alignment runs close to a number of landfill sites which will therefore need to be accommodated in the design;
  - ◆ the Nailsea Bypass runs through an area of fluvial flood plain for a number of streams between Tickenham and Nailsea – the design will therefore need to take this into account;
  - ◆ given its proximity to the River Severn and River Avon, it is unsurprising that the scheme for the construction of a second crossing of the River Avon runs within areas of tidal flood plains which the scheme's design would need to reflect and accommodate – at the same time, the alignment runs close to some landfill sites;
  - ◆ at its western end, the South Bristol Ring Road runs close to a number of landfill sites in the section between the A38 and A370 while the widening of the A370 also potentially affects landfill sites to the south of the existing road;
  - ◆ the widening of the M4 between Junctions 19 and 20 lies close to landfill sites to the north of the existing motorway, although the impact is likely to be small because the proposed scheme lies within the existing boundary of the motorway;

- ◆ the M4 widening also crosses the Bradley Brook although, because the scheme is an extension of the existing road, there should not be a further impact on the stream;
- ◆ the schemes at Junctions 16 and 17 of the M5 and the section of the motorway between them do not have a significant impact on water resources, although there is a small landfill site in the vicinity of Junction 17;
- ◆ the Stoke Gifford Bypass and M32 Junction 1 cross small streams; and
- ◆ the A36 to A46 Link crosses the River Avon and has a potential impact on the river.

8.48 Overall, the strategy could have **moderate adverse** impacts on the water environment and the detailed design and alignment of schemes will need to take specific impacts into account. The inclusion of area-wide road user charging in the strategy, or the exclusion of Smarter Choices from it, would not have a significant impact on this assessment.

### Physical Fitness

8.49 The Government has a general desire to improve the health and fitness of the nation and, in particular, it has set targets for the reduction of coronary heart disease and strokes. In connection with this, the recommended minimum level of physical activity is for 30 minutes or more, for most days of the week.

8.50 In the appraisal, the contribution that schemes make to physical fitness is measured by the extent to which the number of pedestrians or cyclists, who are active for more than 30 minutes, is increased. A further indication of improvements in physical activity is the level of mode change from private car to public transport, where the stop/station access and egress constitutes an increase in activity and hence would be beneficial to physical fitness.

8.51 In the assessment of measures within a strategic study such as GBSTS, it is not possible to quantify the number of pedestrians or cyclists and the length of their activity. However, it is reasonable to assert that the strategy would enhance the level of physical fitness because it includes the specific policy of providing additional facilities to enhance pedestrian and cycling activity. Furthermore, the overall strategy makes a significant change in the level of mode split with major increases in the proportion of travellers using public transport. The impact is further raised with the introduction of area-wide road user charging which has the effect of increasing the public transport mode share.

8.52 Hence, the overall effects of the strategy in terms of physical fitness would be **moderate beneficial**. By encouraging greater use of public transport, the inclusion of area-wide road user charging will have a **large beneficial** effect. On the other hand, the exclusion of Smarter Choices from the strategy is likely to reduce the impact to **slight beneficial**.

### Journey Ambience

8.53 Journey Ambience is a function of the quality of facilities provided for travellers, the level of information that is disseminated to them, the cleanliness of services, the views from vehicles, and the level of overall traveller stress which includes such



factors as the safety of travel. The level of journey ambience can be directly affected (positively or negatively) by travellers themselves, and by the network providers and operators.

- 8.54 The GBSTS strategy may be deemed to enhance journey ambience in a number of ways although it is not possible to estimate the number of travellers that would be affected, nor to gauge the magnitude of the effect. The aspects of the strategy which would enhance journey ambience include the improvements to reliability and hence the reduction in stress as a result of the decreased congestion on the highway network. The increase in the level of information to travellers would also improve ambience; this information would be provided on the motorway network through the greater use of Variable Message Signs and on the public transport network, for example with the increased availability of real-time information for bus passengers as part of the showcase bus corridors.
- 8.55 The improved public transport vehicles included in the short-term enhancements to the local rail network and in the introduction of new buses as part of the Showcase bus corridors will have a positive affect on the journey ambience. In the longer term, the inauguration of rapid transit services across the study area, operated by modern vehicles, will have a significant effect on journey ambience.
- 8.56 Hence, the overall effects of the strategy in terms of journey ambience would be **moderate beneficial**. The inclusion of area-wide road user charging and the exclusion of Smarter Choices will not affect the assessment.

## SAFETY

- 8.57 The appraisal against the safety objectives covers the impact of the strategy on:
- ◆ accidents; and
  - ◆ security.

### Accidents

- 8.58 The GBSTS strategy would result in a significant improvement in road safety through reductions in the level of road traffic, particularly within urban areas. The overall impact of the strategy on casualties is shown in Table 8.6. The derivation of the statistics on accident levels follows standard DfT guidance and is based on the change in the volume of vehicle-kms on different types of road as a result of the strategy. In this approach, new roads, designed to modern standards, would tend to have a lower accident level compared with existing roads.

**Table 8.6 – Impact of GBSTS Strategy on Casualties**

| Scenario                | Annual Weekday Casualties |         |        |       | Total Saving Compared with Do Minimum |
|-------------------------|---------------------------|---------|--------|-------|---------------------------------------|
|                         | Fatal                     | Serious | Slight | Total |                                       |
| 2003                    | 33                        | 365     | 3152   | 3551  |                                       |
| 2031 Do Minimum         | 33                        | 332     | 4022   | 4388  |                                       |
| 2031 Strategy           | 31                        | 298     | 3597   | 3926  | 462                                   |
| 2031 Strategy with RUC  | 30                        | 286     | 3440   | 3756  | 632                                   |
| 2031 no Smarter Choices | 33                        | 316     | 3804   | 4152  | 235                                   |

- 8.59 Overall, the GBSTS strategy would result in around 460 weekday casualties being avoided each year, including 34 serious injuries and 3 fatalities. Including road user charging in the strategy would result in a greater reduction in casualties, while excluding 'Smarter Choices' would reduce the impact of the strategy on accidents by 50%.
- 8.60 The Joint Local Transport Plan for the Greater Bristol area focuses on reductions in the number of the most serious road casualties with targets for cutting the number of people killed and seriously injured (KSI). The GBSTS strategy delivers a 10% reduction in KSI casualties in 2031. With the new road links, the strategy tends to transfer traffic from local roads to strategic roads, resulting in greater reductions in casualties on local roads.
- 8.61 Overall, the impact of the strategy on accidents is assessed as **large beneficial**. The inclusion of area-wide road user charging will have the same impact as the main strategy, although the exclusion of Smarter Choices would reduce the impact to **moderate beneficial**.

### Security

- 8.62 The public transport elements of the strategy include measures to increase the personal security of travellers as an integral part of the recommendations, especially in the operation of public transport through improved facilities at bus stops and better real-time passenger information. The measures also include improvements to transport interchanges throughout the Greater Bristol area. Hence, the overall impact on security is assessed as **moderate beneficial**; this assessment would be valid for the inclusion of area-wide road user charging and the exclusion of Smarter Choices.

### ECONOMY

- 8.63 The appraisal of the GBSTS strategy against the Government's Economy objective covers the following sub-objectives:



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- ◆ minimise cost to public accounts;
  - ◆ improve transport economic efficiency;
  - ◆ improve reliability;
  - ◆ provide beneficial wider economic impacts;
  - ◆ improve strategic transport movements into, out of and through the study area;
  - ◆ improve access to BIA; and
  - ◆ reduce dependence on the car.

### Transport Economic Efficiency and Public Accounts

- 8.64 The Transport Economic Efficiency (TEE) sub-objective refers to the economic impact of the strategy on transport users and the private sector, including travel time and vehicle operating cost savings along with changes in fares and other charges, and income and costs to the private sector. The economic impact of the strategy on the public sector, including capital and operating costs, revenue and indirect tax income is considered under the Public Accounts sub-objective. The two sub-objectives are therefore closely interrelated and need to be considered together through an assessment of the economic performance of the strategy.
- 8.65 The performance of the GBSTS transport strategy against the TEE and Public Accounts sub-objectives has been assessed using the DfT's TUBA program. In summary, the assessment process involved the comparison of the total monetised benefits generated by the strategy against the total monetised costs. The costs and benefits considered fall into the following categories:
- ◆ **Impacts of the strategy on travel times and costs** for trips made within and through the modelled study area, together with the associated impacts on revenue and indirect tax levels. These impacts were estimated on the basis of the forecast change in travel conditions caused by the strategy compared to the Do Minimum situation. Outputs from the Greater Bristol Model (GBM) were used within TUBA to estimate traveller user benefits, revenues and indirect tax benefits over a 60 year appraisal period.
  - ◆ **Impacts of the strategy on road accidents** in the study area. Estimates were made using the COBA 11 methodology and the changes in traffic levels and patterns forecast by the transport model.
  - ◆ **Capital and operating costs for the strategy.** Cost estimates were made on the basis of current scheme proposals and cost rates from previous similar schemes. Appropriate allowances were made for optimism bias. As noted in Chapter 6, the capital costs exclude the costs associated with land acquisition.
- 8.66 The summary results of the economic assessment are presented in Table 8.7 (with definitions provided in the box below). The entries under the Present Value of Benefits (PVB) summarise the impact of the strategy on transport economic efficiency whilst the entries under the Present Value of Costs (PVC) summarise its impact on public accounts. The full TEE, Public Accounts and Summary Analysis Tables are given in Appendix A.

**Table 8.7 – Summary of Economic Assessment of GBSTS Strategy**

|  | Strategy       | Strategy with RUC | Strategy without Smarter Choices |
|--|----------------|-------------------|----------------------------------|
| <b>1) Costs in current prices (2005, Q1), £mill, inc Optimism Bias</b>                   |                |                   |                                  |
| Capital Cost   | £1,156         | £1,186            | £1,156                           |
| Operating Costs (60 years)   | £2,586         | £2,586            | £2,498                           |
| <b>2) PVC (£ mill, 2002 prices &amp; values, 60 year appraisal period, 2016 to 2075)</b> |                |                   |                                  |
| a) Public sector capital & operating costs   | £668           | £687              | £643                             |
| b) Public sector revenue (indirect tax + parking & road charges)                         | £435           | -£11,028          | £107                             |
| <b>c) Total PVC (a+b)</b>  | <b>£1,103</b>  | <b>-£10,341</b>   | <b>£750</b>                      |
| <b>3) PVB (£ mill, 2002 prices &amp; values, 60 year appraisal period, 2016 to 2075)</b> |                |                   |                                  |
| d) Travel time benefits  | £29,248        | £34,698           | £22,173                          |
| e) Vehicle operating cost benefits   | £323           | £72               | £188                             |
| f) User charge benefits  | -£225          | -£12,193          | -£348                            |
| g) Private sector revenue  | £5,067         | £5,688            | £4,026                           |
| h) Public sector operating & capital costs   | -£652          | -£652             | -£652                            |
| i) Accidents   | £681           | £923              | £322                             |
| <b>j) Total PVB (d+e+f+g+h+i)</b>  | <b>£34,442</b> | <b>£28,534</b>    | <b>£25,707</b>                   |
| <b>4) NPV (j-c)</b>  | <b>£33,339</b> | <b>£38,876</b>    | <b>£24,957</b>                   |
| <b>5) BCR (j/c)</b>  | <b>31</b>      | <b>-3</b>         | <b>34</b>                        |
| <b>6) BKR([j-b-h]/[c-b-h])</b>   | <b>26</b>      | <b>30</b>         | <b>20</b>                        |

| Definition of Summary Statistics               |   |
|--|---|
| <b>The Present Value of Costs (PVC) (2)</b>    | Represents the total value of the costs of the scheme over the 60 year appraisal period, discounted to 2002 values. Costs are defined as the net impact of the scheme on the public sector.   |
| <b>The Present Value of Benefits (PVB) (3)</b> | Represents the total value of the benefits of the scheme over the 60 year appraisal period, discounted to 2002 values. Benefits are defined as the net impact of the scheme on transport users and the private sector.  |
| <b>The Net Present Value (NPV) (4).</b>        | Represents the value of the PVB less the PVC. For most purposes this is the key figure, with a more positive NPV representing a stronger economic case for a scheme.  |
| <b>The Benefit Cost Ratio (BCR) (5).</b>       | Represents the ratio of the benefits caused by the scheme to its costs and is calculated by dividing the PVB by the PVC. As the definitions of the PVB and PVC above show, this figure effectively represents the comparison of the impact of the scheme on users and the private sector with its impact on the public sector.  |
| <b>The HA Benefit Cost Ratio (BKR) (6)</b>     | Represents the ratio of the net impact of the scheme on transport users and revenue income (public and private sector) to its total capital and operating costs. This ratio differs from the BCR in its treatment of public sector revenue (including indirect tax) and private sector capital and operating costs. The BCR includes private sector capital and operating costs with the benefits on the numerator of the ratio and the public sector revenue with the costs on the denominator of the ratio. In contrast, the BKR includes the private sector capital/operating costs with the costs (i.e. the denominator of the ratio) and the public sector revenue with the benefits (i.e. the numerator). These differences can lead to markedly different results, particularly for schemes with large scale impacts on public sector revenue. |

8.67 The following key points arise from the economic assessment of the GBSTS strategy:

- ◆ **Economic Performance:** The economic performance of the strategy is very strong. The benefits that it generates considerably outweigh its costs over the 60 year appraisal period, resulting in an NPV of nearly £35 billion and a BCR of greater than 30.
- ◆ **Time savings:** The vast majority of the benefits generated by the strategy are time savings experienced by transport users. The implementation of the strategy would cause a step change in transport provision in the study area, alleviating congestion and providing more numerous, direct and frequent travel options. The average journey time for travel by each mode would therefore reduce considerably, generating large time savings, although, as noted below, to a large extent, the original congestion is caused by the large increase in population and employment between 2003 and 2031.
- ◆ **Revenue:** The strategy causes a marked increase in public transport patronage, resulting in a substantial increase in revenue income (a present value of over £5 billion, over the 60 year appraisal period). The revenue received comfortably

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covers the ongoing costs incurred in operating the services provided. The increase is supplemented by a small increase in revenue from car drivers, raised through the workplace parking levy in the North Fringe of Bristol and increases in city centre parking charges in Bristol and Bath. The revenue impacts of the strategy are the second largest in scale (nearly 20% of the value of the time savings).

- ◆ **Accident Savings:** As discussed under the safety sub-objective above, the strategy reduces the number of road accidents in the study area, leading to 10% fewer killed and seriously injured casualties than occur in the Do Minimum in 2031. The savings result from the reduction in overall traffic levels caused by the strategy and its encouragement of traffic to switch from older, lower hierarchy roads to newer and more strategic roads with higher design and safety standards. The accidents saved are worth over £620 million (present value) when considered over the full appraisal period.
- ◆ **Vehicle Operating Costs:** The net impact of the strategy is a small saving in vehicle operating costs worth only a few percent of the value of total time savings. This saving comprises a larger scale decrease in costs experienced by car trips and an offsetting increase in costs experienced by goods vehicles. The two components of vehicle operating costs are the fuel used and non-fuel costs (such as general 'wear and tear'). Both are dependent on travel time and distance (and the associated travel speed). Up to a threshold speed of between 60 and 75 kph (depending on vehicle type), an increased travel speed reduces average fuel consumption and acts to decrease fuel costs. For car trips in the Do Minimum, average speeds are typically 40 to 50 kph (because of the high proportion of journeys occurring on slower, congested urban roads). They are therefore well below the efficiency threshold, and hence the increased average speed produced by the strategy improves fuel efficiency and reduces vehicle operating costs. However, the average speeds of goods vehicles, in the Do Minimum, are typically higher at around 60 to 65 kph, because a greater proportion of the journeys are on less congested inter-urban roads and motorways. These speeds are therefore above the efficiency threshold for this vehicle type so that increased speeds lead to a decrease in operating efficiency and a slight increase in vehicle operating costs. The increase is relatively large in absolute terms but represents less than 2% of total goods vehicle operating costs.
- ◆ **User Charge:** The strategy increases the charges paid by transport users. This is primarily the result of the workplace parking levy introduced for those working in the North Fringe and the increase in city centre parking charges in Bath and Bristol. The losses are offset, to an extent, by minor savings experienced by rail and park and ride passengers. These passengers are able to reduce the fare they pay by taking more direct and shorter routes made available by the changes in conditions and options provided by the strategy.
- ◆ **Indirect Tax:** The impacts of the strategy on indirect tax levels are directly related to its effects on vehicle operating costs and revenue. Expenditure by the user on various items of transport-related costs is subject to different levels of indirect taxation. For example, fuel incurs fuel duty and VAT whilst other vehicle operating costs and some parking charges incur VAT only. In contrast, public transport fares incur no taxation. Therefore, as the strategy alters the amount of travel and expenditure on each mode, it results in changes in the levels of indirect tax received by the government. The net effect is a decrease in indirect

tax income resulting primarily from the increase in expenditure on public transport fares. The assessment takes account of the fact that, by spending more of their available income on fares, consumers would have less to spend on other, taxable items, thus leading to a reduction in indirect tax paid to the Government.

- 8.68 The strategy performs very strongly in economic terms, mainly due to the contribution of travel time savings which arise largely because of the high levels of congestion in the 2031 Do Minimum situation. The Do Minimum shows significant increases in population (25%) and employment (20%) with only limited improvements to the transport infrastructure. Thus, the transport system is under extreme levels of stress, which is perhaps unrealistic because there would need to be some improvement to the transport system in order to accommodate the additional population and employment. The strategy provides a significant improvement in transport supply, compared with the Do Minimum, and hence there are significant travel time savings.
- 8.69 The high levels of congestion in the Do Minimum situation result in the suppression of trips. The strategy provides additional transport capacity and therefore releases some of the suppressed trips. In the 2031 morning peak period, there are 2% more trips overall with the strategy than in the Do Minimum situation. The benefits from the release of suppressed trips are in addition to the benefits accrued by users of the transport system in the Do Minimum.
- 8.70 The economic assessment demonstrates a very strong case for the strategy, which would perform well even with lower levels of growth. In the base year (2003) situation, the transport system is already under stress, and many of the measures included in the strategy are needed to address current as well as future problems.
- 8.71 TUBA presents time savings generated by the strategy in terms of a Net Present Value (NPV) of the savings experienced over the 60 year appraisal period and measured in millions of pounds. To provide a sense of scale, Table 8.8 presents a summary of the average time savings experienced for journeys to and from each of the major urban areas for each mode in the morning peak in 2031. The figures show that savings experienced are significant, generally between 5 and 15 minutes and considerably greater for rapid transit in general and for bus and rail to and from Weston-super-Mare.

**Table 8.8 – Average Time Saving for Trips to Urban Areas by Mode (Morning peak, 2031)**

| Trips to/from/<br>within | Mode | Average Travel Times |          | Change in Time |       |
|--------------------------|------|----------------------|----------|----------------|-------|
|                          |      | Do Minimum           | Strategy | Absolute       | % age |
| Bristol                  | Bus  | 66                   | 54       | 12             | 18%   |
|                          | RT*  | 108                  | 44       | 64             | 59%   |
|                          | Rail | 79                   | 73       | 6              | 7%    |
|                          | Car  | 34                   | 25       | 9              | 27%   |
| Bath                     | Bus  | 47                   | 39       | 8              | 17%   |
|                          | RT*  | 134                  | 62       | 72             | 54%   |
|                          | Rail | 79                   | 73       | 6              | 8%    |
|                          | Car  | 45                   | 32       | 13             | 29%   |
| Weston-super-Mare        | Bus  | 140                  | 90       | 50             | 36%   |
|                          | RT   | na                   | na       | na             | na    |
|                          | Rail | 98                   | 75       | 23             | 23%   |
|                          | Car  | 40                   | 29       | 11             | 28%   |

\*Rapid Transit Do Minimum times are the travel times that people travelling by rapid transit with the strategy in place would have faced if travelling by bus in the Do Minimum. Public transport times relate to trips within the study area only and include waiting and walking time.

- 8.72 The majority of trips in the study area are made by car (for example, 91% of trips in the morning peak in 2031 in the Do Minimum situation which falls to 76% with the full strategy). It therefore follows that the majority of time savings generated by the strategy are experienced by car users. Nonetheless, over 30% of the total benefits are experienced on public transport and park and ride, despite these modes accounting for less than 25% of the total trips in the GBSTS strategy (see Table 8.9).

**Table 8.9 – Strategy Time Savings by Mode (full 60 year time savings)**

| Mode          | Proportion of Total Time Saving |
|---------------|---------------------------------|
| Highway       | 69%                             |
| Bus           | 8%                              |
| Rapid Transit | 13%                             |
| Rail          | 5%                              |
| Park & Ride   | 4%                              |

- 8.73 The majority of trips made in the study area and the highest congestion levels occur in the weekday peak periods. Consequently, over 50% of the time savings

generated by the strategy are experienced during this time period, despite it accounting for less than 20% of total annual hours (see Table 8.10). This pattern is the result of the larger number of trips made during this period which experience the benefits and the larger scale of the congestion alleviation impacts of the strategy in the more congested peak times.

**Table 8.10 – Strategy Time Savings by Time of Day**

| Mode             | Proportion of Total Time Saving | Proportion of Annual Hours |
|------------------|---------------------------------|----------------------------|
| Weekday Peak     | 51%                             | 17%                        |
| Weekday Non Peak | 33%                             | 52%                        |
| Weekend          | 18%                             | 31%                        |

8.74 Trip making patterns and high congestion levels in the study area also focus on the main urban areas. Consequently, as Table 8.11 shows, a high proportion of the time savings generated by the strategy are experienced by trips to, from or within these areas.

**Table 8.11 – Time Savings by Mode & Geographical Area (2031 morning peak)**

|                             | %age of Total Strategy Time Savings |     |               |      |               |
|-----------------------------|-------------------------------------|-----|---------------|------|---------------|
|                             | Road                                | Bus | Rapid Transit | Rail | Park and Ride |
| To & From Bristol           | 46%                                 | 79% | 74%           | 59%  | 66%           |
| To & From Bath              | 17%                                 | 7%  | 15%           | 11%  | 14%           |
| To & From Weston-super-Mare | 11%                                 | 7%  | 0%            | 24%  | 6%            |

*Note: these figures include double counting as some of the journeys 'to and from Bristol' will be 'from and to Bath' etc.*

#### *Strategy with Road User Charging*

8.75 The inclusion of road user charging (RUC) in the strategy alters its economic performance in a number of ways. The summary results of the assessment are shown in Table 8.7, alongside the equivalent figures for the strategy without RUC. More detailed information is provided in the TEE, Public Accounts and Summary Analysis tables in Appendix A (Tables A.5 to A.8).

8.76 A comprehensive national congestion charging scheme could not be implemented before 2021, although local measures could be put in place earlier. Therefore, the form of the road user charge included in the GBSTS strategy varies through time, with:

- ◆ a cordon around Bristol in the earlier part of the study period; and
- ◆ an area-wide congestion-based scheme covering all roads later in the study period.



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- 8.77 While an allowance of £30 million has been made for the development of the Bristol cordon scheme, no information was available to estimate the proportion of the costs of the national scheme that would fall to the Greater Bristol area. Neither has any allowance been made for the operating and enforcement costs of either the cordon or the national scheme. Thus, the assessment below gives an optimistic view of the economic performance of the strategy with road user charging.
- 8.78 Using these assumptions, the inclusion of RUC increases the NPV of the strategy by over 15% to nearly £40 billion. This is accompanied by a change in the BCR from 31 to -3. This apparently counterintuitive effect is a consequence of the definition of the BCR and of the scale of public sector revenue generated by the charge. The BCR is defined as the comparison of the impacts on the private sector ('Benefit') against the impacts on the public sector ('Cost'). The public sector revenue generated by RUC exceeds the costs of the strategy with RUC, so the public sector receives a net income over the appraisal period. Hence, the result is that the strategy 'Cost' becomes a benefit (or negative cost). This results in a negative BCR which, in this case, is not a useful indicator of the economic performance of the scheme.
- 8.79 The Highways Agency's benefit cost comparison ratio (the BKR) is more useful in this context. As discussed above, it includes the public sector income as a benefit in the numerator of the ratio with only the scheme's capital and operating costs included in the PVC in the denominator. The value of this measure is 30 for the strategy with RUC, representing a significant increase on the value of 26 for the strategy without RUC.
- 8.80 The increased NPV (and therefore BKR) associated with including RUC is primarily the result of two effects:
- ◆ increased time savings; and
  - ◆ revenue generated from the charges.
- 8.81 The time savings are mainly experienced by road-based journeys (largely highway trips and, to a much lesser extent, bus trips). They are the result of congestion relief but are only experienced in the later years of the strategy period when the area-wide charging measures are introduced.
- 8.82 The impacts of RUC vary considerably through time as the form of the scheme alters. During the earlier years of the strategy, when RUC takes the form of an intermediate cordon around Bristol following an alignment between the Inner Ring Road and Avon Ring Road (see Figure 4.8), the scheme results in net time losses compared to the strategy without RUC in the equivalent years. Although the charge brings considerable congestion relief to central Bristol, the associated savings are more than offset by the losses that arise as drivers outside the cordon divert to avoid the charge. There are often no clear diversion routes around the cordon with the result that drivers travel considerable additional distances with associated increases in journey times. This rerouting increases congestion on roads such as the Avon Ring Road (A4174) which in turn reduces travel speeds. The result is an increase in journey times for all those using the roads, supplementing the time losses incurred by those rerouting directly to avoid the charge.
- 8.83 The area-wide congestion-based charge implemented later in the study period causes less rerouting. Drivers act to minimise their travel cost and a considerable
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number switch modes as the widespread charge makes the comparison between public transport and car costs more favourable to public transport. The result is a 4% reduction in car trips compared to the strategy without RUC, with a consequent reduction in congestion and an increase in travel time savings of over 15% in the morning peak in 2031, compared to the strategy without RUC.

- 8.84 In line with the overall time savings, the majority of the increased benefits generated by RUC occur in the most congested areas, i.e. the main urban areas. For example in the 2031 morning peak, over 70% of benefits are experienced by trips to and from Bristol, Bath and Weston-super-Mare.
- 8.85 The total revenue generated by RUC is over £10 billion (present value) over the 60 year appraisal period. As discussed above, this results in a negative BCR using the standard definition. However, the impact on the strategy's NPV is limited because the benefits of increased revenue are largely (90%) offset by the increase in the user charge experienced by those paying the charge.
- 8.86 Other, more minor, impacts from the implementation of RUC include increased vehicle operating cost savings generated by improved journey speeds and the additional incentive to reduce journey lengths. The traffic reduction effect of RUC also results in a 50% increase in the accident savings created by the strategy, bringing the value to more than £900 million (present value) over the appraisal period. Finally, slight rail disbenefits arise as rail travellers experience additional crowding due to the increase in mode switching encouraged by the road user charge.

#### *The Impact of 'Smarter Choices'*

- 8.87 The 'Smarter Choices' component of the strategy has an important impact on the strategy's overall economic performance. Table 8.7 presents the summary economic assessment results of a sensitivity test undertaken to exclude the Smarter Choices component from the strategy. Further information is provided in the TEE, Public Accounts and Summary Analysis tables in Appendix A (Tables A.9 to A.12).
- 8.88 The exclusion of 'Smarter Choices' reduces the NPV for the strategy by around 25% or £8 billion. The associated change in BCR is an increase from 31 to nearly 34.
- 8.89 The increase in NPV is mainly the consequence of reduced road travel time savings. The impacts of 'Smarter Choices' are focussed on congested urban areas and these measures are therefore very effective at alleviating highway congestion and reducing highway travel times. If 'Smarter Choices' are excluded from the strategy, average highway time savings decrease markedly, reducing the value of highway time saving benefits by over 30%.
- 8.90 A second important impact of the exclusion of 'Smarter Choices' measures is an increase in the revenue received from drivers. The measures focus on broadly the same trips that are targeted by the parking strategy (i.e. those to central urban areas and to work). The success of 'Smarter Choices' in removing these trips therefore reduces the revenue received by the public sector. When the 'Smarter Choices' are excluded, the revenue received increases by over £1.5 billion (present value) over the 60 year appraisal period.

- 8.91 The impact of this change on NPV is limited by the offsetting increase in user charges. However, it is this change, along with the reduction in the Government's indirect tax losses (resulting from the reduction in vehicle operating cost savings), that causes the BCR to increase when 'Smarter Choices' are removed. As both parking revenue and indirect tax represent public sector income, they offset the strategy costs in the BCR. The increase in revenue caused by excluding 'Smarter Choices' reduces the effective cost to the public sector by over 35%, a larger proportion than the 25% reduction in benefits for the numerator of the BCR (due to time saving reductions, etc). The net result is therefore an increase in the BCR.
- 8.92 As discussed above, the BKR measure excludes the complicating effect of public sector income (which acts to offset scheme costs) and compares all user and revenue impacts of the strategy with its capital and operating costs. The BKR measure reduces from 26 to 20 when 'Smarter Choices' are excluded following a pattern more consistent with the change in NPV.
- 8.93 Other more minor impacts of the exclusion of 'Smarter Choices' include a drop in public transport patronage (and therefore revenue), and reductions in the vehicle operating savings (due to the reduced improvements in average travel speed and therefore vehicle fuel efficiency). The decrease in traffic reduction also halves the accident savings caused by the strategy.

### **Improve Strategic Transport Movements into, out of and through the Study Area**

- 8.94 One of the main aims of the study was to improve strategic transport movements into, out of and through the study area. Clearly, the key to achieving this objective is to improve the operation of the motorway network in the Greater Bristol area. To achieve this, it is important to consider the interface between the local and strategic networks as well as the motorway network itself, because problems on the local network can often cause knock-on impacts on strategic routes. The GBSTS strategy includes a number of measures intended to meet this objective:
- ◆ measures designed to make better use of the existing motorway network, including Active Traffic Management;
  - ◆ providing better alternatives to the car by a step change in the provision of local public transport, including a new rapid transit system;
  - ◆ actively encouraging people to use alternatives to the car by means of Smarter Choices and parking restraint;
  - ◆ improvements to the local strategic transport network to take some pressure off the motorway network, including South Bristol Ring Road, Second Avon Crossing, Airport Link Road and Stoke Gifford Bypass; and
  - ◆ improvements to the motorway network itself, including relocating M5 Junction 21, widening the M4 to four lanes between Junctions 19 and 20, and improvements to M5 Junctions 16 and 17 and to M32 Junction 1.
- 8.95 Table 8.12 summarises the impact of the different elements of the GBSTS strategy on the motorway network. In the table, the following colour coding is used for the links.
- ◆ Green – capacity utilisation less than 85%;

- ◆ Orange – capacity utilisation between 85% and 90%; and
- ◆ Red – capacity utilisation greater than 90%.

8.96 For the junctions, the colour coding is:

- ◆ Green – capacity utilisation less than 85%;
- ◆ Orange – capacity utilisation greater than 85% for some links; and
- ◆ Red – capacity utilisation greater than 85% for all or most links.

**Table 8.12 – Impact of the Strategy on the Motorway Network (Morning Peak Period)**

| Location                  | 2003 Base | 2031 Do Minimum | Public Transport Measures | Public Transport plus Smarter Choices | Public Transport, Smarter Choices and Parking | Strategy (no RUC) | Strategy with RUC |
|---------------------------|-----------|-----------------|---------------------------|---------------------------------------|---|-------------------|-------------------|
| <b>Motorway Links</b>     |           |                 |                           |                                       |   |                   |                   |
| M5 J21-J20 NB             | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M5 J20-J19 NB             | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M5 J19-J18 NB             | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M5 J18-J17 NB             | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M5 J17-J16 NB             | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M4 J20-J19 EB             | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M4 J19-J18 EB             | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M4 J18-J17 EB             | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| <b>Motorway Junctions</b> |           |                 |                           |                                       |   |                   |                   |
| M5 J21                    | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M5 J20                    | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M5 J19                    | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M5 J18/J18A               | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M5 J17*                   | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M5 J16*                   | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M4 J19*                   | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |
| M32 J1*                   | ●         | ●               | ●                         | ●                                     | ●   | ●                 | ●                 |

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- 8.97 Some of the measures proposed in the GBSTS strategy, such as junction improvements at M5 Junctions 16 and 17 and at M32 Junction 1 involve detailed changes to operations and slip road arrangements. It did not prove possible to represent such schemes in the Greater Bristol Model which, as a strategic model, is not suitable for analysis of such detailed proposals. Consequently, the expected benefits from these measures are not reflected in the model output, or in any further analysis derived from the model results.
- 8.98 Table 8.12 shows that there is a marked deterioration in the performance of the motorway network between 2003 and 2031 in the Do Minimum situation. With only limited improvements in place (the climbing lanes), the network cannot cope with the large increases in traffic volumes created as a result of the developments in Spatial Scenario F and the associated growth of 25% in population and 20% in employment across the study area.
- 8.99 The non-highway elements of the strategy (such as public transport measures and Smarter Choices) reduce the flows on the motorway network considerably, bringing most motorway links below the 85% capacity threshold. The exception is the M4 between Junctions 19 and 20, for which capacity utilisation remains above 90% despite the introduction of such measures. It is only with widening to four lanes that this section is brought below the 85% capacity threshold.
- 8.100 Problems at the motorway junctions are much harder to solve, and reductions in the general level of traffic brought about by the non-highway elements of the strategy are not sufficient to reduce congestion. The GBSTS strategy therefore includes specific measures to tackle problems at key motorway junctions.
- 8.101 The public transport elements of the strategy improve strategic transport movements into and out of the study area by improving access to inter-regional rail services. Specific measures include:
- ◆ Worle public transport interchange, with an increase in the number of inter-regional rail services stopping at the station and improved connections by car, bus and coach;
  - ◆ improved interchange at Bristol Parkway; and
  - ◆ improved connections to main rail stations (such as Bristol Temple Meads, Bath Spa, Bristol Parkway and Worle) via higher frequency local rail services, rapid transit and enhanced bus services.
- 8.102 Overall, the impact of the strategy on improving strategic transport movements into, out of and through the study area is judged to be **large beneficial**. The assessment is maintained with the inclusion of area-wide road user charging and the exclusion of Smarter Choices.

### Reliability

- 8.103 The assessment of reliability has considered the changes in route stress (congestion) in the 2031 morning peak period as this represents the period of greatest congestion. Reliability is difficult to quantify directly, but a useful measure is the extent of the highway network below, approaching, at, and over capacity. The greater the proportion of the network below capacity, the less risk of network instability leading to

delay and unreliable journey times. Table 8.13 presents the proportion of vehicle-kilometres in each category in the morning peak period in 2031, with the equivalent 2003 figures shown for comparison. The results indicate a considerable worsening of reliability between 2003 and 2031 in the Do Minimum situation, with the proportion of links comfortably below capacity falling from 91% to 69%. The strategy brings this measure back up to 86% and, when road user charging is included, it is returned to 2003 levels. If Smarter Choices are excluded, the impact of the strategy on reliability is muted.

**Table 8.13 – Proportion of Vehicle-kilometres on Congested Links (2031, morning peak)**

|                             | Base (2003) | Do Minimum | Strategy | Strategy with RUC | Strategy without Smarter Choices |
|-----------------------------|-------------|------------|----------|-------------------|----------------------------------|
| Below capacity              | 91%         | 69%        | 86%      | 91%               | 76%                              |
| Approaching capacity        | 4%          | 14%        | 5%       | 3%                | 12%                              |
| At capacity                 | 3%          | 8%         | 6%       | 3%                | 6%                               |
| Significantly over capacity | 3%          | 9%         | 3%       | 2%                | 6%                               |

8.104 Measures included in the strategy to make best use of the existing motorway network, including Active Traffic Management, will also contribute to improved reliability, reinforcing the effects of reductions in congestion.

8.105 The GBSTS strategy provides significant improvements to reliability when compared to the Do Minimum case, and is judged to have a **large beneficial** impact overall. This assessment is strengthened with the inclusion of area-wide road user charging. If Smarter Choices were to be excluded from the strategy, the overall impact would be **moderate beneficial**.

### Wider Economic Impacts

8.106 The assessment of potential wider economic benefits provides an estimate of the scheme, area specific and cumulative wider impacts of the transport proposals in the strategy. The analysis shows that, overall, the wider economic impacts of the proposed GBSTS strategy are significant.

- ◆ The strategy improves current and future accessibility of residential populations to workplaces in the region. Schemes which make a particular contribution include the South Bristol Ring Road, cross-Bristol rail services and rapid transit measures. These enable the transfer of working populations in predominantly residential locations to employment centres such as the North Fringe, and central Bristol and Bath.

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- ◆ The impact of the transport proposals on the nature and form of business activity varies by scheme and the sectors affected. A literature review showed that, generally, it is the manufacturing, retail and office based sectors that are most greatly impacted by transport scheme improvements. Bus and rail schemes assist primarily in widening customer and labour catchments with little impact on supplier relationships with business. Road-based schemes can improve the relationships of business with suppliers, customers and workforce. The GBSTS strategy, in providing for a range of public transport and highways based improvements, will have a positive overall impact on the business activity as relationships with customers, suppliers and workforce are assisted.
  - ◆ Overall, proposals contained within the GBSTS transport strategy have an impact on the Greater Bristol area as a whole with the main effects on sub-areas in the central and south Bristol, with lesser impacts on parts of the North Fringe, Weston-super-Mare and central Bath. Several of the proposals (e.g. motorway measures, the second Avon crossing) have a greater impact on the effective operation of the motorway network rather than other local roads within the sub-region and therefore have a less noticeable local impact.
  - ◆ The impact of the transport proposals on areas of unemployment and deprivation varies. Several of the proposals (e.g. motorway measures, second Avon crossing, Stoke Gifford bypass, Nailsea bypass, A36-A46 link) do not impact on sub-areas in the Greater Bristol sub-region with current unemployment and deprivation problems. Generally, unemployment and deprivation in the sub-region is found in central and south Bristol, Weston-super-Mare and, to a limited degree, central Bath. The proposals for Junction 21 of the M5, South Bristol Ring Road, rapid transit and cross-Bristol rail services are best located to have a positive impact on existing pockets of deprivation and unemployment. This is possible via improved customer/workforce links to centres of major employment (i.e. from south to central Bristol, from existing locations to new development sites in Weston-super-Mare). It is also possible as new sites become accessed and developable as a result of transport improvements, for example those in close proximity to the alignment of the South Bristol Ring Road, in central Bristol or in Weston-super-Mare. However, the literature review suggests that a positive impact on existing levels of unemployment and deprivation is only possible via a comprehensive policy response that includes, but is not exclusive to, improvements in transport infrastructure.
  - ◆ The GBSTS strategy will have an overall positive impact on inward investment in the Greater Bristol area. The impacts will be higher where they are associated with those schemes which facilitate better strategic road movements (motorway measures, etc) and access to Bristol International Airport. However, it should be noted that demand from inward investors is likely to remain in the north of Greater Bristol (e.g. North Fringe) and that the potential for this area in the long term is unclear given limited additional site availability.
  - ◆ Overall, the assessment estimates that the GBSTS strategy has the potential to encourage the development of a range of employment sites which together provide for about 20,000 jobs, of which approximately 2,000 are not redistributed or displaced jobs. This is in addition to the assistance the strategy provides in enabling improved accessibility for sites earmarked for major mixed use development.



- ◆ The GBSTS strategy will have a positive wider economic impact on the South West region as a whole. This would be achieved in three main ways:
  - it will improve economic activity in the sub-region and therefore will improve the overall economic prosperity of the South West region as a whole;
  - it will improve inward investment opportunities for the Greater Bristol sub-region, which in turn will have a positive impact on overall wealth of the South West region; and
  - by improving the capacity for the motorway network and relieving traffic congestion, it will improve accessibility to other parts of the South West region with potential positive economic impacts for businesses elsewhere in the region.

8.107 Thus, overall the transport strategy is considered to have a **moderate beneficial** effect on the wider economic benefits across the Greater Bristol area. This assessment is maintained with the inclusion of area-wide road user charging and the exclusion of 'Smarter Choices'.

### Improve Access to BIA

8.108 The strategy includes a number of specific measures which contribute to improving access to Bristol International Airport (BIA):

- ◆ Bristol Airport Link Road connecting BIA with both Weston-super-Mare and south Bristol, with improved onward connections via the South Bristol Ring Road and the relocated M5 J21;
- ◆ improved and expanded Flyer express bus services to BIA, with direct links from Bristol Parkway, Worle transport interchange and Bath as well as increased frequencies from central Bristol;
- ◆ improved onward connections by public transport, via the rapid transit system and improved rail services, with the possibility of extending some services on the Ashton Vale rapid transit route through to BIA; and
- ◆ demand responsive public transport services for airport employees.

8.109 In addition, general congestion relief throughout the highway network as a result of the strategy improves journey times to BIA by car. The strategy therefore has a significant impact on journey times compared with the Do Minimum, increasing the population within half an hour of BIA by car by 500,000, and increasing the population within an hour of BIA by public transport by 60,000. Further details and journey time contours are given in the section on accessibility below.

8.110 Overall the strategy is judged to have a **large beneficial** impact on access to BIA. This assessment is unchanged with the inclusion of area-wide road user charging or the exclusion of Smarter Choices.

### Reduce Dependence on the Car

8.111 The strategy has a considerable impact on reducing dependence on the car within the Greater Bristol area, with a step change in the frequency, coverage and quality of public transport services (see the section on accessibility below). This is reflected in a large reduction in car mode share, from 91% in the Do Minimum to 76% with the

strategy in the morning peak period and from 94% to 85% in the inter-peak period (see Table 8.14).

8.112 As well as providing improvements to public transport infrastructure, it is important to give people incentives to reduce their dependence on the car. The measures included within 'Smarter Choices' are a key component of the strategy – without these, even with the improved public transport services in place, the morning peak car mode share would be 80%, compared with 76% with the complete strategy. Area-wide road user charging would provide a further incentive against the use of the car and reduce the morning peak car mode share to 74%.

8.113 Overall, the impact of the strategy on changing dependence on the car is assessed as **large beneficial**.

**Table 8.14 – Impact of Strategy on Mode Share**

| Mode                               | 2003 Base | 2031 Do Minimum | 2031 Strategy | 2031 Strategy with RUC | 2031 Strategy no Smarter Choices |
|------------------------------------|-----------|-----------------|---------------|------------------------|----------------------------------|
| <b>Morning Peak (average hour)</b> |           |                 |               |                        |                                  |
| Car                                | 88.8%     | 90.8%           | 76.2%         | 74.2%                  | 79.9%                            |
| Bus                                | 7.8%      | 5.7%            | 6.1%          | 7.3%                   | 4.9%                             |
| Rail                               | 2.5%      | 2.7%            | 3.7%          | 4.0%                   | 2.8%                             |
| Rapid Transit                      | 0.0%      | 0.0%            | 9.6%          | 10.2%                  | 8.7%                             |
| Park & Ride                        | 0.9%      | 0.9%            | 4.3%          | 4.2%                   | 3.7%                             |
| <b>Inter Peak (average hour)</b>   |           |                 |               |                        |                                  |
| Car                                | 92.4%     | 93.8%           | 85.2%         | 84.0%                  | 86.3%                            |
| Bus                                | 6.2%      | 4.6%            | 5.1%          | 6.0%                   | 4.7%                             |
| Rail                               | 1.2%      | 1.3%            | 1.7%          | 1.8%                   | 1.5%                             |
| Rapid Transit                      | 0.0%      | 0.0%            | 7.2%          | 7.4%                   | 6.9%                             |
| Park & Ride                        | 0.2%      | 0.2%            | 0.8%          | 0.8%                   | 0.7%                             |

## ACCESSIBILITY

8.114 The appraisal of the strategy against the Government's accessibility objective includes the following sub-objectives:

- ◆ increase option values – i.e. provide a greater choice of the means of travel;
- ◆ reduce severance;
- ◆ improve access to the transport system; and
- ◆ facilitate easier local, national and international travel.



## Option Values

- 8.115 The principle underlying option values can be explained using the example of the proposed rapid transit system. Even if a particular individual living along the route of the rapid transit does not intend to use the service with any regularity, he/she may still value having the option to use the service if and when they choose. For example, a car-owner may value the ability to use the service when, for whatever reason, they cannot drive or the car is unavailable. A non-car-owning resident who generally does not travel far may value the knowledge that, should they need to reach the city centre, the facilities exist for them to do so, at acceptable cost and with a reasonable level of convenience.
- 8.116 The GBSTS strategy includes a number of major public transport enhancements, which would provide additional options to residents of the Greater Bristol area:
- ◆ the rapid transit network, covering the Bristol and Bath urban areas, and extending out to Portishead and Avonmouth;
  - ◆ cross-Bristol rail services, giving a good level of service for journeys that were previously difficult by rail, i.e. Weston-super-Mare and Bath to the North Fringe and Yate.
  - ◆ new park and ride sites at Lambridge, Whitchurch, Emersons Green, Hambrook and Nibley.
- 8.117 Table 8.15 demonstrates the increases in public transport and park and ride capacity provided by the strategy, compared with the Do Minimum situation. There is a doubling in the capacity of bus/rapid transit (measured by the number of seat-kms), largely due to the new rapid transit network. In 2031, around 160,000 Greater Bristol residents (13% of the total) would be within 250 metres of the rapid transit network. In addition, the new park and ride sites and extensions to existing sites provide a doubling in capacity compared with the existing park and ride network.

**Table 8.15 – Public Transport Capacity**

| Mode  | % Change in Capacity |
|---|----------------------|
| Rail (increase in seat-km)                  | 20%                  |
| Bus and rapid transit (increase in seat-km) | 102%                 |
| Park and ride (parking spaces)              | 109%                 |

- 8.118 Overall, it is considered that the GBSTS strategy will have a **large beneficial** impact on option values. There is no change in this assessment through the addition of area-wide road user charging or the exclusion of Smarter Choices.

## Severance

- 8.119 The introduction of new transport infrastructure has the potential to create increased severance by the introduction of new or additional barriers to movement. The classic situation is the construction of a new road which breaks an existing travel movement (whether by walking, cycling, public transport or car) and hence creates a potential hindrance to travel. The design of the scheme can, and should, of course, include

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measures which mitigate against the potential severance, through the inclusion of footbridges, underpasses and other facilities designed to accommodate existing movement patterns as far as possible.

8.120 However, it is likely that there will be some increases in severance with major transport schemes. In view of the nature of the strategic study, it is not appropriate to include the detailed design of schemes, and hence identify the measures designed to mitigate against potential severance. However, it is possible to highlight potential sources of increased severance for individual schemes:

- ◆ South Bristol Ring Road – potential for increased severance along the route particularly on the urban sections through Hartcliffe and Withywood where the number of crossing points may be reduced, but also in terms of access in the rural areas where it will be necessary to replicate, as far as possible, the current footpaths, bridleways, etc;
- ◆ relocation of M5 Junction 21 – small change to severance, probably limited to the alignment of the link between the new junction and the A370;
- ◆ new crossing of River Avon – on the one hand, the scheme reduces the level of severance created by the River Avon by providing a more accessible link between the two banks of the river while, on the other hand, potentially worsening severance through the sections of new construction on either side of the river, although the impact of this is likely to be small;
- ◆ new link between A370 and M5 Junction 20 (Nailsea Bypass) – the scheme runs along a new alignment, south of the existing B3130 and there is therefore the potential for the severance of existing local movements – although the major movements would be accommodated in the construction of replacement measures, it may not be feasible to include all current movements;
- ◆ new link between A370 and M5 Junction 21 (Airport Link Road) – the scheme broadly involves a new alignment with limited on-line improvements to the existing highway network and, as with similar schemes, it would be expected that major current links would be included in the design to reduce problems of severance although there may be some minor movements which cannot be accommodated and hence severance would increase;
- ◆ Stoke Gifford bypass – the scheme involves a combination of new alignment and improvement to existing alignments and it is likely that there will therefore be some impact on severance, although much of the development along the alignment has yet to be designed and hence the scheme can be taken into consideration from the outset;
- ◆ the A36 to A46 could have a negative impact on local severance in the immediate vicinity of the scheme, where it cuts existing movements, although by providing a new crossing of the River Avon to the east of Bath, there is the potential for improved connections and hence reduced severance, for travellers wishing to cross the river, for example between Bathampton and Bailbrook;
- ◆ measures such as Smarter Choices and road user charging which reduce overall traffic levels across the highway network will therefore reduce severance by making it easier for pedestrians, cyclists, etc to move around the network; and
- ◆ the rapid transit network of lines includes a number of segregated sections which could potentially sever existing movements, for example through the harbourside

area between Ashton Vale and Bristol city centre, and in the connection between M32 and Coldharbour Lane, although the impact on severance is likely to be small.

- 8.121 As noted above, it is difficult to assess the net impact on severance without the detailed design of the major schemes. However, on the basis that the design will include reasonable features to counter any potential increases in severance, and taking into account the positive effects of Smarter Choices and road user charging, it is estimated that the net impact would be **slight adverse**.

### Access to Transport

- 8.122 The national sub-objective “Access to Transport” focuses on access to the public transport system for those with no car available.
- 8.123 The GBSTS strategy provides a substantial improvement in public transport provision throughout the study area, particularly in urban areas. This will significantly increase the opportunity for people to access the public transport network, and will provide the means for a much wider range of journeys to be made conveniently by public transport.
- 8.124 The improvements to the public transport system would have a particular impact on local travel within the Greater Bristol area, but would also improve public transport connections to mainline rail stations such as Bristol Temple Meads, Bristol Parkway and Bath Spa, which facilitates inter-regional travel. Worle Parkway will provide a more convenient hub for passengers from the south of the study area wishing to access inter-regional rail and coach services, and enhanced links to BIA will make international travel easier for those without access to a car.
- 8.125 The diagrams in Appendix B (Figures B.13 to B.22) show changes in morning peak journey times for trips by public transport, comparing the GBSTS strategy with the Do Minimum situation in 2031.
- 8.126 Table 8.16 shows the change in population within an hour of the key destinations by public transport as a result of the GBSTS strategy, compared with the Do Minimum.

**Table 8.16 – Change in Population within an Hour by Public Transport**

| Destination                   | Additional Population within an hour |                   |                                  |
|-------------------------------|--------------------------------------|-------------------|----------------------------------|
|                               | Strategy                             | Strategy with RUC | Strategy without Smarter Choices |
| Bristol city centre           | 515,000                              | 524,000           | 476,000                          |
| Bath city centre              | 56,000                               | 56,000            | 56,000                           |
| Weston-super-Mare             | 53,000                               | 53,000            | 53,000                           |
| Aztec West                    | 61,000                               | 75,000            | 50,000                           |
| Bristol International Airport | 62,000                               | 73,000            | 52,000                           |

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8.127 The key points that can be drawn from the analysis of public transport journey times are:

- ◆ the strategy leads to a considerable improvement in journey times to Bristol city centre. With the strategy in place, an additional 500,000 people are within an hour of the city centre, including residents of the Bristol urban area, Keynsham, Bath, Portishead, Nailsea and Yate, together with users of BIA;
- ◆ the rapid transit service to Portishead gives a vast improvement in its accessibility by public transport, reducing the total journey time to Bristol city centre from over two hours to under an hour. In addition, the improved interchange possibilities mean that journey times from Portishead to Aztec West and BIA are also improved significantly;
- ◆ the main improvements in public transport journey times to Bath are focused on the rail and rapid transit corridors - in particular, with increased rail frequencies, there is improved accessibility to Bath from Yate and stations in North Somerset;
- ◆ from Weston-super-Mare, a much greater proportion of the Bristol urban area can be reached within an hour and a half. Areas covered by the cross-Bristol rail services, such as Bath, Yate and the North Fringe, are also more accessible from Weston-super-Mare;
- ◆ the accessibility of the Aztec West area of the North Fringe by public transport is also enhanced, with an additional 60,000 people able to reach it within an hour – there are particular improvements along the rail corridors and within the Bristol urban area;
- ◆ journey times to BIA by public transport are improved, with an additional 60,000 people being able to reach it within an hour – the most significant improvements are from south Bristol and from the Worle public transport interchange; and
- ◆ there is a marked improvement in the accessibility of south Bristol – with the strategy in place, south Bristol residents are within an hour of central Bristol, and within an hour and a half of the North Fringe and BIA.

8.128 Overall, the strategy is judged to have a **large beneficial** impact on access to public transport. This assessment is unchanged with the addition of area-wide road user charging or the exclusion of Smarter Choices.

### **Easier Local, National and International Travel**

8.129 The improved opportunities for travel by public transport as a result of the GBSTS strategy are discussed in the previous section.

8.130 The local road schemes included in the strategy, particularly the South Bristol Ring Road, Second Avon Crossing and Airport Link Road, improve the accessibility of key locations for travellers by car, making local travel easier. The motorway schemes in the strategy, namely M4 widening from Junction 19 to 20, and improvements to M5 Junctions 16, 17 and 21, improve access to the South West and to the rest of the UK. The Airport Link Road improves access to BIA, facilitating international travel, while the Second Avon Crossing improves access to Bristol Port.

8.131 Furthermore, reduced congestion on the highway network, brought about by the whole package of measures included in the GBSTS strategy, cuts journey times and

improves journey time reliability, making travel easier at the local, national, and international levels.

8.132 The diagrams in Appendix B (Figures B.23 to B.32) show the changes in journey times for trips by car in the morning peak period in 2031.

8.133 Changes in the population within half an hour of the key destinations by car in the morning peak period in 2031 are shown in Table 8.17.

**Table 8.17 – Change in Population within 30 Minutes by Car**

| Destination                   | Additional Population within 30 mins |                   |                                  |
|-------------------------------|--------------------------------------|-------------------|----------------------------------|
|                               | Strategy                             | Strategy with RUC | Strategy without Smarter Choices |
| Bristol city centre           | 623,000                              | 653,000           | 587,000                          |
| Bath city centre              | 21,000                               | 312,000           | 9,000                            |
| Weston-super-Mare             | 60,000                               | 74,000            | 9,000                            |
| Aztec West                    | 210,000                              | 296,000           | 22,000                           |
| Bristol International Airport | 533,000                              | 659,000           | 471,000                          |

8.134 The results show that the GBSTS strategy makes travel by road in the Greater Bristol area considerably easier. This is due not only to the highway infrastructure improvements, but also, to a large extent, to the other elements of the strategy, such as public transport improvements and the expansion of Smarter Choices which encourage changes in mode split and hence ease congestion on the highway network.

8.135 With the strategy in place, a large part of the study area is within half an hour of Bristol city centre, the North Fringe (Aztec West) and BIA, by car. This amounts to a considerable improvement in accessibility compared with the Do Minimum, with an additional 600,000 people living within 30 minutes drive of Bristol city centre and a further 500,000 living within 30 minutes of BIA. There are also improvements in the accessibility of Weston-super-Mare and Bath.

8.136 If road user charging is added to the strategy, this has a particular impact on accessibility in Bath, increasing the population within half an hour of the centre by almost 300,000. The strategy includes several measures which reduce car travel within central Bath, including the rapid transit system, Smarter Choices, and the A36/A46 link road, but despite this, congestion levels in Bath remain high. The congestion-based road user charging scheme targets the highest levels of charge at the most congested locations, thus discouraging car travel to areas such as central Bath. With the reduction in delays this brings within Bath, a large area around the city is brought within the 30 minute catchment area.

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- 8.137 Excluding Smarter Choices from the strategy significantly reduces the impact in tackling congestion, and there is less improvement in car journey times. In particular, the workplace travel plans included in Smarter Choices lead to a substantial reduction in congestion around workplaces in the North Fringe area, and thus excluding Smarter Choices limits the improvements in journey times to Aztec West considerably.
- 8.138 Overall, the strategy is assessed as having a **large beneficial** impact on ease of local, national and international travel. The inclusion of area-wide road user charging and the exclusion of Smarter Choices do not affect the assessment.

### INTEGRATION

- 8.139 The consideration of the impact of the GBSTS strategy on integration within the study area concentrates on the following aspects:
- ◆ the effects on the integration between transport modes;
  - ◆ the integration of the strategy with land use policy; and
  - ◆ the integration with other government policies.
- 8.140 Each of these aspects is covered separately in the sections below.

### Transport Interchange

- 8.141 The strategy contains a number of measures designed to improve the ease and quality of interchange between transport modes across the study area. Some of the specific measures include:
- ◆ the creation of a new multi-modal interchange at Worle, with combined activities of rail, local bus, regional bus and coach services (including airport access) with park and ride at a single site;
  - ◆ the expansion of interchange facilities at Bristol Parkway (bus and rail) and University of the West of England (bus);
  - ◆ increased parking facilities at Nailsea and Backwell rail station;
  - ◆ improved passenger waiting facilities at stops including real-time passenger information, within the Showcase bus corridor measures;
  - ◆ increased frequency on local rail services to provide 'turn up and go' style of operation for passengers on the local rail network;
  - ◆ creation of a network of rapid transit services on corridors extending from central Bristol with common sections within Bristol city centre to facilitate interchange between lines;
  - ◆ expansion of existing park and ride sites and creation of new sites to enhance integration between private car and public transport; and
  - ◆ improved facilities for cyclists at rail stations, public transport interchanges, etc.
- 8.142 An additional form of integration between modes occurs through the inclusion of public transport aspects within highway schemes, for example the potential use of South Bristol Ring Road for new public transport services and the improved access to Bristol Parkway provided by Stoke Gifford bypass.



8.143 The overall impact of the package of measures would be a significant enhancement in the level of integration between modes and within public transport sub-modes.

8.144 Thus the transport strategy may be considered to be **large beneficial** in terms of the provision of physical interchange measures. The inclusion of area-wide road user charging in the strategy and the exclusion of Smarter Choices from the strategy would not have a significant impact on this assessment.

### Land Use Policy

8.145 The development of the GBSTS transport strategy has been closely linked with the parallel development, by the West of England Partnership, of the sub-regional spatial strategy (SRSS) for the Greater Bristol area. The level of growth to 2031 implied by the SRSS, with a 25% increase in population and 20% rise in employment, dictated that the transport strategy needed to closely reflect the location of the new developments in developing the measures in the strategy. At a number of key points within the study process, the study has taken direct account of the inter-relationship between transport and land use impacts including:

- ◆ the impact of five spatial development scenarios was tested to identify the effect of each different distribution of population and employment on the transport network;
- ◆ an initial series of generic transport measures, representing a range of potential improvements to the transport system, were tested with each of the spatial development scenarios to establish both the suitability of transport measures to accommodate the growth in demand and the impact on the transport system of developments at specific locations;
- ◆ the two preceding stages contributed to the identification, by the WoEP, of the spatial scenario (Scenario F) which formed the basis for the development of the SRSS and the GBSTS transport strategy; and
- ◆ the transport strategy which has formed the basis of the appraisal in this report was therefore linked directly with the land use in Spatial Scenario F, which was closely associated with the SRSS prepared by the WoEP.

8.146 Thus, there have been close links throughout the study between the transport elements of the GBSTS strategy and spatial development components of the SRSS.

8.147 The transport strategy took direct account of the needs of specific developments within the spatial strategy. In addition, there were significant developments within the existing urban areas across the study area, together with specific growth at BIA. The transport measures in the GBSTS strategy were designed specifically to cater for the spatial developments and the timing of the implementation programme for the transport measures was tailored to the anticipated spatial development programme. As an example, the rapid transit network was designed to serve a number of the new development sites, including Ashton Vale, Emersons Green, Whitchurch, Harry Stoke, Portishead, Keynsham and Cribbs Causeway. Other improvements to the highway network were also designed to cater for the additional demands caused by the developments, for example the South Bristol Ring Road, link road between M5 Junction 21 and South Bristol, Second Avon Crossing and Stoke Gifford Bypass.



8.148 Hence, the GBSTS strategy shows **strong beneficial** impacts in terms of the integration with land use developments. The inclusion of area-wide road user charging and the exclusion of Smarter Choices do not affect this assessment.

### Other Government Policies

8.149 The sub-objective seeks to identify how the strategy affects other relevant government policies across the range of government departments.

8.150 In July 2002, the Government and the Local Government Association agreed upon a set of seven shared priorities, which were:

- ◆ raising standards across schools;
- ◆ promoting healthier communities and narrowing health inequalities;
- ◆ creating safer and stronger communities;
- ◆ transforming the local environment;
- ◆ improving the quality of life of older people and children, young people and families at risk;
- ◆ meeting local transport needs more effectively; and
- ◆ promoting the economic vitality of localities.

8.151 A number of these wider priorities are directly relevant to the contents and objectives of the transport strategy. In this context, the Department for Transport's 'Shared Priority Delivery Plan' contains the following four key outcomes:

- ◆ tackling congestion;
- ◆ delivery accessibility;
- ◆ safer roads; and
- ◆ better air quality.

8.152 Further DfT policy objectives include these specific outcomes, supplemented by further related items:

- ◆ improving the quality of life; and
- ◆ reducing social exclusion.

8.153 The other elements of the strategy appraisal highlight how the combined elements of the transport strategy contribute to satisfying the outcomes.

8.154 Other government departments have related policy objectives which are relevant to the aims and contents of the transport strategy, including:

- ◆ Department for Health
  - improve access to health facilities,
  - encouraging walking and cycling
- ◆ Department for Education and Skills
  - increasing opportunities for access to education
- ◆ Department for the Environment, Food and Rural Affairs

- a better quality of life, the strategy for sustainable development

8.155 The contents of the transport strategy and the appraisal, described elsewhere in this report, make a significant contribution to the achievement of these policies. Hence, the GBSTS strategy shows a **strong beneficial** impact in terms of integration with other Government policies. The inclusion of area-wide road user charging and the exclusion of Smarter Choices do not alter this assessment.

### SUMMARY

8.156 The preceding sections have examined the impacts of the GBSTS strategy under the key headings of environment, safety, economy, accessibility and integration. At the same time, a comparison has been made with the changes to the appraisal resulting from variations to the strategy by adding area-wide road user charging and excluding 'Smarter Choices'.

8.157 The detailed appraisals outlined in the previous sections are summarised in the Appraisal Summary Tables:

- ◆ Table 8.18 – central GBSTS transport strategy;
- ◆ Table 8.19 – GBSTS strategy with area-wide road user charging; and
- ◆ Table 8.20 – GBSTS strategy excluding 'Smarter Choices'.

8.158 The tables highlight the key features in the appraisal of each strategy.



**Table 8.18 – Appraisal Summary Table for GBSTS Strategy**

| GBSTS Strategy |                                | Problems: congested road network with lack of high quality public transport options   |  | Present Value of Costs to Public Accounts £1,103M   |
|----------------|--------------------------------|---|--|---|
| OBJECTIVE      | SUB-OBJECTIVE                  | QUALITATIVE IMPACTS   | QUANTITATIVE ASSESSMENT  | ASSESSMENT  |
| Environment    | Noise                          | <p>Small net decrease in the number of people annoyed by noise (based on perceptible changes in noise levels). Increase in noise levels along new highway links on strategic road network. Decreases in noise spread across the study area network.</p> <p>The appraisal excludes the potential impacts attributable to the use of low noise surfacing and noise barriers in new schemes which would further reduce levels of noise pollution.</p>  | <p>Number of zones experiencing noise impact:</p> <ul style="list-style-type: none"> <li>- Increase in population annoyed – 28 zones</li> <li>- No change in population annoyed – 82 zones</li> <li>- Decrease in population annoyed – 77 zones</li> </ul>   | Net decrease in estimated population annoyed of 16,800.   |
|                | Local Air Quality              | <p>Reduction in emission levels of NO<sub>x</sub> and PM<sub>10</sub> between 2003 and 2031 through increasing use of cleaner, more efficient engines and improved fuels. Further moderate improvements achieved in 2031 by the strategy for both NO<sub>x</sub> (2%) and PM<sub>10</sub> (4%) compared with Do Minimum.</p> <p>Within the local Air Quality Management Areas, there are reductions in emissions compared with 2031 Do Minimum. For NO<sub>x</sub> reductions are 3% (Avonmouth), 7% (Bristol) and 8% (Bath) and for PM<sub>10</sub> a 4% drop in Bath and no change in Avonmouth and Bristol.</p> <p>The appraisal excludes impacts attributable to possible supporting measures such as roadside emissions testing, low emission zones and the further development of low emissions technologies.</p>   | <p>Total annual emissions (tonnes) – NO<sub>x</sub>:</p> <ul style="list-style-type: none"> <li>- Base (2003) – 13033</li> <li>- Do Minimum (2031) – 7150</li> <li>- Strategy (2031) – 6980</li> </ul> <p>Total annual emissions (tonnes) – PM<sub>10</sub>:</p> <ul style="list-style-type: none"> <li>- Base (2003) – 416</li> <li>- Do Minimum (2031) – 196</li> <li>- Strategy (2031) – 188</li> </ul> | <p>Changes in:</p> <p>NO<sub>x</sub>:<br/>-170 tonnes pa (-2.4% change)</p> <p>PM<sub>10</sub>:<br/>-8 tonnes pa (-4.1% change)</p> |
|                | Greenhouse Gases               | <p>A moderate (5%) reduction in CO<sub>2</sub> emissions in 2031 making a contribution towards meeting the UK Government's obligations under the Kyoto agreement on tackling climate change. Due to growth in development between 2003 and 2031, the level of CO<sub>2</sub> emissions increases by 33% between 2003 and 2031 Do Minimum.</p>   | <p>Total annual emissions (tonnes) – CO<sub>2</sub>:</p> <ul style="list-style-type: none"> <li>- Base (2003) – 2027705</li> <li>- Do Minimum (2031) – 2694531</li> <li>- Strategy (2031) – 2559328</li> </ul>   | <p>Changes in:</p> <p>CO<sub>2</sub><br/>-135203 tonnes pa (-5.0% change)</p>   |
|                | Landscape                      | <p>Impacts of specific strategy measures on individual landscape designations:</p> <ul style="list-style-type: none"> <li>- South Bristol Ring Road – potential impacts at western and eastern ends of the route;</li> <li>- Airport Link Road – potentially significant impacts on landscape in the Wrington area</li> <li>- M5 Junction 17 – possible impact on local landscape designations to west of existing junction; and</li> <li>- A36 – A46 Link Road – potentially significant impact on AONB.</li> </ul> <p>Remedial measures may need to be included within the design as schemes are developed.</p>   | N/A  | Potentially large adverse impact  |
|                | Townscape                      | <p>Impacts of specific strategy measures on individual townscape designations:</p> <ul style="list-style-type: none"> <li>- South Bristol Ring Road – parts of the urban sections of the route (Bishop Ave, Hawkfield Rd, Hengrove Way, Cater Rd Link, King George's Rd, Highridge Grn) could have potential townscape impacts; and</li> <li>- Stoke Gifford Bypass – potential local impacts.</li> </ul> <p>Remedial measures may need to be included within the design as schemes are developed.</p>  | N/A  | Potentially moderate adverse impact   |
|                | Heritage of Historic Resources | <p>Impacts of specific strategy measures on individual heritage designations:</p> <ul style="list-style-type: none"> <li>- South Bristol Ring Road – runs through Avon Conservation Area in Highridge and Withywood area;</li> <li>- Airport Link Road – runs very close to Scheduled Ancient Monuments at Nye, Redhill and Felton;</li> <li>- Nailsea Bypass – passes close to, but does not directly impact on, a Scheduled Ancient Monument at Wraxall and listed garden at Tyntesfield;</li> <li>- Widening of A370 – lies close to a Scheduled Ancient Monument and runs through a narrow band of Avon Conservation Area;</li> <li>- Improvements to M32 Junction 1 – could potentially impact on Avon Conservation Area to the north-east of the junction; and</li> <li>- A36 – A46 Link Road – runs close to Avon Conservation Area.</li> </ul> <p>Remedial measures may need to be included within the design as schemes are developed.</p>   | N/A  | Potentially moderate adverse impact   |
|                | Biodiversity                   | <p>Impacts of specific strategy measures on individual biodiversity designations:</p> <ul style="list-style-type: none"> <li>- South Bristol Ring Road – runs close to small ancient woodland at eastern end;</li> <li>- Airport Link Road – skirts SSSI between Nye and Congresbury, crosses Local Nature Reserve along disused rail line between Congresbury and Winscombe, runs through ancient woodlands north of Wrington;</li> <li>- Nailsea Bypass – skirts northern boundary of SSSI across Tickenham Moor;</li> <li>- Second Avon Crossing – runs close to important bird area when it crosses River Avon;</li> <li>- Improvements to M5 Junctions 16 &amp; 17 – close proximity to areas of ancient woodland; and</li> <li>- A36 – A46 Link Road – passes close to small SSSI.</li> </ul> <p>Remedial measures may need to be included within the design as schemes are developed.</p>  | N/A  | Potentially moderate adverse impact   |
|                | Water Environment              | <p>Impacts of specific strategy measures on individual water environment designations:</p> <ul style="list-style-type: none"> <li>- South Bristol Ring Road – runs close to a number of landfill sites at western end;</li> <li>- Airport Link Road – crosses fluvial flood plain between Nye and Congresbury, crosses the flood plain of River Yeo to the south of Wrington, crosses Source Protection Zones near to BIA and runs close to landfill sites north of BIA;</li> <li>- Nailsea Bypass – runs through flood plain between Tickenham and Nailsea;</li> <li>- Second Avon Crossing – runs within tidal flood plain of River Avon and at southern end near to landfill sites;</li> <li>- Widening of A370 – runs close to landfill sites;</li> <li>- Widening of M4 between Junctions 19 and 20 – lies close to landfill sites and crosses Bradley Brook;</li> <li>- Stoke Gifford Bypass – crosses small streams;</li> <li>- Improvements to M5 Junctions 16 &amp; 17 – close proximity to landfill site near Junction 17; and</li> <li>- A36 – A46 Link Road – crosses River Avon.</li> </ul> <p>Remedial measures may need to be included within the design as schemes are developed.</p> | N/A  | Potentially moderate adverse impact   |

| GBSTS Strategy |   | Problems: congested road network with lack of high quality public transport options   |  | Present Value of Costs to Public Accounts £1,103M |
|----------------|---|---|--|---|
| OBJECTIVE      | SUB-OBJECTIVE   | QUALITATIVE IMPACTS   | QUANTITATIVE ASSESSMENT  | ASSESSMENT  |
|                | Physical Fitness  | Promotion of walking and cycling measures and reduced car use through transfer to public transport would increase physical activity and fitness.  | N/A  | Moderate beneficial impact                        |
|                | Journey Ambience  | Various measures potentially reduce stress for drivers (through improved journey reliability, e.g. Variable Message signs, reduced congestion) and public transport passengers (improved journey times, real-time passenger information).                     | N/A  | Moderate beneficial impact                        |
| Safety         | Accidents   | Transfer of traffic onto new higher standard roads reduces overall accident levels.   | Annual weekday casualty levels:<br>2003 – 398 KSI<br>2031 (Do Minimum) – 365<br>2031 (Strategy) - 329  | PVB £681M   |
|                | Security  | Improved public transport security through better facilities at stops, real-time passenger information.   | N/A  | Moderate beneficial impact                        |
| Economy        | Public Accounts   | Significant public sector expenditure, particularly on public transport and highway schemes.  | Central Government PVC: £703M,<br>Local Government PVC: £399M  | PVC £1,103M                                       |
|                | Transport Economic Efficiency: Business Users and Transport Providers | Large travel time savings, especially for freight, with smaller vehicle operating cost savings. Significant time savings for public transport operators.  | Users PVB: £13,743M,<br>Transport Providers PVB: £4,414M,<br>Other PVB: £0M  | PVB: £18,158M                                     |
|                | Transport Economic Efficiency: Consumers                              | Large travel time savings for users, with smaller operating cost savings.   | Users PVB: £15,603M  | PVB: £15,603                                      |
|                | Reliability   | Additional highway capacity will reduce congestion and improve reliability. Extended use of Variable Message Signs will improve reliability on the motorway network.  | Proportion of vehicle-kms below capacity:<br>Base – 91%<br>Do Minimum – 69%<br>Strategy – 86%  | Moderate beneficial impact                        |
|                | Wider Economic Impacts  | Current and future population have improved accessibility to work particularly in south Bristol.  |  | Moderate beneficial impact                        |
| Accessibility  | Option Values   | Significant increase in level of public transport provision through bus, rapid transit park and ride and rail improvements.   | Increase in public transport capacity between Do Minimum and Strategy:<br>Rail – 20%<br>Bus and rapid transit – 102%<br>Park and Ride – 109%   | Large beneficial impact                           |
|                | Severance   | Individual highway schemes will increase local severance although detailed scheme design should include mitigation measures to maintain current links.  | N/A  | Slight adverse impact                             |
|                | Access to Transport   | Improved accessibility to main city/town centres. North Fringe and BIA for both public transport and highways.  | Extra population within 60 mins – public transport<br>Bristol city centre – 515,000<br>Bath city centre – 56,000<br>Weston-super-Mare – 53,000<br>North Fringe – 61,000<br>BIA – 62,000<br>Extra population within 30 mins – highways<br>Bristol city centre – 623,000<br>Bath city centre – 21,000<br>Weston-super-Mare – 60,000<br>North Fringe – 210,000<br>BIA – 533,000 | Large beneficial impact                           |
|                | Accessibility for the Disabled  | Introduction of new vehicles on bus, rapid transit and rail services with low floor access and designated areas for disabled.   | N/A  | Moderate beneficial impact                        |
| Integration    | Transport Interchange   | Improved interchange through developments including expansion of interchanges (at Worle, Bristol Parkway and UWE.), enhanced network of rapid transit and rail services, increased provision of park and ride. Improved real-time information for passengers. | N/A  | Moderate beneficial impact                        |
|                | Land-Use Policy   | Spatial development forecasts have been key input to strategy development process. Close liaison with West of England Partnership in preparation of Sub-Regional Spatial Strategy.  | N/A  | Moderate beneficial impact                        |
|                | Other Government Policies   | Strategy assists other Government policies (e.g. sustainability and social inclusion) through improvements to public transport services and changes in mode split.  | N/A  | Moderate beneficial impact                        |

**Table 8.19 – Appraisal Summary Table for GBSTS Strategy with Road User Charging**

| GBSTS Strategy with Road User Charging |   |   | Problems: Congested road network with lack of high quality public transport options   | Present Value of Costs to Public Accounts £10,341M  |
|--|---|---|---|---|
| OBJECTIVE                              | SUB-OBJECTIVE   | QUALITATIVE IMPACTS   | QUANTITATIVE ASSESSMENT   | ASSESSMENT  |
| Environment                            | Noise   | Small net decrease in the number of people annoyed by perceptible change in noise levels. Increase in noise levels along new highway links on strategic road network. Decreases in noise spread across the study area network.<br>The appraisal excludes the potential impacts attributable to the use of low noise surfacing and noise barriers in new schemes which would further reduce levels of noise pollution.   | Number of zones experiencing noise impact:<br>- Increase in population annoyed – 29 zones<br>- No change in population annoyed – 74 zones<br>- Decrease in population annoyed – 84 zones  | Net decrease in estimated population annoyed of 125,300.  |
|  | Local Air Quality   | Reduction in emission levels of NO <sub>x</sub> and PM <sub>10</sub> between 2003 and 2031 through increasing use of cleaner, more efficient engines and improved fuels. Further moderate improvements achieved in 2031 by the strategy with RUC for both NO <sub>x</sub> (4%) and PM <sub>10</sub> (6%) compared with Do Minimum.<br>Within the local Air Quality Management Areas, there are reductions in emissions compared with 2031 Do Minimum. For NO <sub>x</sub> reductions are 3% (Avonmouth), 10% (Bristol) and 9% (Bath) and for PM <sub>10</sub> a 6% drop in Bath, a 4% drop in Bristol and no change in Avonmouth.<br>The appraisal excludes impacts attributable to possible supporting measures such as roadside emissions testing, low emission zones and the further development of low emissions technologies.  | Total annual emissions (tonnes) – NO <sub>x</sub> :<br>- Base (2003) – 13033<br>- Do Minimum (2031) – 7150<br>- Strategy with RUC (2031) – 6874<br>Total annual emissions (tonnes) – PM <sub>10</sub> :<br>- Base (2003) – 416<br>- Do Minimum (2031) – 196<br>- Strategy with RUC (2031) – 184 | Changes in:<br>NO <sub>x</sub> :<br>- 276 tonnes pa (-3.9% change)<br>PM <sub>10</sub> :<br>- 12 tonnes pa (-6.1% change) |
|  | Greenhouse Gases  | A moderate (8%) reduction in CO <sub>2</sub> emissions in 2031 making a contribution towards meeting the UK Government's obligations under the Kyoto agreement on tackling climate change. Due to growth in development between 2003 and 2031, the level of CO <sub>2</sub> emissions increases by 33% between 2003 and 2031 Do Minimum.  | Total annual emissions (tonnes) – CO <sub>2</sub> :<br>- Base (2003) – 2027705<br>- Do Minimum (2031) – 2694531<br>- Strategy with RUC (2031) – 2479879   | Changes in:<br>CO <sub>2</sub> :<br>-214652 tonnes pa (-8.0% change)  |
|  | Landscape   | Impacts of specific strategy measures on individual landscape designations:<br>- South Bristol Ring Road – potential impacts at western and eastern ends of the route;<br>- Airport Link Road – potentially significant impacts on landscape in the Wrington area<br>- M5 Junction 17 – possible impact on local landscape designations to west of existing junction; and<br>- A36 – A46 Link Road – potentially significant impact on AONB.<br>Remedial measures may need to be included within the design as schemes are developed.   | N/A   | Potentially large adverse impact  |
|  | Townscape   | Impacts of specific strategy measures on individual townscape designations:<br>- South Bristol Ring Road – parts of the urban sections of the route (Bishop Ave, Hawkfield Rd, Hengrove Way, Cater Rd Link, King George's Rd, Highridge Grn) could have potential townscape impacts; and<br>- Stoke Gifford Bypass – potential local impacts.<br>Remedial measures may need to be included within the design as schemes are developed.  | N/A   | Potentially moderate adverse impact   |
|  | Heritage of Historic Resources  | Impacts of specific strategy measures on individual heritage designations:<br>- South Bristol Ring Road – runs through Avon Conservation Area in Highridge and Withywood area;<br>- Airport Link Road – runs very close to Scheduled Ancient Monuments at Nye, Redhill and Felton;<br>- Nailsea Bypass – passes close to, but does not directly impact on, a Scheduled Ancient Monument at Wraxall and listed garden at Tyntesfield;<br>- Widening of A370 – lies close to a Scheduled Ancient Monument and runs through a narrow band of Avon Conservation Area;<br>- Improvements to M32 Junction 1 – could potentially impact on Avon Conservation Area to the north-east of the junction; and<br>- A36 – A46 Link Road – runs close to Avon Conservation Area.<br>Remedial measures may need to be included within the design as schemes are developed.   | N/A   | Potentially moderate adverse impact   |
|  | Biodiversity  | Impacts of specific strategy measures on individual biodiversity designations:<br>- South Bristol Ring Road – runs close to small ancient woodland at eastern end;<br>- Airport Link Road – skirts SSSI between Nye and Congresbury, crosses Local Nature Reserve along disused rail line between Congresbury and Winscombe, runs through ancient woodlands north of Wrington;<br>- Nailsea Bypass – skirts northern boundary of SSSI across Tickenham Moor;<br>- Second Avon Crossing – runs close to important bird area when it crosses River Avon;<br>- Improvements to M5 Junctions 16 & 17 – close proximity to areas of ancient woodland; and<br>- A36 – A46 Link Road – passes close to small SSSI.<br>Remedial measures may need to be included within the design as schemes are developed.  | N/A   | Potentially moderate adverse impact   |
|  | Water Environment   | Impacts of specific strategy measures on individual water environment designations:<br>- South Bristol Ring Road – runs close to a number of landfill sites at western end;<br>- Airport Link Road – crosses fluvial flood plain between Nye and Congresbury, crosses the flood plain of River Yeo to the south of Wrington, crosses Source Protection Zones near to BIA and runs close to landfill sites north of BIA;<br>- Nailsea Bypass – runs through flood plain between Tickenham and Nailsea;<br>- Second Avon Crossing – runs within tidal flood plain of River Avon and at southern end near to landfill sites;<br>- Widening of A370 – runs close to landfill sites;<br>- Widening of M4 between Junctions 19 and 20 – lies close to landfill sites and crosses Bradley Brook;<br>- Stoke Gifford Bypass – crosses small streams;<br>- Improvements to M5 Junctions 16 & 17 – close proximity to landfill site near Junction 17; and<br>- A36 – A46 Link Road – crosses River Avon.<br>Remedial measures may need to be included within the design as schemes are developed. | N/A   | Potentially moderate adverse impact   |
|  |   | Physical Fitness  | Promotion of walking and cycling measures and reduced car use through transfer to public transport would increase physical activity and fitness.  | N/A   |
|  | Journey Ambience  | Various measures potentially reduce stress for drivers (through improved journey reliability, e.g. Variable Message signs, reduced congestion) and public transport passengers (improved journey times, real-time passenger information).   | N/A   | Moderate beneficial impact  |
| Safety                                 | Accidents   | Transfer of traffic onto new higher standard roads reduces overall accident levels.   | Annual weekday casualty levels (KSI):<br>2003 – 398<br>2031 (Do Minimum) – 365<br>2031 (Strategy with RUC) - 316  | PVB £923M   |
|  | Security  | Improved public transport security through better facilities at stops, real-time passenger information.   | N/A   | Moderate beneficial impact  |
| Economy                                | Public Accounts   | Large revenues accruing to local authority through road user charging which offsets government expenditure.   | Central Government PVC: £2,230M,<br>Local Government PVC: - £12,571M  | PVC - £10,341M  |
|  | Transport Economic Efficiency: Business Users and Transport Providers | Large travel time savings, especially for freight, with smaller vehicle operating cost savings. Significant time savings for public transport operators.  | Users PVB: £12,840M,<br>Transport Providers PVB: £5,036M,<br>Other PVB: £0M   | PVB: £17,875M   |
|  | Transport Economic Efficiency: Consumers                              | Large travel time savings for users but offset by suppressed trips through road user charging.  | Users PVB: £9,736M  | PVB: £9,736   |
|  | Reliability   | Additional highway capacity will reduce congestion and improve reliability. Extended use of Variable Message Signs will improve reliability on the motorway network.  | Proportion of vehicle-kms below capacity:<br>Base – 91%<br>Do Minimum – 69%<br>Strategy with RUC – 91%  | Large beneficial impact   |
|  | Wider Economic Impacts  | Current and future population have improved accessibility to work particularly in south Bristol.  |   | Moderate beneficial impact  |

| GBSTS Strategy with Road User Charging |                                |   | Problems: Congested road network with lack of high quality public transport options   | Present Value of Costs to Public Accounts £10,341M |
|--|--------------------------------|---|---|--|
| OBJECTIVE                              | SUB-OBJECTIVE                  | QUALITATIVE IMPACTS   | QUANTITATIVE ASSESSMENT   | ASSESSMENT   |
| Accessibility                          | Option Values                  | Significant increase in level of public transport provision through bus, rapid transit park and ride and rail improvements.   | Increase in public transport capacity between Do Minimum and Strategy:<br>Rail – 20%<br>Bus and rapid transit – 102%<br>Park and Ride – 109%  | Large beneficial impact                            |
|  | Severance                      | Individual highway schemes will increase local severance although detailed scheme design should include mitigation measures to maintain current links.  | N/A   | Slight adverse impact                              |
|  | Access to Transport            | Improved accessibility to main city/town centres. North Fringe and BIA for both public transport and highways.  | Extra population within 60 mins – public transport<br>Bristol city centre – 524,000<br>Bath city centre – 56,000<br>Weston-super-Mare – 53,000<br>North Fringe – 75,000<br>BIA – 73,000<br>Extra population within 30 mins – highways<br>Bristol city centre – 653,000<br>Bath city centre – 812,000<br>Weston-super-Mare – 74,000<br>North Fringe – 296,000<br>BIA – 659,000 | Large beneficial impact                            |
|  | Accessibility for the Disabled | Introduction of new vehicles on bus, rapid transit and rail services with low floor access and designated areas for disabled.   | N/A   | Moderate beneficial impact                         |
| Integration                            | Transport Interchange          | Improved interchange through developments including expansion of interchanges (at Worle, Bristol Parkway and UWE.), enhanced network of rapid transit and rail services, increased provision of park and ride. Improved real-time information for passengers. | N/A   | Moderate beneficial impact                         |
|  | Land-Use Policy                | Spatial development forecasts have been key input to strategy development process. Close liaison with West of England Partnership in preparation of Sub-Regional Spatial Strategy.  | N/A   | Moderate beneficial impact                         |
|  | Other Government Policies      | Strategy assists other Government policies (e.g. sustainability and social inclusion) through improvements to public transport services and changes in mode split.  | N/A   | Moderate beneficial impact                         |



**Table 8.20 – Appraisal Summary Table for GBSTS Strategy without Smarter Choices**

| GBSTS Strategy without Smarter Choices |   |   | Problems: Congested road network with lack of high quality public transport options   | Present Value of Costs to Public Accounts £750M   |
|--|---|---|---|---|
| OBJECTIVE                              | SUB-OBJECTIVE   | QUALITATIVE IMPACTS   | QUANTITATIVE ASSESSMENT   | ASSESSMENT  |
| Environment                            | Noise   | Small net decrease in the number of people annoyed by perceptible change in noise levels. Increase in noise levels along new highway links on strategic road network. Decreases in noise spread across the study area network.<br>The appraisal excludes the potential impacts attributable to the use of low noise surfacing and noise barriers in new schemes which would further reduce levels of noise pollution.   | Number of zones experiencing noise impact:<br>- Increase in population annoyed – 30 zones<br>- No change in population annoyed – 94 zones<br>- Decrease in population annoyed – 63 zones  | Net increase in estimated population annoyed of 79,500.   |
|  | Local Air Quality   | Reduction in emission levels of NO <sub>x</sub> and PM <sub>10</sub> between 2003 and 2031 through increasing use of cleaner, more efficient engines and improved fuels. Further small improvements achieved in 2031 by the strategy for both NO <sub>x</sub> (negligible %) and PM <sub>10</sub> (1%) compared with Do Minimum.<br>Within the local Air Quality Management Areas, there are reductions in emissions compared with 2031 Do Minimum. For NO <sub>x</sub> reductions are 3% (Avonmouth), 5% (Bristol) and 6% (Bath) and for PM <sub>10</sub> a 3% drop in Bath and no change in Avonmouth and Bristol.<br>The appraisal excludes impacts attributable to possible supporting measures such as roadside emissions testing, low emission zones and the further development of low emissions technologies.   | Total annual emissions (tonnes) – NO <sub>x</sub> :<br>- Base (2003) – 13033<br>- Do Minimum (2031) – 7150<br>- Strategy without Smarter Choices (2031) – 7117<br>Total annual emissions (tonnes) – PM <sub>10</sub> :<br>- Base (2003) – 416<br>- Do Minimum (2031) – 196<br>- Strategy without Smarter Choices (2031) – 194 | Changes in:<br>NO <sub>x</sub> :<br>-33 tonnes pa (-0.5% change)<br>PM <sub>10</sub> :<br>-2 tonnes pa (-1.0% change) |
|  | Greenhouse Gases  | A small (2%) reduction in CO <sub>2</sub> emissions in 2031 making a contribution towards meeting the UK Government's obligations under the Kyoto agreement on tackling climate change. Due to growth in development between 2003 and 2031, the level of CO <sub>2</sub> emissions increases by 33% between 2003 and 2031 Do Minimum.   | Total annual emissions (tonnes) – CO <sub>2</sub> :<br>- Base (2003) – 2027705<br>- Do Minimum (2031) – 2694531<br>- Strategy without Smarter Choices (2031) – 2649771  | Changes in:<br>CO <sub>2</sub><br>-44760 tonnes pa (-1.7% change)   |
|  | Landscape   | Impacts of specific strategy measures on individual landscape designations:<br>- South Bristol Ring Road – potential impacts at western and eastern ends of the route;<br>- Airport Link Road – potentially significant impacts on landscape in the Wrington area<br>- M5 Junction 17 – possible impact on local landscape designations to west of existing junction; and<br>- A36 – A46 Link Road – potentially significant impact on AONB.<br>Remedial measures may need to be included within the design as schemes are developed.   | N/A   | Potentially large adverse impact  |
|  | Townscape   | Impacts of specific strategy measures on individual townscape designations:<br>- South Bristol Ring Road – parts of the urban sections of the route (Bishopport Ave, Hawkfield Rd, Hengrove Way, Cater Rd Link, King George's Rd, Highridge Grn) could have potential townscape impacts; and<br>- Stoke Gifford Bypass – potential local impacts.<br>Remedial measures may need to be included within the design as schemes are developed.  | N/A   | Potentially moderate adverse impact   |
|  | Heritage of Historic Resources  | Impacts of specific strategy measures on individual heritage designations:<br>- South Bristol Ring Road – runs through Avon Conservation Area in Highridge and Withywood area;<br>- Airport Link Road – runs very close to Scheduled Ancient Monuments at Nye, Redhill and Felton;<br>- Nailsea Bypass – passes close to, but does not directly impact on, a Scheduled Ancient Monument at Wraxall and listed garden at Tyntesfield;<br>- Widening of A370 – lies close to a Scheduled Ancient Monument and runs through a narrow band of Avon Conservation Area;<br>- Improvements to M32 Junction 1 – could potentially impact on Avon Conservation Area to the north-east of the junction; and<br>- A36 – A46 Link Road – runs close to Avon Conservation Area.<br>Remedial measures may need to be included within the design as schemes are developed.   | N/A   | Potentially moderate adverse impact   |
|  | Biodiversity  | Impacts of specific strategy measures on individual biodiversity designations:<br>- South Bristol Ring Road – runs close to small ancient woodland at eastern end;<br>- Airport Link Road – skirts SSSI between Nye and Congresbury, crosses Local Nature Reserve along disused rail line between Congresbury and Winscombe, runs through ancient woodlands north of Wrington;<br>- Nailsea Bypass – skirts northern boundary of SSSI across Tickenham Moor;<br>- Second Avon Crossing – runs close to important bird area when it crosses River Avon;<br>- Improvements to M5 Junctions 16 & 17 – close proximity to areas of ancient woodland; and<br>- A36 – A46 Link Road – passes close to small SSSI.<br>Remedial measures may need to be included within the design schemes are developed.   | N/A   | Potentially moderate adverse impact   |
|  | Water Environment   | Impacts of specific strategy measures on individual water environment designations:<br>- South Bristol Ring Road – runs close to a number of landfill sites at western end;<br>- Airport Link Road – crosses fluvial flood plain between Nye and Congresbury, crosses the flood plain of River Yeo to the south of Wrington, crosses Source Protection Zones near to BIA and runs close to landfill sites north of BIA;<br>- Nailsea Bypass – runs through flood plain between Tickenham and Nailsea;<br>- Second Avon Crossing – runs within tidal flood plain of River Avon and at southern end near to landfill sites;<br>- Widening of A370 – runs close to landfill sites;<br>- Widening of M4 between Junctions 19 and 20 – lies close to landfill sites and crosses Bradley Brook;<br>- Stoke Gifford Bypass – crosses small streams;<br>- Improvements to M5 Junctions 16 & 17 – close proximity to landfill site near Junction 17; and<br>- A36 – A46 Link Road – crosses River Avon.<br>Remedial measures may need to be included within the design as schemes are developed. | N/A   | Potentially moderate adverse impact   |
|  | Physical Fitness  | Promotion of walking and cycling measures and reduced car use through transfer to public transport would increase physical activity and fitness.  | N/A   | Moderate beneficial impact  |
|  | Journey Ambience  | Various measures potentially reduce stress for drivers (through improved journey reliability, e.g. Variable Message signs, reduced congestion) and public transport passengers (improved journey times, real-time passenger information).   | N/A   | Moderate beneficial impact  |
| Safety                                 | Accidents   | Transfer of traffic onto new higher standard roads reduces overall accident levels.   | Annual weekday casualty levels (KSI):<br>2003 – 398<br>2031 (Do Minimum) – 365<br>2031 (Strategy without Smarter Choices) - 349   | PVB £322M   |
|  | Security  | Improved public transport security through better facilities at stops, real-time passenger information.   | N/A   | Moderate beneficial impact  |
| Economy                                | Public Accounts   | Significant public sector expenditure, particularly on public transport and highway schemes.  | Central Government PVC: £551M,<br>Local Government PVC: £199M   | PVC £750M   |
|  | Transport Economic Efficiency: Business Users and Transport Providers | Large travel time savings, especially for freight with smaller vehicle operating cost savings. Significant time savings for public transport operators.   | Users PVB: £9,800M,<br>Transport Providers PVB: £3,373M,<br>Other PVB: £0M  | PVB: £13,173M   |
|  | Transport Economic Efficiency: Consumers                              | Large travel time savings for transport users, with smaller operating cost savings.   | Users PVB: £12,213M   | PVB: £12,213  |
|  | Reliability   | Additional highway capacity will reduce congestion and improve reliability. Extended use of Variable Message Signs will improve reliability on the motorway network.  | Proportion of vehicle-kms below capacity:<br>Base – 91%<br>Do Minimum – 69%<br>Strategy without Smarter Choices – 76%   | Slight beneficial impact  |
|  | Wider Economic Impacts  | Current and future population have improved accessibility to work, particularly in south Bristol.   |   | Moderate beneficial impact  |

| GBSTS Strategy without Smarter Choices |                                |   | Problems: Congested road network with lack of high quality public transport options  | Present Value of Costs to Public Accounts £750M |
|--|--------------------------------|---|--|---|
| OBJECTIVE                              | SUB-OBJECTIVE                  | QUALITATIVE IMPACTS   | QUANTITATIVE ASSESSMENT  | ASSESSMENT                                      |
| Accessibility                          | Option Values                  | Significant increase in level of public transport provision through bus, rapid transit park and ride and rail improvements.   | Increase in public transport capacity between Do Minimum and Strategy:<br>Rail – 20%<br>Bus and rapid transit – 102%<br>Park and Ride – 109%   | Large beneficial impact                         |
|  | Severance                      | Individual highway schemes will increase local severance although detailed scheme design should include mitigation measures to maintain current links.  | N/A  | Slight adverse impact                           |
|  | Access to Transport            | Improved accessibility to main city/town centres. North Fringe and BIA for both public transport and highways.  | Extra population within 60 mins – public transport<br>Bristol city centre – 476,000<br>Bath city centre – 56,000<br>Weston-super-Mare – 50,000<br>North Fringe – 52,000<br>BIA – 62,000<br>Extra population within 30 mins – highways<br>Bristol city centre – 587,000<br>Bath city centre – 9,000<br>Weston-super-Mare – 9,000<br>North Fringe – 220,000<br>BIA – 471,000 | Large beneficial impact                         |
|  | Accessibility for the Disabled | Introduction of new vehicles on bus, rapid transit and rail services with low floor access and designated areas for disabled.   | N/A  | Moderate beneficial impact                      |
| Integration                            | Transport Interchange          | Improved interchange through developments including expansion of interchanges (at Worle, Bristol Parkway and UWE.), enhanced network of rapid transit and rail services, increased provision of park and ride. Improved real-time information for passengers. | N/A  | Moderate beneficial impact                      |
|  | Land-Use Policy                | Spatial development forecasts have been key input to strategy development process. Close liaison with West of England Partnership in preparation of Sub-Regional Spatial Strategy.  | N/A  | Moderate beneficial impact                      |
|  | Other Government Policies      | Strategy assists other Government policies (e.g. sustainability and social inclusion) through improvements to public transport services and changes in mode split.  | N/A  | Moderate beneficial impact                      |

## 9. Funding and Next Steps

- 9.1 Ultimately, the greatest challenge to developing any transport strategy or scheme is the ability to pay for it. This section reviews the potential sources of funding for transport schemes in the context of the GBSTS. The transport strategy comprises a series of individual elements, with different characteristics in terms of the balance between ownership of the assets, construction or capital cost, operating cost, level of revenue and variety of benefits. At the same time, these characteristics lend themselves to different possible sources of funding.

### NEW DEVELOPMENTS AFFECTING FUNDING

- 9.2 Government spending is usually categorised as ‘capital’ or ‘revenue’ expenditure, with different sources and funding rules for each. Typically, for local transport, revenue spending comes from the Block Grant from ODPM and capital spending from the Integrated Transport Block and Structural Maintenance Block of the LTP settlement. Many local authorities claim that, while there are many opportunities to obtain capital resources, they can rarely obtain sufficient revenue funding.

### Main Mechanisms for Capital Investment

- 9.3 Four main mechanisms of government capital spending on transport schemes can be identified:
- ◆ programme spending by national government agencies or bodies such as Network Rail and the Highways Agency;
  - ◆ the Regional Funding Allocation (with funding from central government) for schemes with an identified regional importance;
  - ◆ Local Transport Plan (LTP) spending by local authorities (funded partially by central government); and
  - ◆ smaller grants and locally-raised finance, primarily for smaller schemes.
- 9.4 The current arrangements for the financing of major local transport capital projects provide a range of options for local authorities:
- ◆ The most common are projects financed through a mixture of credit approvals and specific government grants.
  - ◆ Other existing mechanisms include procurement through the Private Finance Initiative (PFI) or through specific public-private partnerships such as those established for the procurement of large light rail schemes. These involve a mix of funding sources: credit approvals and grants during the construction phase, and PFI credits to support availability payments during the operations phase.
  - ◆ Funding for transport improvements can also be secured through agreements under Section 106 of the Town and Country Planning Act 1990, which provides the opportunity for authorities to facilitate transport improvements through the development process.

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## LTP Second Round (LTP2) – 2006/7 to 2010/11

- 9.5 The process for agreeing LTPs is the main route for delivering local transport capital investment as well as driving much current expenditure. The LTP2 process is more targeted and robust than the first round and is based on four principles:
- ◆ setting transport in a wider local context, integrating it with planning for other functions, such as housing, regeneration, health and land use;
  - ◆ setting locally relevant targets with identified outcome objectives;
  - ◆ getting value for money by making the best use of existing infrastructure or capacity before implementing any new investment, along with robust assessments of major schemes at an early stage; and
  - ◆ establishing new monitoring plans with indicators and trajectories.
- 9.6 The mainstream LTP2 funding (consisting of the Integrated Transport Block and the Maintenance Block) is likely to be based increasingly on a 'formula approach'. The 'Planning Guideline' approach gives additional money for 'good' LTPs and less money for 'poor' LTPs. The Maintenance Block allocation for the Greater Bristol area in 2006/7 is £12.694 million, with an additional amount for Exceptional Maintenance for the A4174 of £3.950 million. For the Integrated Transport Block, the 2006/7 allocation is £11.281 million. Planning guidelines show the allocation rising to £12.765 million for the Integrated Transport Block in 2010/11.
- 9.7 The LTP 'major scheme' funding will continue to be additional to the mainstream LTP funding and is designed for schemes with an estimated cost greater than £5 million. However, the new guidance underlines that schemes will now have to be much better specified and costed at an earlier stage in development. The local authorities in the Greater Bristol area have submitted a Major Scheme Bid for £42 million for the Showcase bus services in the Greater Bristol Bus Network. A second bid for the Bath Package of transport measures is being prepared. The prioritisation of such schemes against other competing alternatives across the region is undertaken through the Regional Funding Allocation process, outlined below.

## Regional Funding Allocations

- 9.8 The Regional Funding Allocations (RFA) are set out for transport, housing and economic development over a three year period with indicative amounts based on projecting forward long term planning assumptions (currently up to 2015/16). The spending included within each of these sectors is as follows:
- ◆ Transport:
    - LTP major scheme capital funding;
    - Highways Agency major scheme (>£5 million) funding on roads of a regional significance;
  - ◆ Housing:
    - Regional housing pot;
    - Housing market renewal pathfinder;
  - ◆ Economic development:
    - RDA single budget.

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- 9.9 Total RFA for the South West region in 2005/6 is £374 million, of which transport element amounts to £84 million. This is set to rise to £455 million by 2007/8 with the transport portion up to £88 million. Although not committed, based on planning assumptions the South West RFA could reach £535 million by 2015/16 with transport accounting for £105 million of the total.
- 9.10 The RFA process recognises the difficulties of delivering large projects which require significant and guaranteed funding levels in certain years. Thus, to accommodate this 'lumpiness' in funding requirements regions are able to:
- ◆ defer expenditure from one year to a later year (but not bring it forward);
  - ◆ adjust the distribution of funding between the sectors of transport, housing and economic development; and
  - ◆ agree with another region a process by which the two regions together meet their allocations.
- 9.11 The RFA process extends to cover the funding of some schemes in the trunk road network managed by the Highways Agency. The trunk road network is divided between two main categories:
- ◆ Routes of Strategic National Importance – funded from the HA national transport budget; and
  - ◆ Other National Routes – funded by the RFA.
- 9.12 As far as the study area is concerned, the designation of the trunk road network is:
- ◆ Routes of Strategic National Importance – M4 and M5; and
  - ◆ Other National Routes – M48 east of M4 Junction 21 and M49 between M5 Junction 18 and M4 Junction 22.
- 9.13 The Regional Funding Allocation process will be continuously updated as the information about the content, design and performance of schemes changes as they are developed. The South West Regional Assembly undertook the initial RFA in January 2006 in which it allocated potential schemes under a number of headings covering the period to 2016 including:
- ◆ schemes already in progress or firmly planned;
  - ◆ other schemes where the region concluded that there is a strong case;
  - ◆ schemes which require further work and analysis; and
  - ◆ schemes which may well prove to be longer term priorities but which are not sufficiently developed or focussed on top level priorities.
- 9.14 While no schemes within the study area have been allocated to the first category, there are a significant number of entries in the remaining categories. This highlights the work undertaken by the authorities within the Greater Bristol sub-region to bring forward schemes with sufficient merit and evidence. The individual schemes being advanced within the RFA process are outlined later in the chapter.

### **The Private Finance Initiative**

- 9.15 The PFI approach allows investment to be brought forward by using private capital, through a committed stream of 'revenue' payments by local (and central) government. Some risk is also transferred to the private sector. Currently, the PFI approach appears to be the only method by which a major light rail project, for example, can be procured.

### **Section 106 Developer Contributions**

- 9.16 Current Government policy requires fair, open and reasonable negotiation of planning obligations, so that the obligations enhance the quality of development and enable proposals to go ahead which might otherwise be refused.
- 9.17 New clauses in the Planning and Compulsory Purchase Act 2004 introduce an alternative means for developers to make contributions towards services and facilities without the need to negotiate with the Local Planning Authority (LPA). Those undertaking development may agree to pay to a LPA an amount set out in a document, drawn up by the LPA, as an alternative to the negotiated agreements which are currently made.

### **Local Authority 'Prudential' Borrowing**

- 9.18 Local councils receive the bulk of their revenue funding from the government through the Formula Grant. This includes a Revenue Support Grant (RSG) based on an assessment of each council's needs and a proportion of the National Non Domestic Rate (NNDR), collected from businesses.
- 9.19 From 2004/05 government support for capital investment is described as either Supported Capital Expenditure (Revenue), known as SCE(R), or Supported Capital Expenditure (Capital Grant), known as SCE(C). Supported Capital Expenditure (Revenue) is the amount of expenditure towards which revenue grant will be paid to a local authority on the costs of borrowing.

### **Tolls and Road User Charging**

- 9.20 The Transport Act 2000 allows local and municipal authorities to charge road users on a limited scale. In addition, a local traffic authority can impose a levy or licence charge on road users, or for keeping vehicles on roads.
- 9.21 This funding method involves charging road users for the use of road space. This may be through passing a 'cordon' (as currently in operation in London), or based on congestion levels in operation when using the road.
- 9.22 One of the key political issues associated with a local charging scheme is that the transport improvements may need to be in place in advance of the charging regime. However, it is difficult for a local authority to develop and procure transport projects in advance of the introduction of a charging scheme, when the funding for those projects is dependent on the successful implementation of the charging scheme.



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### Workplace Parking Charges

9.23 The Transport Act 2000 also made provision for local authorities to implement workplace parking levies. The availability of convenient, free or relatively cheap parking provided by employers encourages car use, particularly for commuting, even when alternative modes are available. By imposing a charge on the level of parking attached to a development, the objective is to influence the level of car use by employees at the site. As with road user charging, the revenues received from workplace charges must be used to improve transport in the charged area.

### Transport Innovation Fund

9.24 The recently introduced Transport Innovation Fund (TIF) has three key aims:

- ◆ to support innovative local transport packages e.g. those that combine road pricing with enhanced public transport, especially buses;
- ◆ to support innovative mechanisms to raise new funds; and
- ◆ to support schemes which are beneficial to national productivity.

9.25 A TIF bid should include demand management measures that go beyond those referred to as 'soft measures' or 'Smarter Choices' and preference would be given to bids that include road pricing over workplace parking levies, and schemes that cover a wide geographical area and/or a large population base. Although the guidance does not explicitly state as much, it is generally assumed that TIF schemes are likely to be pilot versions of a national road pricing system.

9.26 The first TIF allocations are expected in 2008/9 – nationally this is likely to amount to £290 million. The guidance indicates the fund growing to £2,550 million by 2014/15.

9.27 In addition to the general TIF allocation, a separate fund exists to 'pump prime' scheme developments. A separate process exists for authorities to win funds for this stage and pump priming will not be available for all successful TIF bidders. The aim of the pump priming fund is to ensure the development of packages for a range of circumstances. In November 2005, the local authorities in Greater Bristol were successful in receiving an award of £1.495 million from the TIF pump priming fund to develop their congestion charging scheme.

### Land Value Taxation

9.28 The Treasury is examining the possibility of using the land value gains that can result from the development of transport infrastructure. Changing the tax base towards land could have other positive implications such as preventing unsustainable housing booms.

### Local Authority Business Grant Incentive (LABGI)

9.29 This is a newly proposed funding method, based on the US system of Tax Increment Financing which has been in operation for over 20 years in America. Essentially, local authorities can carry out improvements to attract businesses, without raising taxes. Funds are derived from the growth in property tax revenues – the tax increment.



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### **Business Improvement Districts (BIDs)**

- 9.30 BIDs are a partnership between a local authority and the local business community to develop and take forward projects and services that benefit the trading environment and the public realm. They are designed to support the long-term sustainability of town and city centres. The BID is funded by non-domestic rate payers through a supplement to the rates bill.

### **Summary**

- 9.31 There are clearly several significant developments that will shape the way transport schemes are funded in the future. However, it is likely that the bulk of investment will continue to be funded in a similar way as is done today, with some modifications.

### **FUNDING ROAD AND ROAD TRAFFIC SCHEMES**

#### **Road Schemes and the LTP Process**

- 9.32 Most road schemes proposed by the study for the local strategic road network will need to be included within the Regional Funding Allocation process outlined above. Hence, for these schemes will be considered at the regional level, in competition with other schemes across the region.

#### **Highways Agency Programme Investment**

- 9.33 The Highways Agency (HA) has a substantial annual budget for highway maintenance and renewal. Few new roads are planned, although the programme includes road widening and junction capacity improvements. Proposed new roads will need to be included in the Regional Transport Strategy in order to be considered for HA funding and will be subject to the Regional Funding Allocation process outlined earlier.
- 9.34 The biggest Highways Agency road projects fall into one of the following categories:
- ◆ Targeted Programme of Improvements – major road projects costing more than £5 million;
  - ◆ Country-Wide Projects – national initiatives being carried out by the Agency;
  - ◆ Design, Build, Finance & Operate (DBFO) – a PFI for parts of the motorway and trunk road network. The Highways Agency pay DBFO companies an amount, which is based on the number and type of vehicles using the road, with adjustments made for lane closure and safety performance; and
  - ◆ Route Management Strategies – a strategic approach to the maintenance, operation and improvement of the network, involving regional stakeholders and the public in the decision-making process (e.g. M5 between Junctions 9 and 15).
- 9.35 The HA expects that around 25% (by value) of current and new major schemes will be procured using PFI contracts, including DBFO. The HA is also developing new procurement approaches for maintenance so as to introduce long-term maintenance contracts on DBFO lines.

### **Developer Contributions**

- 9.36 There are many examples of developer contributions being used to fund access roads to developments. However these investments are almost always relatively small-scale and directed at providing access to the particular development in question. Recently the trend has been to look for schemes integrated with public transport improvements. Proposals for changes to the assessment procedure are currently out for consultation. If the changes are implemented as proposed, they could link developments more directly to required contributions.

### **Toll Roads**

- 9.37 The new M6 Toll was designed, built and is run by a private consortium. The tolls are paid by the road users and vary by the type and size of vehicle, and the time of day. Although traffic levels and toll revenues are reported to be lower than expected, the DfT has announced that it considers the scheme to be a success and is willing to support new similar schemes.

### **Area-Wide Road Charging Schemes**

- 9.38 It seems likely that any area-wide charging scheme would have to be part of an integrated transport strategy that includes public transport provision. Any resources obtained through charging road users would have to be shared between road infrastructure development and public transport improvements. Use of the funds raised for any major road scheme is unlikely to fit in with the philosophy of 'better use of existing road space'.

## **FUNDING HEAVY RAIL SCHEMES**

### **Network Rail Investment Programme**

- 9.39 Network Rail currently undertakes the following types of enhancement projects:
- ◆ construction or completion of committed 'legacy' projects;
  - ◆ schemes arising from the Safety and Environment Plan;
  - ◆ schemes costing less than £5 million for which there would be benefits through operational efficiency and reliability gains may be funded through the recently announced Network Rail Discretionary Fund with a total value of £400 million to 2008/9 with half contributed by DfT and half from Network Rail's own funds;
  - ◆ schemes sponsored by the DfT, particularly where the opportunity for the enhancement is as a result of a planned signalling renewal; and
  - ◆ schemes sponsored and funded by other parties, principally PTEs, local authorities and train operators.
- 9.40 In future, most major enhancements will be delivered by third parties, either directly, or by way of a Special Purpose Vehicle company, such as is happening for the North London Line. Thus, despite being intimately involved in the national rail infrastructure, Network Rail will not be a major source for funding for local rail schemes, although it will be a necessary partner in any development.

### **Infrastructure Grants**

- 9.41 Following the abolition of the SRA, infrastructure development schemes that were being developed are being taken over by Network Rail and the DfT. Most of the grants previously applicable for the development of rail schemes – such as the Rail Passenger Partnership Fund or the Freight Facility Grant – are currently not available.

### **Business Case and Affordability**

- 9.42 If a project has a positive business case then it can be considered for DfT funding. All projects with positive business cases are weighed against other calls on the budgets to determine an appropriate funding allocation. However, the pressure on finance means that it will be difficult to obtain funding for any strategic schemes that are not already in the Network Rail Business Plan.

### **LTP Funding of Rail Schemes**

- 9.43 With funding sources such as the Rail Passenger Partnership Fund available, the LTP process generally excluded rail enhancement projects. Since the demise of this fund, the DfT has noted that it is prepared to consider supporting rail projects within LTP2.

### **Community Railways**

- 9.44 Community Rail routes may now be designated separately from the conventional and high speed rail networks, as happens elsewhere in Europe. Separate designation of Community Railways will allow a fresh approach in the way these lines are managed, marketed and supported as well as to the way they are maintained and renewed.

### **Local Authority Borrowing**

- 9.45 Prudential borrowing by local authorities can be used to fund heavy rail schemes – the Mayor of London has done this to pay for the extension of the East London Line. Any borrowing will, of course, have to be underpinned by future revenue stream of some sort.

### **FUNDING LIGHT RAIL SCHEMES**

- 9.46 Since 1980, seven new LRT systems have been built in England at a cost of £2.3 billion, of which more than £1 billion was contributed by central government as a Section 56 grant. Five of the seven systems were designed, constructed, operated and maintained by private sector companies. The Sheffield Supertram was built and originally run by the local PTE but later run and maintained by a private sector company. The Tyne and Wear Metro was built, and is still run, by the local PTE.
- 9.47 After the Nottingham LRT Section 56 grant, the ‘message’ from the Government was that further LRTs were unlikely. Subsequently, the National Audit Office produced a generally critical report on LRT development and the Secretary of State has rejected requests for funding for four LRT schemes (Manchester, South Hampshire, Leeds and Liverpool).

9.48 There are now a number of requirements that future LRT proposals will have to meet:

- ◆ no operating subsidy will be available;
- ◆ users should pay through the fare-box for all the benefits they derive and only non-user benefits can be counted in the social cost-benefit analysis;
- ◆ the cost-benefit analysis must give a high enough positive NPV – this is difficult to achieve as the principal benefits of a public transport system (e.g. time value of passengers not at work) are not included, even though they are included in assessments of new road projects;
- ◆ the project's risks must be largely transferred to the private sector;
- ◆ the maximum contribution possible to the capital cost must be obtained from the private sector;
- ◆ cautious estimating of ridership must be verified by techniques such as stated preference surveys; and
- ◆ rigorous analysis must demonstrate that there is not an alternative mode or solution which is more cost-effective (e.g. bus based).

#### **Local Authority Borrowing**

9.49 In line with heavy rail schemes outlined above, prudential borrowing can be used by local authorities to fund light rail schemes, e.g. extensions of the Docklands Light Railways.

#### **Road Pricing and LRT**

9.50 The development of an LRT scheme could be funded in part by revenue from a local road pricing scheme. However, road pricing is politically more palatable after improvements have been made to public transport. This implies that the capital costs of the LRT would have to be borne initially by a PPP private-sector partner. The current approach to LRT funding would still apply, although a proportion of the 'PFI credit' payments to the PPP would come from road pricing.

9.51 The Transport Innovation Fund aims to support and encourage strategies to tackle congestion in towns and cities. These particularly include linking demand management techniques such as road pricing with enhanced public transport. The emphasis is, however, on bus based public transport schemes.

#### **Pre-LRT Schemes**

9.52 Given the high cost of implementing rail-based LRT, and the current uncertainty for the private sector, it may be appropriate to consider a staged approach, introducing a bus-based scheme initially. This could then be up-graded to a rail-based LRT if the scheme is successful in attracting patronage.

## **FUNDING BUS SCHEMES**

### **The LTP Process**

- 9.53 Since deregulation, few local authorities operate bus services directly and they must issue tenders for any subsidised services that they wish to provide. Nevertheless, they can propose a wide range of measures that will make bus operations more effective and user-friendly, including bus lanes, junction signal priorities, improved bus stops, publicity etc.

### **Quality Bus Partnerships**

- 9.54 Apart from funding bus services considered socially necessary, the main mechanism for implementing bus schemes has been the Quality Bus Partnership (QBP) (or similar approaches such as the Bus Showcase) where investment by the local authority in infrastructure is combined with investment by a bus operator in vehicles or other enhancements.
- 9.55 The DfT provides funding to English local authorities for bus priority measures such as quality bus corridors. Funding provided in 2003–04 was forecast to deliver over 1,300 kilometres of improved bus routes.

### **DfT Grants**

- 9.56 The TIF is now available to authorities pursuing innovative schemes to link demand management with enhanced public transport. The emphasis is on bus based public transport enhancements indicating that this new source of finance is particularly appropriate to funding bus schemes.
- 9.57 Over the last few years, the DfT has arranged 'Challenge' funding for rural and urban bus schemes, although these funds have now been closed.
- 9.58 Improvements to bus services often have a significant 'revenue' component, for which a contribution may be available from Bus Services Operators Grant or Rural Bus Subsidy Grant.

### **Section 106 developer contributions**

- 9.59 The changes affecting Section 106 contributions are described earlier in this chapter. With more attention being directed at ensuring that new developments have adequate public transport provision, the flexibility of bus transport allows cost-effective connection of new developments to the local public transport network.

### **EU Funding**

- 9.60 EU funding is available for the implementation of new technology in public transport, in particular the use of environmentally-friendly fuels and new vehicle technology. However, these are usually only for 'demonstration' pilot projects, rather than regular, 'mainstream' funding.

### **The Countryside Agency**

- 9.61 The Countryside Agency has in the past offered a 'Parish Transport Grant' and a 'Rural Transport Partnership Fund'. However, both of the funds are currently over-committed and the Agency appears to prefer 'mainstream' funding of bus schemes.

### **FUNDING OF OTHER SCHEMES**

#### **Cycling**

- 9.62 The main source of funds for enhancements to the cycling environment is the LTP.
- 9.63 In the 1999 budget the Government introduced a package of seven tax measures to encourage employers to establish green transport plans and help employees travel to work without using their own cars. There is now no tax on workplace parking for bicycles, or bicycles and cycling safety equipment made available for employees to travel between home and work.
- 9.64 Employers are also able to pay their employees up to 20p per mile tax free for using their own cycles on business travel, and employees are able to claim tax relief on 12p per business mile if their employer pays less than 12p.

#### **Walking**

- 9.65 Improvements to facilities for walking usually form part of road development and other urban regeneration schemes. The usual funding source is through the LTP process. Other potential sources of funding include urban regeneration programmes, contributions from developers and congestion charging and the workplace parking levy.

#### **Travel Plans**

- 9.66 The cost of developing travel plans can be shared with other organisations and businesses. Local bus companies may be willing to provide support and incentives in the form of discounted travel.

#### **School Travel Plans (STPs)**

- 9.67 DfES will give a grant to an English state school that implements a STP to help fund measures such as cycle parking, lockers, and bus bays. Details are available from local authority school travel advisers.
- 9.68 Other sources of finance possible for promoting STP initiatives are:
- ◆ 'Safe and Sound' – a challenge scheme open to all schools in England which submit proposals for increasing the number of children who walk or cycle to school;
  - ◆ sponsorship from local business; and
  - ◆ National Lottery Grants – support of transport initiatives is recognised as an application criterion.

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## Intelligent Transport Systems & Travel Information

- 9.69 Such schemes are usually financed through the LTP. EU research funding is also possible for innovative schemes, for example, the VIVALDI Programme.

### Park & Ride

- 9.70 The main source of funding for Park & Ride schemes is likely to remain the LTP process. Partnership is possible with local bus companies to introduce bus corridor improvements as well as improvements in vehicle quality.

## SUMMARY OF SOURCES OF FUNDING

- 9.71 The main sources of finance are:
- ◆ programme investment by the main transport agencies (e.g. Highways Agency, Network Rail);
  - ◆ the LTP process and Regional Funding Allocation;
  - ◆ Section 106 Developer Contributions; and
  - ◆ new sources of funding, such as local authority borrowing, area-wide road charging, and the Transport Innovation Fund.

## PROGRAMME AND FUNDING OF THE GBSTS STRATEGY

- 9.72 In this section, we bring together the cost estimates for the individual elements of the strategy outlined with the preceding sections of the report and present an indicative profile of implementation and expenditure over the period to 2031.
- 9.73 Figure 9.1 presents an indicative timetable for the implementation of schemes through to 2031. The timing of schemes takes into account a number of factors including the time and resources necessary to develop, design and implement the scheme; the likely duration of the planning and approval process, including statutory consultation procedures; the funding process. The timetable shown in Figure 9.1 will evolve and develop as the contents of the strategy are developed.
- 9.74 Figure 9.2 summarises the anticipated costs for the components of the central GBSTS strategy, i.e. including Smarter Choices but excluding the area-wide road user charging and the associated costs and revenues. The projected expenditure of £1155 million, spread over the likely 25 year implementation programme, represents an annual expenditure of about £46 million. This compares with the current Integrated Transport Block received by the unitary authorities in 2006/7 of around £11.3 million.
- 9.75 Finally, Figure 9.3 summarises the possible profile of expenditure over the 25 year period to 2031. As it currently stands there are some significant variations between peaks and troughs in the profile and further work will be required to adjust the profile to smooth out the annual expenditure.



**WHAT HAPPENS NEXT**

- 9.76 The recommendations from the study outlined in this report will be presented to the partner group comprising officers from the following organisations:
- ◆ Department for Transport (DfT)/Government Office for the South West (GOSW);
  - ◆ South West Regional Development Agency (SWRDA);
  - ◆ Highways Agency (HA);
  - ◆ Bath & North East Somerset Council (B&NES);
  - ◆ Bristol City Council (BCC);
  - ◆ North Somerset Council (NSC); and
  - ◆ South Gloucestershire Council (SGC).
- 9.77 Having reviewed the outcomes from the study, the officers will develop recommendations on which schemes and measures should be taken forward by their organisations, identifying a potential timetable for implementation.
- 9.78 The Secretary of State for Transport and elected members of the unitary authorities will then consider which schemes and measures should be taken forward. Once decisions have been made, further work will be undertaken on the schemes and measures to enable them to be entered into the appropriate programmes of the Department for Transport, the Highways Agency and the unitary authorities. The schemes and measures will then be subject to the normal statutory planning processes.
- 9.79 The Secretary of State for Transport has asked the South West region to advise him on its priorities for transport investment in the next ten years or so. The recommendations from GBSTS will assist the region to understand the benefits of the schemes and measures, in terms of supporting future prosperity in Greater Bristol by investing in transport, compared with other areas in the South West. The advice to the Secretary of State will be based on evidence from GBSTS.
- 9.80 The study has been progressed in an open and consultative manner and the possible options have been discussed publicly. Many of the proposals are at a very early stage in the planning process and, if the recommendations are accepted, considerable further work will be required to prepare and consult on detailed designs for the schemes, including specific route alignments.



Figure 9.2 – GBSTS Final Strategy Costs

| Scheme   | Description  | Estimated Capital Cost (£M) | Estimated Revenue Cost p.a. (£M) | Notes  |                                      |
|--|--|-----------------------------|----------------------------------|--|--------------------------------------|
| Smarter Choices  | Smarter Choices - Workplace Travel Plans   | 0.0                         | 0.8                              | Estimated cost p.a. by 2031  |                                      |
|  | Smarter Choices - School Travel Plans  | 0.0                         | 0.6                              | Estimated cost p.a. by 2031  |                                      |
| Public Transport   | Showcase Bus Corridors   | 56.5                        | 0.4                              | 75% of bus operating costs assumed to be covered by revenue                          |                                      |
|  | Improved interchange facilities at UWE   | 0.5                         | 0.0                              |  |                                      |
|  | Express inter-urban buses (including Worle and Bath to BIA)  | 0.0                         | 1.0                              | 50% of bus operating costs assumed to be covered by revenue                          |                                      |
|  | Extending Airport Flyer service to North Fringe  | 0.0                         | 0.0                              | 100% of operating costs assumed to be covered by revenue                             |                                      |
|  | Park and Ride site extensions  | 20.3                        | 0.2                              | Includes new park-and-ride bus service to Bristol Parkway extension                  |                                      |
|  | Bath Package (including new Lambridge P&R site, Bath Rapid Transit, P&R site extensions at Newbridge, Lansdown and Odd Down) | 47.5                        | 0.2                              | 75% of park and ride bus operating costs assumed to be covered by revenue            |                                      |
|  | New Park and Ride sites  | 23.9                        | 0.5                              | 75% of park and ride bus operating costs assumed to be covered by revenue            |                                      |
|  | Worle public transport interchange   | 12.6                        | 0.0                              | Includes car park extension, lengthening platforms                                   |                                      |
|  | Rapid Transit - Hengrove to North Fringe   | 55.4                        | 0.0                              | 100% of operating costs assumed to be covered by revenue                             |                                      |
|  | Rapid Transit - Ashton Vale to Emersons Green  | 25.5                        | 0.0                              | 100% of operating costs assumed to be covered by revenue                             |                                      |
|  | Rapid Transit - Whitchurch to Avonmouth/Portishead   | 30.5                        | 0.0                              | 100% of operating costs assumed to be covered by revenue                             |                                      |
|  | Rapid Transit Newbridge to Cribbs Causeway   | 41.0                        | 0.0                              | 100% of operating costs assumed to be covered by revenue                             |                                      |
|  | Rail infrastructure improvements   | 20.2                        | 0.0                              | Includes turn-back at Yate, extra platforms at Weston-super-mare and Bristol Parkway |                                      |
|  | Train lengthening  | 0.0                         | 7.0                              |  |                                      |
|  | Cross-Bristol rail services  | 0.0                         | 5.0                              | 67% of rail operating costs assumed to be covered by revenue                         |                                      |
|  | Highway  | A38-A370 Red Route          | 15.8                             | 0.0  |                                      |
|  |  | A38-A370 Orange Route       | 13.4                             | 0.0  | Associated with BIA link road scheme |
| South Bristol Ring Road Hicks Gate to Whitchurch section |  | 64.0                        | 0.0                              |  |                                      |
| South Bristol Ring Road Whitchurch to Hengrove section   |  | 40.9                        | 0.0                              |  |                                      |
| South Bristol Ring Road Hengrove to A38 section.         |  | 21.9                        | 0.0                              |  |                                      |
| M5 J21 Junction Relocation                               |  | 62.5                        | 0.0                              | Includes cost of associated road improvements on A370 PDR and B3440                  |                                      |
| Second Avon Crossing                                     |  | 141.7                       | 0.0                              | Includes cost of associated M5 J19 improvements                                      |                                      |
| BIA Link road  |  | 75.0                        | 0.0                              |  |                                      |
| A36-A46 Link Road  |  | 46.2                        | 0.0                              |  |                                      |
| Stoke Gifford Bypass                                     |  | 43.1                        | 0.0                              |  |                                      |
| M5 Junction improvements J16-17                          |  | 91.1                        | 0.0                              |  |                                      |
| M32 J1 improvements                                      |  | 10.0                        | 0.0                              |  |                                      |
| M4 J20 - J19 Widening                                    |  | 55.3                        | 0.0                              |  |                                      |
| Junction improvements on A4174 ARR                       |  | 10.0                        | 0.0                              |  |                                      |
| Long Ashton bypass widening (A370)                       |  | 45.9                        | 0.0                              | Associated with BIA link road scheme   |                                      |
| A38 Widening   |  | 27.5                        | 0.0                              | Associated with BIA link road scheme   |                                      |
| Avon and Somerset Tactical Information System            |  | 50.0                        | 0.0                              |  |                                      |
| Wiltshire Information and Signal Enhancement             | 7.5  | 0.0                         |                                  |  |                                      |
| <b>TOTAL</b>   |  | <b>1155.7</b>               | <b>15.7</b>                      |  |                                      |

Figure 9.3 – GBSTS Emerging Cost Profile

