Government Office for the South West

London to South West and South Wales
Multi Modal Study
Corridor Plan: London – Bristol/Severn Estuary
Final Report
May 2002

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Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Signed
20	0	Plan Report: London – Bristol Corridor-DRAFT	Mar'02	GW
20	1	Plan Report: London-Bristol Corridor – Final Draft	Apr '02	MBr
20	2	Plan Report: London-Bristol Corridor – Final Report	May '02	MBr

The Preferred Strategy will go to the Regional Assemblies for the South West and South East of England, and the Welsh Assembly Government, to consider their recommendations and as an input to the revision of the Regional Transport Strategies in Regional Planning Guidance for the South West and the South East.

These bodies will consider whether they wish to support the strategy. They will then, in turn, make recommendations to Ministers. Only then will any decisions be taken on the addition of schemes to investment programmes.

The study has been taken forward in an open and consultative manner and the possible options discussed publicly. Many of the proposals are at an early stage in the planning process and if the recommendations were accepted, further work would be required to prepare and consult on detailed designs and route alignments. This will allow specific impacts to be identified.

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Executive Summary: London – Bristol/Severn Estuary Corridor Plan

Context

E.1 The London to Bristol/Severn Estuary Plan covers the Great Western Main Line (GWML) between Reading and Severn Tunnel and the M4 between Reading and the Severn Bridges. Areas around Bristol and Swindon are covered in the Greater Bristol Area Plan and Swindon Area Plan respectively. The area to the east of Reading is being addressed within the Thames Valley Multi-Modal Study.

E.2 The key transport-related problems pertinent to this Plan are:

- Congestion on the M4, particularly in the peak periods;
- Relatively minor disruptions to traffic flow on the M4 can cause significant delays;
- The GWML is operated intensively and, again, relatively minor problems can lead to significant delays; and
- Despite relatively high numbers of public transport services on the corridor, good opportunities for interchange away from urban centres are uncommon.

The Preferred Strategy

E.3 The Preferred Strategy is summarised in Figure 1.

E.4 The London-Bristol/Severn Estuary Plan contains a Preferred Strategy which includes investment across all modes on the M4 and GWML strategic corridors. By far the highest level of investment is targetted at the rail corridor, and the expectation would be that the recommendations from TVMMS will significantly increase this amount.

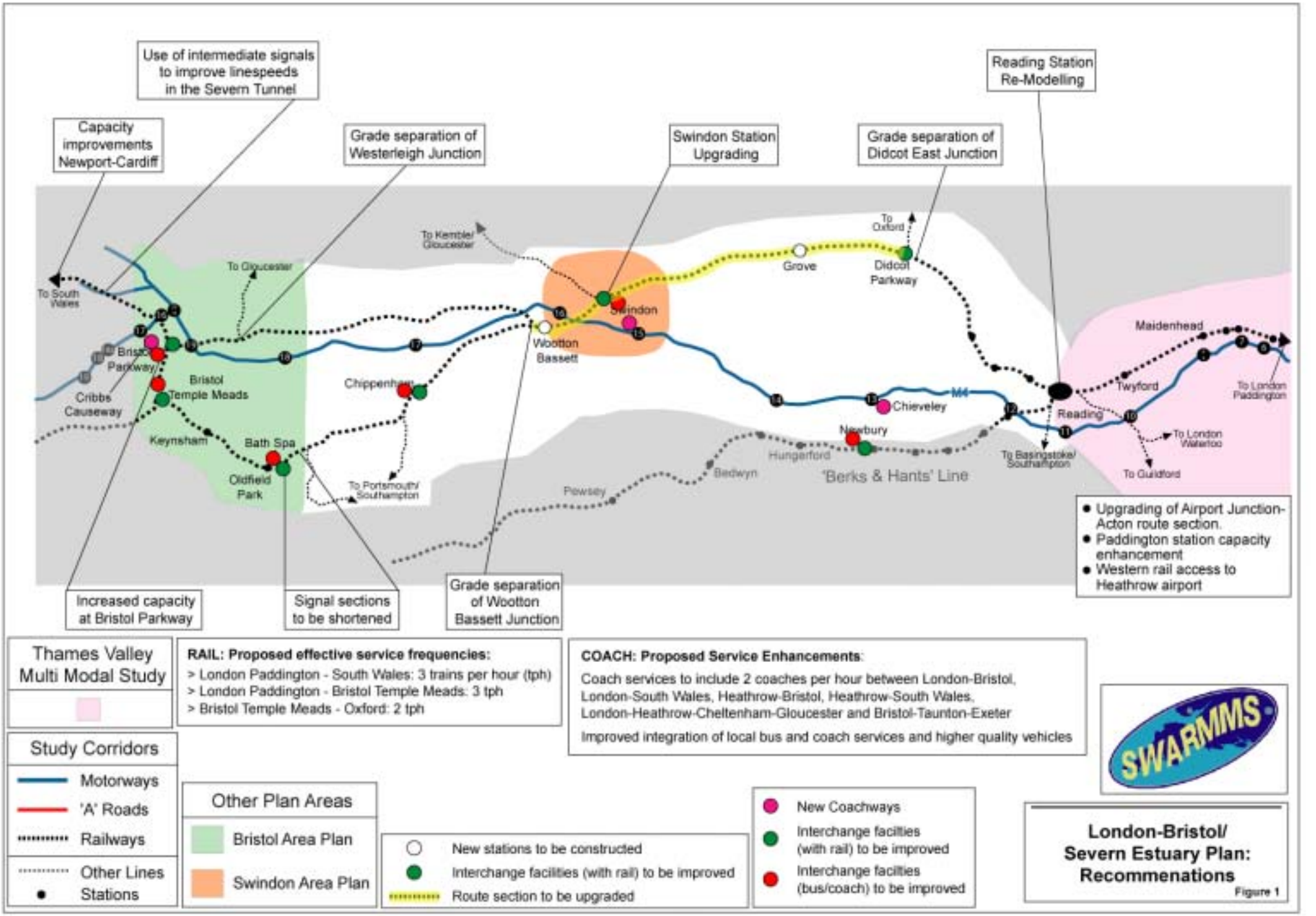
E.5 The Preferred Strategy incorporates substantial increases in frequencies of both long-distance and local services to provide greater opportunities to use rail as an alternative to the private car. The strategy recognises the existing capacity constraints within this corridor and therefore recommends substantial infrastructure works to increase GWML rail capacity. These capacity improvements are recommended to enable increased rail service frequencies to be

operated but more importantly to create the increased flexibility in rail operations to improve service reliability. The full potential of the Preferred Strategy can only be realised if improvements between Reading and Paddington can be delivered.

E.6 The Preferred Strategy also includes a significant upgrade to the existing coach services operating along the M4. Two new Coachways are proposed, at Swindon and Chieveley, which will significantly improve the attractiveness of coach travel, both in terms of offering new, accessible locations for interchange and reducing some existing journey times.

E.7 A comprehensive programme of upgrading existing public transport interchanges (both rail and coach/bus) is also proposed. A first class transport system demands that travellers have levels of comfort, security and information which are above those that currently exist in many locations. The upgrading of interchanges can have a major impact on people's perception of public transport and is a central part of the Preferred Strategy.

E.8 Highway measures along the corridor, again excluding the sections around Bristol, Swindon and Reading eastwards, are focussed on implementation of an upgraded Intelligent Transport System (ITS). This will assist in better management of traffic flow at busy times, providing higher standards of information to the travelling public and reducing the adverse impacts of incidents along the corridor.


Use of intermediate signals to improve linespeeds in the Severn Tunnel
Capacity improvements Newport-Cardiff
Grade separation of Westerleigh Junction
Swindon Station Upgrading
Grade separation of Didcot East Junction
Reading Station Re-Modelling
To Kemble/ Gloucester
To Oxford
To Gloucester
To South Wales
Grove
Didcot Parkway
Swindon
Wootton Bassett
Maidenhead
Bristol Parkway
Bristol Temple Meads
Cribbs Causeway
Chippenham
Chieveley
M4
Twyford
Reading
To London Paddington
Keynsham
Bath Spa
Newbury
To London Waterloo
Oldfield Park
To Portsmouth/ Southampton
Hungerford
To Basingstoke/ Southampton
To Guildford
Bedwyn
'Berks & Hants' Line
Pewsey
• Upgrading of Airport Junction-Acton route section.
• Paddington station capacity enhancement
• Western rail access to Heathrow airport
Increased capacity at Bristol Parkway
Signal sections to be shortened
Grade separation of Wootton Bassett Junction
Thames Valley Multi Modal Study
RAIL: Proposed effective service frequencies:
> London Paddington - South Wales: 3 trains per hour (tph)
> London Paddington - Bristol Temple Meads: 3 tph
> Bristol Temple Meads - Oxford: 2 tph
COACH: Proposed Service Enhancements:
Coach services to include 2 coaches per hour between London-Bristol, London-South Wales, Heathrow-Bristol, Heathrow-South Wales, London-Heathrow-Cheltenham-Gloucester and Bristol-Taunton-Exeter
Improved integration of local bus and coach services and higher quality vehicles
SWARMMS
Study Corridors
Motorways
'A' Roads
Railways
Other Lines
Stations
Other Plan Areas
Bristol Area Plan
Swindon Area Plan
New stations to be constructed
Interchange facilities (with rail) to be improved
Route section to be upgraded
New Coachways
Interchange facilities (with rail) to be improved
Interchange facilities (bus/coach) to be improved
London-Bristol/ Severn Estuary Plan: Recommenations
Figure 1

1 Introduction

1.1 ***Context***

1.1.1 Halcrow was appointed by the Government Office for the South West (GOSW) in March 2000 to undertake the London to South West and South Wales Multi-Modal Study ('SWARMMS'-South West Area Multi-Modal Study). The overall aim of the study is to make recommendations for a long-term strategy to address passenger and freight transport needs within the key transport corridors between London and the South West of England and South Wales (M3, M4, M5, A303, A30, A38 and the parallel rail routes). The SWARMMS study area is shown in Figure 1.1.

Figure 1.1: Map of the SWARMMS Study Area

1.1.2 This will include, as and where appropriate, plans of specific interventions to address existing and predicted strategic transport problems in the study area, looking in particular at opportunities for reducing congestion by better management and modal shift, as well as options for taking forward focused improvements.

1.1.3 This Plan is one of ten being produced for SWARMMS. The ten plans comprise:

Four Multi-Modal Transport Corridor Plans

- (London) Reading-Bristol/Severn Estuary (including the Great Western Main Line - GWML - and the M4)
- (London) Reading/Basingstoke-Exeter (including the Berks & Hants and Waterloo-Exeter rail lines and the M3/A303/A30)
- Bristol-Exeter (including the Bristol-Exeter railway and the M5)
- Exeter-Penzance (including the Exeter-Penzance railway, the A30 and the A38)

Two Principal Urban Area (PUA) Plans

- Greater Bristol
- Swindon

Four Study-Wide Theme Plans

- Reducing the growth in travel demand
- Tourism
- Inter-modal freight
- Rural access to the transport system

1.2 Contents of the Report

1.2.1 This report details the findings of the London-Bristol/Severn Estuary corridor Plan. A series of specific recommendations for the strategy is made in terms of:

- Rail measures;
- Other public transport (including express bus and coach and interchanges); and
- Highway measures (including traffic control measures).

1.2.2 Chapter 2 sets the context for the Plan. Chapters 3 to 5 then describe the detailed schemes and measures which are included in the Preferred Strategy. Chapter 6 provides a summary of findings.

1.3 Interaction with other Plans

1.3.1 There is a degree of interaction between all ten Plans being produced by SWARMMS. By definition, the four corridor plans interact by reason of

geography as shown in Figure 1.2, and specific links are referenced throughout each Plan.

Figure 1.2: Coverage of Geographic Plans

1.3.2 The four study-wide theme Plans also interact, both with each other and with the geographic-based Plans. This London-Bristol/Severn Estuary Plan is particularly influenced by the Plan to reduce the growth in travel demand (as are all Plans) and tourism (with the M4 being a key route from London and the South East to the South West and South Wales).

1.3.3 The London-Bristol/Severn Estuary corridor links London, Reading, Swindon Bristol and South Wales. Details of measures in the Greater Bristol and Swindon areas are discussed in the appropriate area Plans.

2 Context

2.1 *Introduction*

2.1.1 This chapter sets the context for the London-Bristol/Severn Estuary Plan, the geographic area for which is shown in Figure 2.1. It begins by presenting some basic travel data for the main transport links within the corridor. It then lists the 16 key problems and issues identified at an earlier stage in the study which apply to the whole of the SWARMMS area, going on to explain those of particular relevance for this Plan. The chapter continues by summarising the finding of earlier work which led Halcrow to pursue the general structure of the Preferred Strategy. It concludes by describing the particular relevance to the London-Bristol/Severn Estuary Plan of the ongoing Thames Valley Multi-Modal Study (TVMMS).

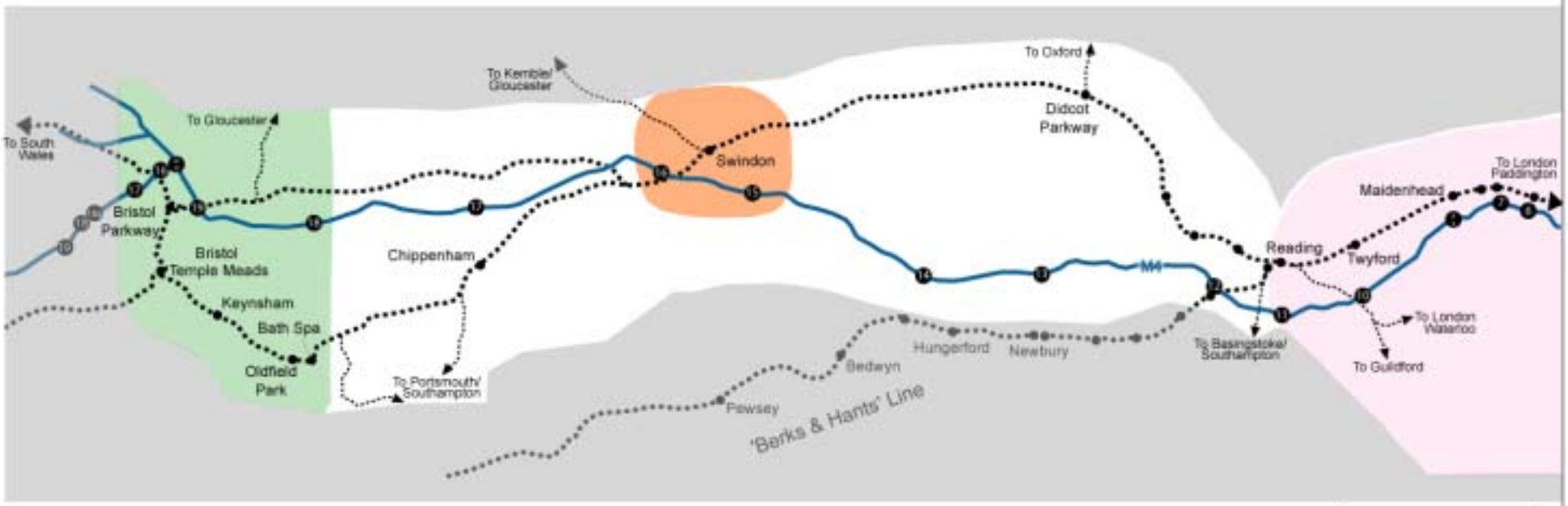
2.2 *Travel Data*

2.2.1 Figure 2.2 presents some basic transport data for the London-Bristol/Severn Estuary corridor. It can be seen that the M4 is busiest at its eastern end between Reading and London. The central section is less busy, with existing flows at about 80,000 AADT (2000, two-way). Traffic flows increase on the approach to Bristol.

2.2.2 In terms of mode share, the 'screenline' across the M4 and GWML shows that rail caters from some 10-12% of the passenger movement along the corridor to the west of Reading. The rail mode share increases to the east of Reading.

2.3 *Problems and Issues*

2.3.1 The key problems identified earlier in the study, which apply to the whole of the SWARMMS study area, are shown in Figure 2.3.



Study Corridors

- Motorways
- 'A' Roads
- Railways
- Other Lines
- Stations

Other Plan Areas

- Bristol Area Plan
- Swindon Area Plan

Thames Valley Multi Modal Study

SWARMMS

London-Bristol/ Severn Estuary Plan Area

Figure 2.1

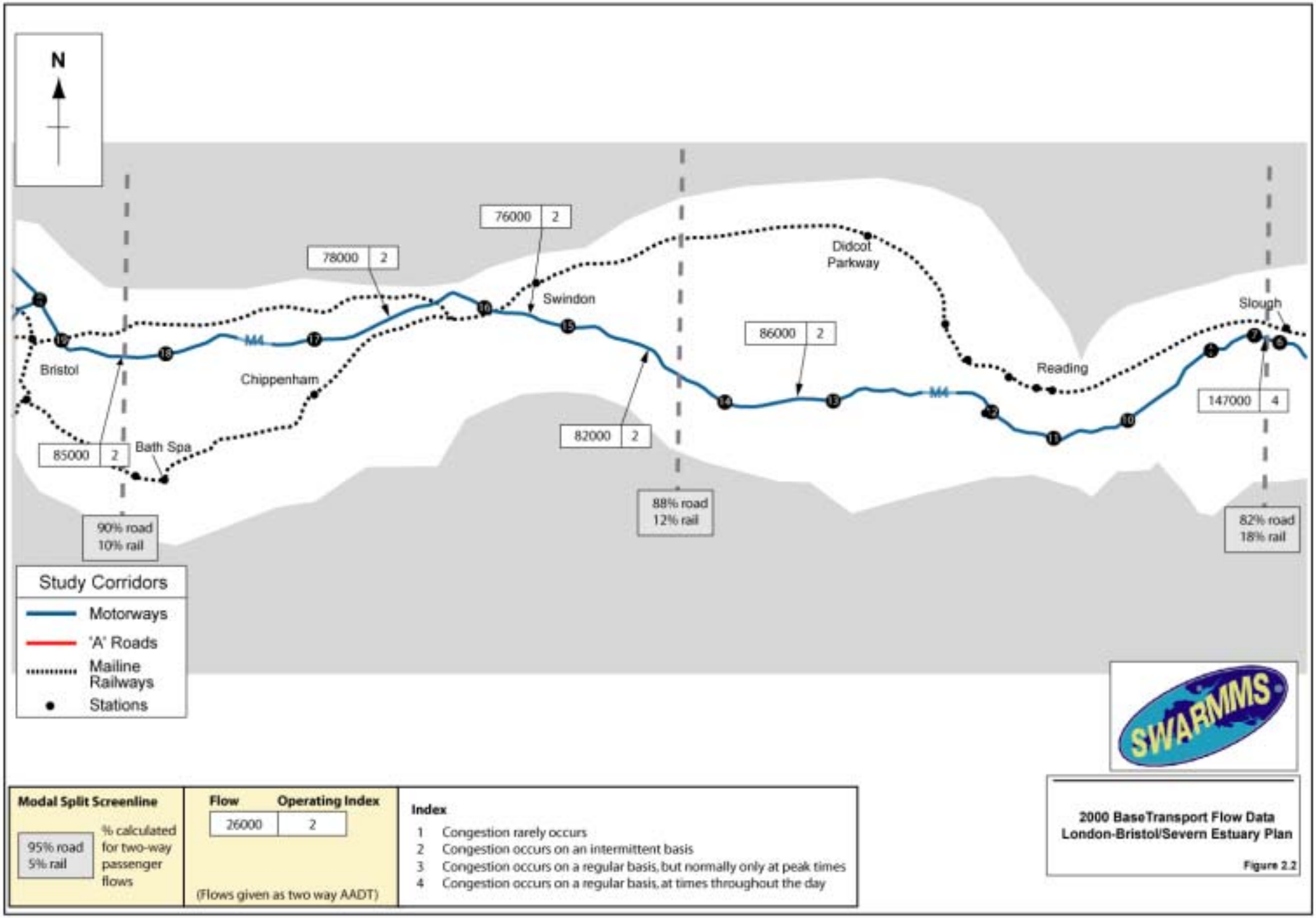
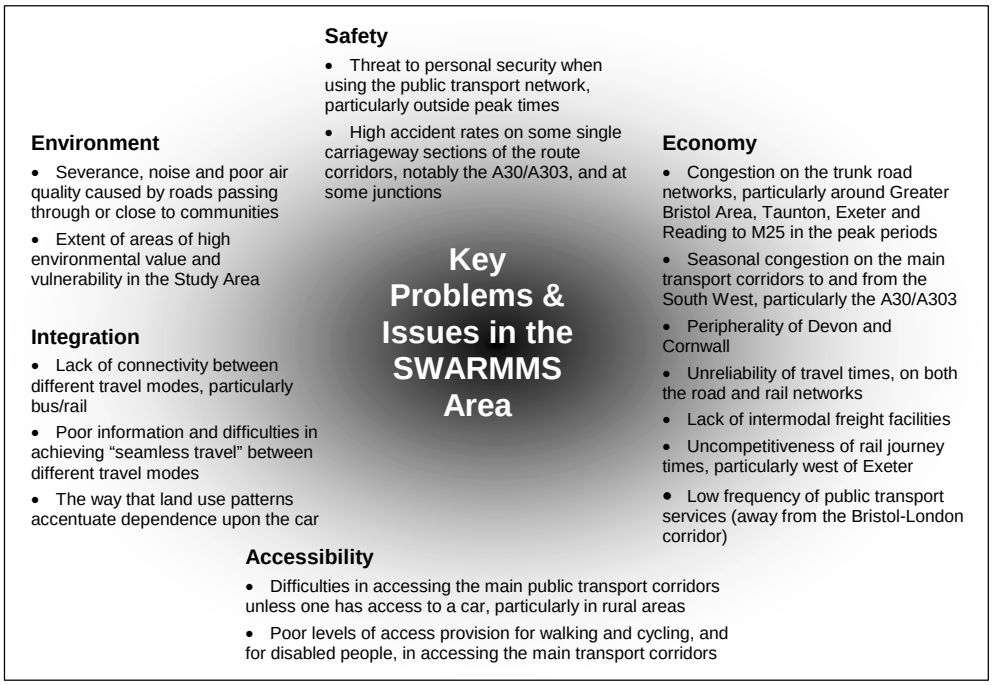

N
76000 2
78000 2
Didcot Parkway
Swindon
Slough
86000 2
M4
Bristol
Chippenham
Reading
147000 4
82000 2
85000 2
Bath Spa
88% road 12% rail
90% road 10% rail
82% road 18% rail
Study Corridors
Motorways
'A' Roads
Mailine Railways
Stations
SWARMMS
Modal Split Screenline
95% road 5% rail
% calculated for two-way passenger flows
Flow
Operating Index
26000
2
(Flows given as two way AADT)
Index
1 Congestion rarely occurs
2 Congestion occurs on an intermittent basis
3 Congestion occurs on a regular basis, but normally only at peak times
4 Congestion occurs on a regular basis, at times throughout the day
2000 BaseTransport Flow Data
London-Bristol/Severn Estuary Plan
Figure 2.2

Figure 2.3: Key Problems and Issues in the SWARMMS Area



2.3.2 Whilst to a greater or lesser extent each of these problems and issues applies to the London-Bristol corridor, those of particular relevance are as follows:

Economy

- Congestion on the trunk road network, particularly around Greater Bristol Area, Taunton, Exeter and Reading to M25 in the peak periods – issues relating to Bristol are discussed in the Bristol area plan, with those in the area Reading to M25 being considered by the TVMMS.

- Unreliability of travel times, on both the road and rail networks – Relatively minor disruptions to traffic flow on the M4 can cause significant delays. The GWML is operated intensively and, again, relatively minor problems can lead to significant delays.

Integration

- Poor information and difficulties in achieving 'seamless travel' between different travel modes – Despite relatively high numbers of public

transport services within the corridor, good opportunities for interchange away from urban centres are uncommon.

2.3.3 The purpose of the Preferred Strategy is to address these problems and issues in a satisfactory manner.

2.4 Structure of the Preferred Strategy

2.4.1 Various scheme and strategy tests were carried out earlier in the study to establish the extent to which the key problems and issues could be addressed by different approaches. Although accepting that more detailed work was required at the Plan stage, these tests led Halcrow to conclude that the London-Bristol/Severn Estuary corridor should have:

- significantly upgraded rail services and facilities for the GWML (see Chapter 3);
- a significantly enhanced network of coach services, supported by new Coachways (see Chapter 4);
- significantly enhanced public transport interchanges (also see Chapter 4);
- improved operation and management systems on the M4 corridor (see Chapter 5); and
- all the above to be nested within a proactive strategy to reduce the growth in travel demand and encourage mode-shift for some tourism-related journeys (see Reducing the Growth in Travel Demand Plan and Tourism Plan).

2.5 TVMMS

2.5.1 The Thames Valley Multi-Modal Study (TVMMS) is undertaking a more detailed analysis of the requirements for the area between Reading/Basingstoke and London. That is, in relation to this Plan, TVMMS is considering detailed proposals for the M4 east of Junction 12 (to the west of Reading) and the GWML between Reading and Paddington. TVMMS is due to report later in 2002.

3 Rail Measures

3.1 ***Introduction***

3.1.1 This Plan describes the SWARMMS proposals for the enhancement of rail services and infrastructure on the Great Western Main Lines (GWML), including the rail routes:

- Paddington – Bristol Temple Meads via Chippenham and Bath ; and
- Paddington – Severn Tunnel via Bristol Parkway.

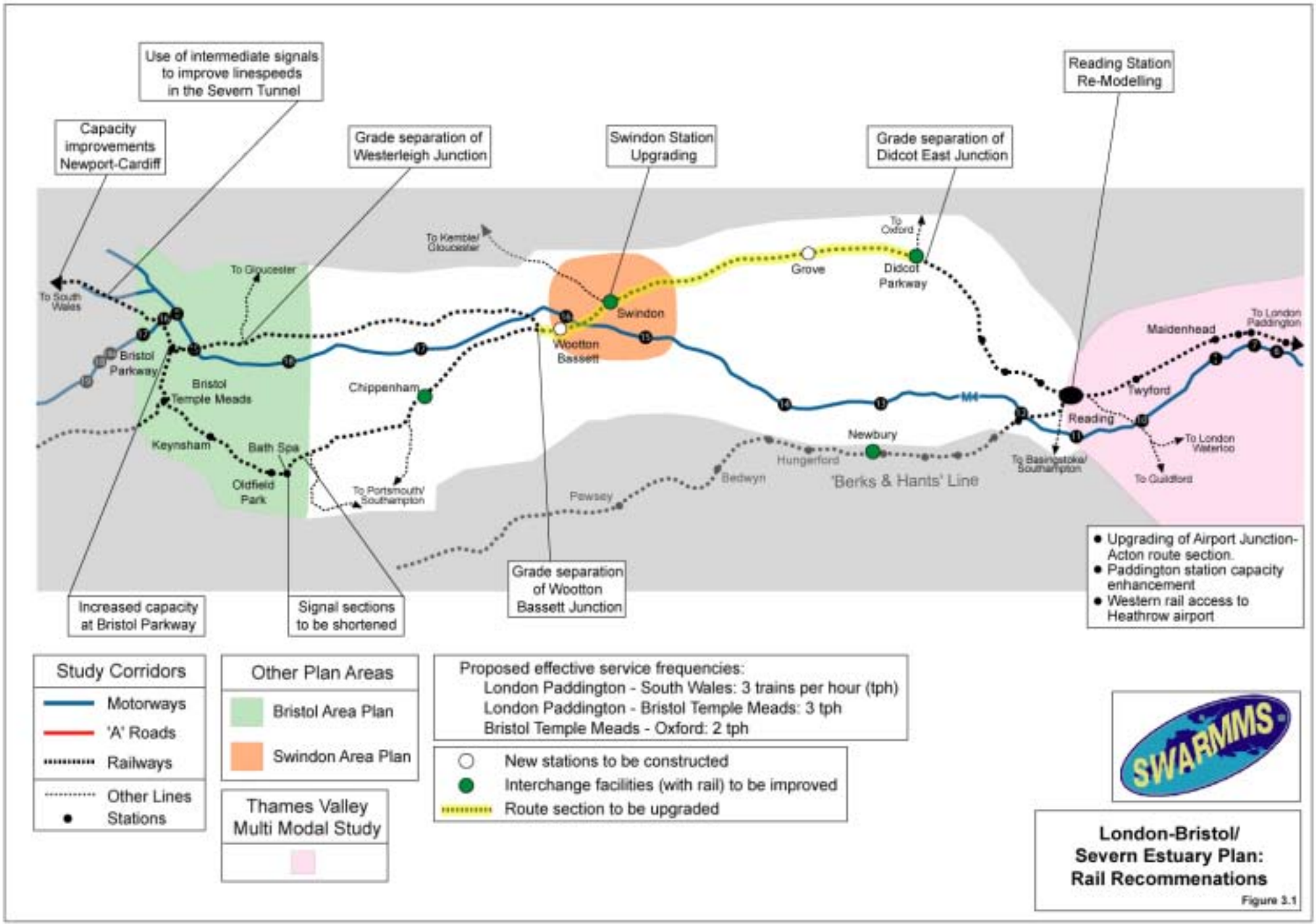
3.1.2 It should be recognised that this Plan focuses on improvements of these routes west of Reading, as the Thames Valley Multi Modal Study (TVMMS) is examining the route between Reading and London Paddington. However, where it has been identified that rail service improvements within the corridor have implications for the Reading – London Paddington route section, these requirements are outlined, recognising that they will be studied in greater detail within the TVMMS.

3.1.3 At the western end of these routes, there is considerable overlap with the rail measures set out in the Greater Bristol Area Plan. Indeed, the interactions between local and long distance rail services in the Bristol area have a critical effect on capacity and are currently being investigated through the SRA's Bristol Capacity Study.

3.1.4 Figure 3.1 shows the proposed measures in outline.

3.2 ***Overview***

3.2.1 The concept of upgrading the GWML has been discussed and examined for many years. There have been a range of significant earlier studies such as the Great Western 2000 Study and the TENS study which have investigated the costs and benefits of enhancing the key rail routes between London and South Wales and, London and the South West of England. More recent work has shown that the main issue is one of train path capacity and that these problems can only be overcome through a package of major infrastructure improvements comparable in size to the upgrades of the East Coast Main Line (ECML) and West Coast Main Line (WCML). Whilst in the past such enhancement projects were normally driven forward by Railtrack, with the changes in the rail industry over recent years the SRA has a much greater role in this work.


Use of intermediate signals to improve linespeeds in the Severn Tunnel
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Grade separation of Westerleigh Junction
Swindon Station Upgrading
Grade separation of Didcot East Junction
Reading Station Re-Modelling
To South Wales
To Gloucester
To Kemble/ Gloucester
To Oxford
Grove
Didcot Parkway
Swindon
Wootton Bassett
Bristol Parkway
Bristol Temple Meads
Chippenham
Keynsham
Bath Spa
Oldfield Park
To Portsmouth/ Southampton
Newbury
Hungerford
Bedwyn
Pewsey
'Berks & Hants' Line
Reading
To Basingstoke/ Southampton
Maidenhead
To London Paddington
Twyford
To London Waterloo
To Guildford
Increased capacity at Bristol Parkway
Signal sections to be shortened
Grade separation of Wootton Bassett Junction
• Upgrading of Airport Junction-Acton route section.
• Paddington station capacity enhancement
• Western rail access to Heathrow airport
Study Corridors
Motorways
'A' Roads
Railways
Other Lines
Stations
Other Plan Areas
Bristol Area Plan
Swindon Area Plan
Thames Valley Multi Modal Study
Proposed effective service frequencies:
London Paddington - South Wales: 3 trains per hour (tph)
London Paddington - Bristol Temple Meads: 3 tph
Bristol Temple Meads - Oxford: 2 tph
New stations to be constructed
Interchange facilities (with rail) to be improved
Route section to be upgraded
SWARMMS
London-Bristol/ Severn Estuary Plan: Rail Recommenations
Figure 3.1

3.2.2 With the exception of Heathrow Express, the GWML route has received no significant investment either in new rolling stock or infrastructure capacity since the introduction of the High Speed Trains (HSTs) in the late-1970s. It should be noted that First Great Western are currently in the process of bringing into service a supplementary fleet of 125mph Adelante (DMU) rolling stock which were required with the upgrading of Cardiff – Paddington services to 30 minute frequency in Autumn 2001. The current fleet of HSTs is expected to be life-expired by 2011 although the date may be extended by refurbishment and life extension.

3.2.3 Regarding the infrastructure, renewal of most key junctions and signalling on the GWML needs to be undertaken within the next decade, with some installations particularly in the Bristol area requiring more urgent replacement. The types of signalling range from the manual boxes in the West of England to Integrated Electronic Control Centre (IECC) facilities controlling movements in the Paddington area.

3.2.4 The pattern of demand on the GMWL has also been changing. Economic growth in the Thames Valley and the growth of Bristol as a commercial centre in its own right, have placed increasing pressure on transport infrastructure in the SWARMMS area. Bristol has always been an attractive alternative location to London because of its cheaper property prices and good transport links to the Capital by rail. This commuting generates high levels of peak period rail demand, which arguably dictates the resource requirements for this rail line.

3.2.5 Bristol has also developed its own rail commuting travel patterns in tandem with its growth as a commercial centre. Parallel to the GWML the M4 and M5 motorways are congested in peak-periods, particularly on the approaches to London and the sections around Bristol. There have also been significant increases in the number of passengers commuting to other stations in the Thames Valley (in addition to Paddington) such as Swindon and Reading. This is as a result of companies relocating to take advantage of lower cost accommodation and the availability of a skilled workforce.

3.2.6 Changing demographics and changes to rail service patterns have meant that sections of the GWML are now used by a significant number of north-south rail services. For example, Reading-Didcot is used as a 'crossroads' for Bournemouth – Birmingham services. These cross movements make the accommodation of the traditional east-west movements all the more difficult. In the near future, the

proposed increases in frequency of north-south services by Virgin trains will place further strain on capacity.

3.2.7 In considering the case for upgrade of the GWML there are a number of issues to be considered as follows:

- Replacement of HST fleet and choice of technology;
- Replacement of existing signalling systems;
- Upgrading of route capacity at key bottlenecks to reflect changes in demand;
- Impact of European Directive on Interoperability with respect to electrification and the need for derogation if other forms of power are to be used;
- Desire for service improvements;
- Passenger demand;
- Franchise replacement; and
- Modal implications specifically impact on the M4 (and M5).

3.2.8 All of the issues above concern the long run replacement of assets.

3.3 ***Developing a Case for Upgrading the GWML***

3.3.1 Replacement of long-term assets has serious implications for developing a case for upgrade. Any one particular scheme will have its own benefits to the GWML but no individual scheme will be able to achieve a step change in service because of inter-dependencies and the nature of the capacity constraints. This type of approach has been recognised within the Rail Industry in their upgrades of the WCML and ECML, where an overall strategy has been outlined and specific projects developed to deliver it. Such an approach is advocated for developing a case for the upgrade of the GWML, where the SWARMMS requirements only form part of the overall justification for the improvements.

3.3.2 Railtrack and the SRA recently commissioned the Great Western Economic Study which is examining the economic implications of upgrading various sections of the GWML. This includes forecasting the patronage and revenue implications of enhancing particular services. SWARMMS has not attempted to replicate the work being undertaken in this parallel study but has monitored the progress of that study which is still at an early stage.

3.3.3 In the following sections the known constraints and their estimate cost are outlined.

3.4 ***Future Service Patterns***

3.4.1 A future pattern of recommended long-distance rail services has been developed for the Plan corridor based on the following issues:

- The need to make rail a more attractive alternative to the private car, than it is at present, for journeys within the Corridor;
- The need to accommodate increased numbers of rail passengers within the corridor resulting from forecast increases in employment within the Reading and London areas and also the increasing attraction of rail with continuing road congestion;
- The need to reduce levels of overcrowding on peak period services within the Corridor;
- The relatively high costs of running additional services;
- The scale of additional rail patronage associated with changes in service pattern;
- Recognition of the competing demands for train paths both in the Bristol area and from Didcot eastwards within the corridor; and
- The need to accommodate current and future demands for freight paths.

3.4.2 In addition, it is recognised that, currently, one of the greatest deterrents to rail usage is the unreliability of services. It is therefore considered essential that there is greater flexibility in future rail operations through increases in rail capacity in order to provide enhanced reliability.

3.4.3 Our analysis suggests that the following typical levels of service and stopping patterns should be adopted:

- Paddington – Bristol Temple Meads (3 per hour)
  - 1 calls Reading, Didcot, Swindon, Chippenham and Bath
  - 1 calls Reading, Swindon and Bath
  - 1 calls Reading, Swindon, Bath and extends to Paignton via Worle, Weston-super-Mare, Taunton, Tiverton Parkway, Exeter and Newton Abbot
- Bristol – Oxford (2 per hour)

  - Services call Bath, Chippenham, Swindon, Didcot and Oxford, also serving new station(s) in the short term at Corsham and in the longer term at Wootton Bassett and Grove
- Paddington – South Wales (3 per hour)
  - 1 semi-fast calls Reading, Swindon, Bristol Parkway, Newport, Cardiff, Bridgend, Port Talbot, Neath and Swansea
  - 1 calls Reading, Didcot, Swindon, Bristol Parkway, Newport and Cardiff
  - 1 fast calls Reading, Bristol Parkway, Newport and Cardiff

3.4.4 It should be stressed that these service frequencies and stopping patterns are indicative at this stage pending the more detailed work that is currently being undertaken as part of the Great Western Economic Study and the optimisation work which will be done as part of the TVMMS.

3.4.5 In addition to these service improvements, SWARMMS also recognises the importance of creating efficient rail access to Heathrow Airport for passengers travelling from the west, avoiding having to travel into London Paddington and back out on the Heathrow Express or taking a coach from Reading. Whilst the detail of such services are to be examined as part of the TVMMS, SWARMMS has identified the need to improve western rail access to/from Heathrow for a range of purposes including business, leisure and inward tourism. The details of such improvements are likely to be dependent on the outcome of other studies as well as TVMMS, including the Crossrail and Airtrack proposals which are likely to create the potential for improved western access to Heathrow.

3.4.6 From an examination of proposals, it is recommended that three new stations are developed:

- Wootton Bassett – between Swindon and Chippenham
- Grove – between Swindon and Didcot
- Newton – west of Bath which is described further in the Greater Bristol Area Plan

3.4.7 All of these are likely to be long-term proposals as they could only be implemented following major increases in rail line capacity:

3.4.8 The main reasons for incorporating the new stations are as follows:

- Wootton Bassett – to provide direct rail access for residents of this town, which is set to expand with further committed developments. It will also assist with relief of the heavily congested road corridors between Wootton Bassett and Swindon, in particular around M4 Junction 16.
- Grove – this station is proposed to provide rail access for the nearby town of Wantage, which is one of the largest towns in Oxfordshire not currently served by rail. It also has the potential to serve a greater market as it is close to the A34 trunk road corridor and therefore has some potential to become a Parkway type station.

3.5 Infrastructure Requirements

3.5.1 There are a number of locations within the Plan rail corridor where the current rail infrastructure severely limits the number of additional services that might be operated. The following sections describe the main constraints and the types of improvements which would be required to accommodate the proposed service increases. It should be recognised that in many locations, the infrastructure improvements that have been identified would permit significant numbers of additional services to be operated over and above those proposed from this Study.

Paddington

3.5.2 Paddington station is the terminus station serving London for long-distance rail services from South Wales, South West England and the Cotswolds. Existing platform capacity is a major constraint, along with the signalling to/from the platforms themselves. The prohibition notice placed on signal SN109, following the Ladbroke Grove Disaster, for trains departing the station served to exacerbate these problems.

3.5.3 This end of the route is very complex due to the wide range of options for potential new services and developments, which are yet to be confirmed. This includes Crossrail, new services between St Pancras – Reading/Heathrow, creation of a Western Access point to Heathrow and Airtrack services.

3.5.4 Future forecasts of growth in employment within Central London suggest that the passenger demand for use of London Paddington is set to increase significantly in the medium term. Locally, the development of very large commercial and residential developments at Paddington Basin will put further demands on the station.

3.5.5 In addition, the objectives for development of Paddington station include;

- Better passenger facilities
- Improved station environment
- Improved interchanges
- Increased capacity for trains

3.5.6 Whilst outside the confines of this Plan, increasing rail capacity at Paddington station is essential if the full extent of the recommended rail improvements within this Plan are to be achieved. In the past, preliminary plans for a project known as Span 4 had been drawn up by Railtrack and these indicated that such capacity improvements would be very costly due to the complexities of expanding the station.

Acton-Reading

3.5.7 The main and relief lines operate at or near capacity throughout peak periods as a result of the frequency and mixture of high-speed services, local services and freight. This is exacerbated between Acton and Airport Junction through the frequent Heathrow Express services. To improve capacity further tracks could be provided, with possible use made of sidings on the north side of the line that could be given up or moved to provide the space for more running lines. Again this falls outside the confines of this Plan area but is a critical issue if increased longer-distance services to the South West and South Wales (and local commuter services) are to be accommodated in a reliable fashion. Previous cost estimates have shown this to be very expensive costing in excess of £500M.

Reading Station

3.5.8 The single greatest capacity constraint to rail services on the GWML between Bristol and London is the path capacity at Reading station. Services are limited by the surrounding infrastructure layout and the number of available platforms. Through-train capacity is constrained by the number of bay platforms that exist at Reading and also the limited availability for routeing trains into the existing through-platforms from east/west. Growing north/south traffic flows (which are forecast to increase further) are exacerbating capacity problems. Development of the area occupied by the up and down goods lines to the north of the existing platforms would result in the creation of additional capacity, and necessitate the grade separation of the junctions to the east and west of Reading station. This would be required to allow the full capacity of the new platforms to be exploited along with allowing greater flexibility for out-of-course running.

3.5.9 The cost of these improvements is very significant; dependant on the precise form of the scheme it could cost several hundred million pounds. One of the reasons for this is the limited space available for further sideways expansion given the location of the station.

3.5.10 Once again, this scheme falls within the Thames Valley Multi Modal Study, but is mentioned here due to its influence on services to/from Reading and London.

Didcot East Junction

3.5.11 Didcot East is a critical junction providing access between the GWML and routes to the Midlands. Analysis indicates that the existing flat junction is approaching capacity. By grade separating the junction, enhanced capacity would allow increased passenger and freight services to be accommodated by removing conflicts between north-south and east-west rail movements.

Didcot-Swindon

3.5.12 The existing layout between these locations means that there is only one line in each direction for most of the distance with limited opportunities for fast services to pass slow services. The route is, however, bi-directionally signalled between Foxall Junction and Swindon providing some flexibility to re-organise train paths when out-of-course running occurs. Even so, the disparity between train speeds, frequency, mix of services and signal spacing constrain the operation of services and restrict train path capacity. An upgrading of this route section would provide a general increase to 4 tracks allowing greater segregation of services and significant increases in capacity. The proposed station at Grove (adjacent to the town of Wantage) is only likely to be practically served once this upgrading has taken place.

Swindon Station

3.5.13 The infrastructure layout at Swindon heavily restricts train movements to/from the station. Trains are unable to arrive and depart Swindon station simultaneously at the east end. Trains from Didcot have to travel along the up-line for over an eighth of a mile before crossing back to the down-line. The result of this is that trains have to be either routed into a platform before a train can depart from the second through platform or vice versa. Furthermore, the low speed junctions leading into and out of the station add time penalties for services calling at Swindon. The situation is, however, improved at the west end of the station where trains can be routed simultaneously.

3.5.14 The long-term solution to these problems is a complete re-modelling of the station with increased platform capacity. In the short term, some problems can be eased by the re-opening of an old westbound platform on the south side of the station known as Platform 4.

Wootton Bassett Junction

3.5.15 The existing flat junction serves converging services from Bristol and South Wales and diverging services from Swindon. It is currently operating at approximately 60% capacity. Railtrack regard a junction as 'full' when it is operating at 80% capacity. Whilst this junction is a constraint on capacity along the Main Line route, given these figures, there is limited scope for increasing services (approximately 3 additional trains per hour). Ultimately, grade separation would deliver optimal capacity and remove timetable conflicts. The proposed station development at Wootton Bassett would also impact on the form of junction grade-separation.

Westerleigh Junction

3.5.16 Westerleigh Junction is at a 'crossroads' location where trains moving north/south and east/west meet in the Bristol Parkway area. This junction operates close to capacity for considerable periods during the day serving a mixture of local passenger services, fast passenger services and freight.

3.5.17 By grade separating this junction additional capacity, flexibility and reliability would be delivered. The service increases envisaged in this Plan for GWML and for north/south movements, combined with extra capacity (infrastructure) at other key points, make grade separation essential.

Bristol Parkway

3.5.18 This station currently only has 2 platforms. These cater for all local and fast services serving the South West, South Wales, the Midlands and London. It also has significant freight traffic, which has to travel through the station to and from Avonmouth. This is also forecast to increase in coming years. The introduction of a Royal Mail Rail Terminal adjacent to the station has also seen an increase in the number of services in the area and the station itself has recently undergone a refurbishment of its facilities. Increasing capacity at this station is being considered in conjunction with improvements to other bottlenecks in the local area at Filton junction and Filton Abbeywood station as part of the SRA's Bristol Capacity study. Details of the schemes which are proposed are set out in the Greater Bristol Area Plan.

Severn Tunnel

3.5.19 The tunnel is constrained due to the long signal sections within the tunnel itself. The tunnel is over 4 miles long and only one train is allowed in the tunnel at any time in each direction. Axle counters are used to facilitate train movements given the nature of the tunnel itself, which is permanently damp due to water seepage which is continually pumped out. The tunnel offers only one track in each direction and is controlled throughout from Newport Panel signalbox. The linespeeds within the tunnel also constrain capacity along with the number of freight services that use the route. The long signal section and the linespeeds are the constraints requiring action.

Newport-Cardiff

3.5.20 Whilst there are four tracks between Newport and Cardiff, capacity is constrained by linespeeds and the mix of traffic over the route. This is caused by significant freight traffic between these locations, combined with local and fast services. Whilst outside the area of this Plan, these capacity constraint influence the operation of Cardiff –London services. It is therefore recommended that further studies are undertaken to examine the potential for increasing passenger rail capacity between Newport and Cardiff, in order to accommodate future demands for both long-distance services, as well as potential local station proposals. It is anticipated that the increases in Cardiff – London services set out in this Plan will not in themselves require infrastructure improvements between Newport and Cardiff but they will further strain the capacity on this section of line.

Bathampton Junction & Bath Spa Station

3.5.21 Bath Spa station's capacity is currently 10 trains per hour, resulting from the 4 minutes which must elapse between the departure of one train and the arrival of the next. It is recommended that these signal sections be shortened, reducing the amount of time between arrivals and departures. The station serves both GWML services along with services to Southampton, Portsmouth and Weymouth moving north/south via Bathampton Junction. Taken together, these services place considerable demand on train paths through Bath Spa. These demands are increased by the rail services proposals within this Plan and those in the Greater Bristol Area Plan.

Bristol Temple Meads Station

3.5.22 The complexity of the interactions between rail services and the capacity constraints in the vicinity of Bristol Temple Meads station are being examined

within the SRA's Bristol Rail Capacity Study. These constraints and the rail proposals are discussed within the Greater Bristol Area Plan.

Other

3.5.23 Although not a direct part of this Plan Corridor, it has been identified that improvements to the rail line between Kemble and Swindon would be desirable for two main reasons:

- To improve the reliability of rail services using the Stroud Valley line due to the major operational constraint caused by the existing long single track section; and
- To enable an increased number of services to operate between Swindon and Gloucester/Cheltenham.

3.5.24 The first of these points has a significant effect on rail services within this Plan corridor where existing First Great Western and proposed Virgin services between London and Cheltenham/Midlands operate over the Swindon-Kemble route section.

3.5.25 The detailed operational assessment of this upgrading has not been considered within this Study and therefore further study will be required to identify the extent of double-tracking that will be required to improve operations. As a result, the costs and benefits of such up-grading have not been incorporated in the following sections.

3.6 Costs

3.6.1 The rail proposals for the London – Bristol/Severn Estuary corridor have essentially four cost implications:

- Operating costs of running new or revised rail services;
- Capital costs of constructing the necessary track and signalling infrastructure;
- Capital costs of developing new stations; and
- Cost of operating/maintaining new infrastructure.

The final item has been included in the service operating costs through track access charges.

3.6.2 Table 3.1 provides some broad estimates of the additional costs of each of these elements in relation to the Do Minimum situation. It should be noted that this table includes indicative infrastructure costs for several rail line sections that are outside the main focus of this Plan. The largest of these are on the route section between Reading and London Paddington, which is being examined as part of the Thames Valley Multi Modal Study.

3.6.3 For the route sections outside the core SWARMMS area, the infrastructure improvements which are proposed, will allow a range of other additional rail services to operate, over and above those being considered by SWARMMS. As such, some of the benefits of this investment are not being evaluated within this Corridor Plan.

Table 3.1: Indicative Rail Costs

Infrastructure	Capital Cost (£M)
Reading Station/ Reading West Junction Re-Modelling	500
Didcot Junction Grade Separation	50
Paddington Station Span 4	160
Bristol North Junction Improvement	30
Bathampton – Bristol Temple Meads Improvements	30
Swindon Station Re-Modelling	70
Didcot – Swindon 4-Tracking	100
Wootton Bassett Junction Grade Separation	50
Didcot – Oxford 4-Tracking plus Oxford Re-Modelling	100
Acton – Airport Junction 6-tracking	600
Westerleigh Junction Grade Separation	50
Severn Tunnel Capacity Improvements	30
Capacity Improvements Newport – Cardiff	100
New Stations at Wootton Bassett and Grove	3
TOTAL Capital Costs	1873

Service Improvements	Additional Operating Cost (£M) per annum
Paddington – Bristol TM and Paddington – Cardiff	33
Bristol – Oxford	1
TOTAL Additional Operating Costs	34

Costs are at current (2002) prices

3.6.4 It is important to recognise that these figures represent the full cost of implementing the complete package of rail measures within this Plan including some that might well come forward within TVMMS. In practice it is anticipated that improvements will be made on a staged basis.

3.7 ***Patronage and Revenue Forecasts***

3.7.1 The SWARMMS strategic transport model has been used to forecast likely changes in rail patronage. The key elements of patronage and revenue reviewed within this Plan are:

- Upgrade of services on the London Paddington – Bristol Temple Meads route (including the London Paddington – Paignton services);
- Upgrade of services on the London Paddington – Cardiff route; and
- Upgrade of services on the Bristol – Oxford route.

3.7.2 Table 3.2 presents the key forecasts.

Table 3.2: Rail Patronage and Revenue Forecasts

Service Change	Increase in Rail Patronage (%)	Overall Increase in Fare Revenue £(M) per annum
Paddington – Bristol T.Meads and Paddington – Cardiff	10%	18
Bristol – Oxford	45%*	1**

Patronage forecasts relate to changes in rail patronage on route sections where service levels have changed

* Includes abstraction effects from other Great Western services

** Net change in fare revenue

3.7.3 The forecasts indicate that both sets of service enhancement would result in increased rail patronage and that this would result in additional fare revenue. In the case of the service improvements between London Paddington – Cardiff and London Paddington – Bristol Temple Meads, this revenue is expected to cover approximately 50% of the additional service operating cost, whereas for the Bristol-Oxford improvements the additional revenue is expected to amount to about 50% of the additional operating costs.

3.8 ***Summary of Key Benefits and Costs of Rail Measures***

3.8.1 The key benefits of the rail measures proposed in this Plan are as follows:

- To reduce overcrowding on rail services within the corridor, particularly during peak periods;
- To improve the reliability of rail services through the creation of more flexible infrastructure;

- To permit increased service frequencies to operate, thereby reducing waiting times for rail passengers and making services more attractive;
- To permit increased services to operate on routes not being considered by SWARMMS; and
- To improve accessibility to rail services through the development of new stations.

3.8.2 Taken together the above five improvements will make rail a more attractive alternative to the private car, producing some transfer of journeys from road to rail. Overall the measures are required to reverse the on-going decline in public perceptions of rail as an alternative to the private car and the ability of rail to play a key role in accommodating future growth in travel demand, up to and beyond the timeframe of the SWARMMS study.

3.8.3 Beyond these direct improvements to passenger services, there are other benefits associated with the rail improvements in the corridor:

- To enable additional freight train paths to be accommodated; and
- To assist planned new developments, for example in the Wootton Bassett area, to be served by attractive rail services to avoid the development of unsustainable travel patterns, which will be difficult to reverse in the future.

The full potential of the Preferred Strategy can only be realised if improvements between Reading and Paddington can be delivered.

3.8.4 To deliver these benefits it is estimated that the infrastructure improvements will require capital expenditure of £1873M of which only £513M falls within the direct SWARMMS area, with much of the remainder being required between Reading and London Paddington. The proposals would also require net additional operating costs of £15M per annum.

4 Other Public Transport Measures

4.1 *Introduction*

4.1.1 This chapter describes the variety of other public transport schemes and measures relevant to the London-Bristol corridor which are included in the Preferred Strategy. These comprise:

- Development of expanded coach services within the corridor; and
- Development of proposals to enhance transport interchanges at Chippenham, Didcot, Newbury and Swindon.

4.1.2 Figure 4.1 shows these measures in outline.

4.2 *Coach & Express Bus Network*

4.2.1 During the early stages of SWARMMS information was gathered on the problems and issues faced by the scheduled coach and express bus users and operators. Those most relevant to this Plan were:

- adverse impact of traffic congestion on the reliability and journey times of scheduled coach and express bus services, in particular along the M4 and M5 corridors; and
- scheduled coach service and express bus service patterns biased towards needs of the leisure markets making services relatively unattractive for journeys to work.

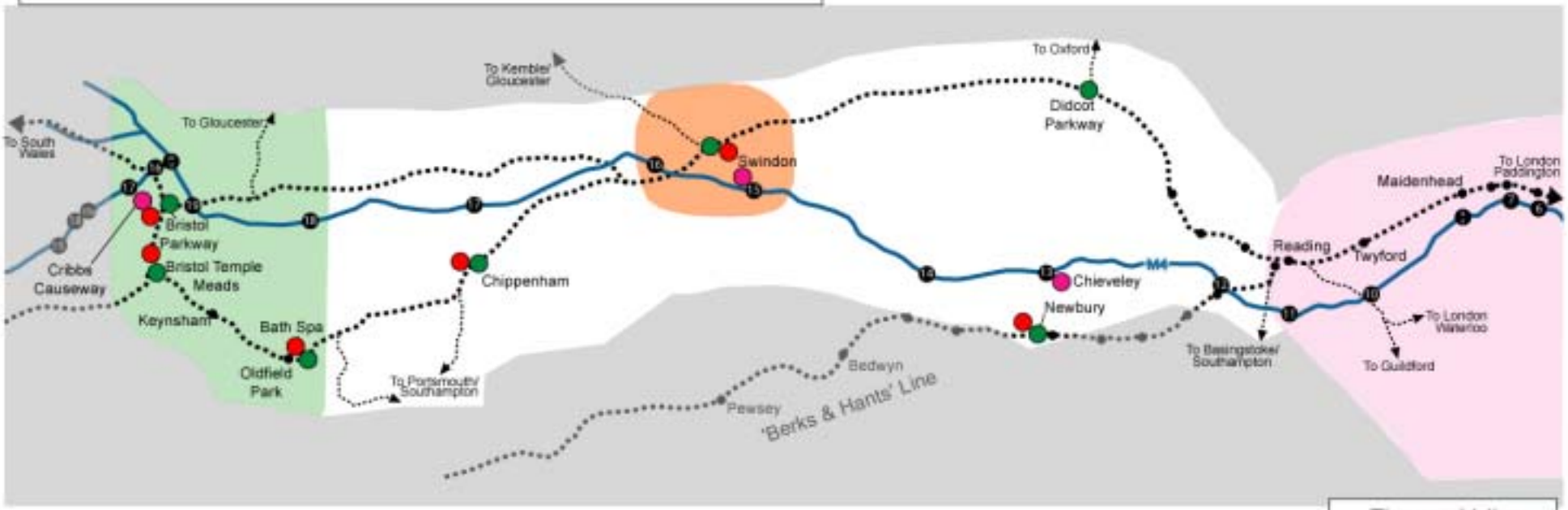
4.2.2 These problems have been used in combination with consultation with operators and feedback from public workshops to help develop a high quality network of coach and inter-urban express bus services. The aim has been to provide an integrated public transport network which will offer a realistic alternative to the car for a range of journey purposes in the SWARMMS area.

Context

4.2.3 This corridor is a key part of the trunk haul scheduled coach network. Scheduled coach services between London, Heathrow and South Wales, Gloucestershire, Bristol, Exeter and the South West operate via this corridor. In excess of 60 coaches per day per direction (cpd) operate over the section of M4 east of Swindon, with even more over the section between Reading and Heathrow.

General Enhancements:

- Coach services to include 2 coaches per hour between London-Bristol, London-South Wales, Heathrow-Bristol, Heathrow-South Wales, London-Heathrow-Cheltenham-Gloucester and Bristol-Taunton-Exeter
- Improved integration of local bus and coach services and higher quality vehicles



Study Corridors	Proposed Measures	Other Plan Areas
Motorways	New Coachways	Bristol Area Plan
'A' Roads	Interchange facilties (with rail) to be improved	Swindon Area Plan
Railways	Interchange facilties (bus/coach) to be improved	
Other Lines		
Stations		

Thames Valley Multi Modal Study

SWARMMS

London-Bristol/ Severn Estuary Plan: 'Other Public Transport' Recommendations

Figure 4.1

4.2.4 A significant proportion of these coach services are long distance routes between London/Heathrow and the South West or South Wales. These have few if any stops over the section of the M4 between Heathrow and Bristol. This results in low levels of scheduled coach service to/from some intermediate locations between London and Bristol/Severn Estuary.

4.2.5 Coach scheduled journey times over this section of the M4 (from Bristol/Severn Estuary to Heathrow/London) vary between periods in response to the effects of traffic delays, particularly during peak periods. Scheduled average speeds are usually less than 50mph and sometimes less than 40mph. While these extended journey times enable the majority of coach services to operate to the schedule, it means that it is difficult for coaches to offer an attractive service to the time sensitive travel market.

4.2.6 The coach user surveys undertaken previously in SWARMMS have shown that a small but significant number of coach passengers along this corridor have work journey purposes. There is potential for scheduled coach services to grow this market if it can improve total journey times and increase the quality of the vehicles and on-board facilities for passengers.

4.2.7 Better protection of coaches from the journey time and reliability effects of traffic congestion would also help long distance coach services operating between the South West and London/Heathrow. The provision of new Coachway coach stops, strategically located to increase the catchment area of the coach network and aimed in particular at the Park & Ride and 'Meeters & Greeters' market segments could, in conjunction with reduced journey times and increased levels of service, encourage mode switching from car to coach.

4.2.8 The SWARMMS strategy for this corridor involves:

- Enhanced level of coach services to provide increased opportunities to use coach for journeys along this corridor.
- Introducing additional Coachways at Swindon and Chieveley on the M4 and Cribbs Causeway on the M5 to increase the catchment area of and improve access to the scheduled coach network. The Cribbs Causeway Coachway (described in the Bristol Plan) would form part of a public transport hub on the edge of Bristol and will enable a proportion of long distance coach services to serve Bristol without diverting via the city centre. The Swindon Coachway would provide a similar role enabling

Swindon to be served without diversion of trunk haul coach services. The Chieveley Coachway would operate more as a long distance coach Park & Ride, intercepting car trips prior to the more congested sections of the M4 east of M4 Junction 13.

- Reducing journey times through the provision of priority measures.

4.2.9 These proposals and their costs are discussed below.

Coachway Catchment Assessment

4.2.10 The Coachway Catchment Assessment is based on analysis of coach user surveys undertaken for SWARMMS and other recent Halcrow studies. This data has provided an understanding of the characteristics of passengers who use a Coachway, in particular their access mode and access time which allows an understanding of the potential scale of the coach network catchment along this corridor.

4.2.11 The Coachway catchment area identified through these surveys has been used to define the potential geographical catchment for car to coach transfer. The surveys showed that the access time profile for Coachways differs from those of coach stations in urban areas. Nearly 35% of those accessing Coachways by car travel more than 30 minutes to access the facility compared with 20% or less for urban coach stations. Over 60% of Coachway users travel for more than 20 minutes to access their coach service in comparison with approximately 40% for coach stations located in urban areas. The longer access times are consistent with a wider geographical spread of users.

4.2.12 Even allowing for the effects of traffic delays on the road network feeding the surveyed Coachways, it is apparent that these facilities have a larger catchment area than traditional urban centre coach stations.

4.2.13 The geographical area covered by the proposed Coachways on the Bristol to London corridor is extensive. Collectively they provide a catchment area which covers all key conurbations along the M4 corridor from Cardiff to Reading and extends north to include Gloucester, Cheltenham, Oxford and Stroud and south to include Newbury, Warminister and Andover. Combined with the established Calcot Coachway the potential collective geographical catchment area of Coachways on the Bristol to London corridor would extend from Cardiff to inner London.

Proposed Service Patterns

4.2.14 Based on the experience of operating successful coach operations elsewhere in the UK, the proposed service pattern has been developed to meet the following criteria:

- Increased service frequencies (minimum of 2cph) for key movements including:
  - London – Swindon – Chippenham – Bath – Bristol;
  - Heathrow – Swindon – Chippenham – Bath – Bristol;
  - London – South Wales;
  - Heathrow – South Wales;
  - London/Heathrow – Swindon – Cheltenham – Gloucester;
  - Bristol – Taunton – Exeter.
- Closer integration between local bus services and the coach network in rural areas, with local bus schedules arranged to minimise waiting times for passengers and to ensure reliable connections; and
- Higher quality coaches with air conditioning, increased legroom and luggage space, and with capacity for at least 70 passengers (will require double-deck and/or articulated coaches).

4.2.15 A proposed service pattern has been developed such that the long distance coach services between the South West/South Wales and Heathrow/London continue to operate largely non-stop along the M4 east of Bristol. The intermediate stops between Bristol and London would be served by a combination of existing and additional Bristol/Bath – Heathrow/London coach services.

4.2.16 Table 4.1 shows the proposed indicative levels of service and destinations served from Swindon and Chieveley Coachways.

Table 4.1: Indicative Levels of Service and destinations served from Swindon and Chieveley Coachways

Chieveley Coachway	
Service	*Services (per day)*
Gloucester	8
Cheltenham	8
Swindon Coachway	21
Newport	13

Swindon Coachway	
	Services (per day)
Gloucester	17
Cheltenham	17
Newport	13
Cardiff	13

Chieveley Coachway	
Service	*Services (per day)*
Cardiff	13
Bridgend	4
Swansea	4
Chippenham	13
Bath	13
Bristol	37
Cribbs Causeway C'way	4
Heathrow	29
London	46
Gatwick	4

Swindon Coachway	
	Services (per day)
Bridgend	4
Swansea	4
Cribbs Causeway C'way	4
Chippenham	18
Bath	18
Bristol	22
Chieveley Coachway	17
Calcot Coachway	15
Heathrow	43
London	40
Gatwick	4

Proposed Service Frequencies

4.2.17 In developing the service frequencies, the aim has been to have a minimum of 2cph between key locations along the corridor. The key locations have been identified through examination of travel demand across all modes. At key public transport hubs such as Bristol, Heathrow and London Victoria the combined service frequency will be significant.

4.2.18 The existing and proposed levels of service at key locations along this corridor are summarised in Table 4.2.

Table 4.2: Existing and Proposed Levels of Service at Key Locations

Location	**Coach Service Level (coaches / day / direction)**	
	Existing	Proposed
Bristol Bus Station	38	71
Bristol Cribbs Causeway	-	28
Bath	11	32
Chippenham	10	32
Swindon Bus Station	13	14
Swindon Coachway	-	40
Chieveley Coachway	-	42
Calcot Coachway	39	58
Heathrow	68	118
London Victoria	71	130

4.2.19 Cribbs Causeway Coachway would be served by long distance coach services operating between the South West and M4 corridor destinations for which serving Bristol Bus Station would cause significant increases in journey times to through passengers. Alternative coach services are proposed between Exeter and Bristol to meet travel demand for journeys between the South West and Bristol (see Bristol-Exeter Plan report). Cribbs Causeway Coachway would also provide for coach services operating between the South West, the Midlands, Northern England and Scotland.

4.2.20 The proposed service pattern provides a reasonable coach frequency at intermediate points along the corridor. For example, each of the proposed M4 coachways would be served by at least 40 cpd. It should be noted that the frequencies for Heathrow and London Victoria relate only to coach services operating to/from the SWARMMS area.

Proposed Coach Journey Times

4.2.21 Earlier work in the SWARMMS study highlighted the impact of traffic congestion on coach journey times. It also highlighted that, in terms of total journey times, coach travel is significantly slower than car along this corridor. Table 4.3 summarises the existing and estimated future scheduled coach journey times between Bristol and London.

Table 4.3: Existing and Proposed Coach Journey times from Bristol

Location	Typical Journey Times from Bristol (mins)	
	Existing	Proposed
Bath	45	29
Chippenham	75	59
Swindon Bus Station	110	94
Swindon Coachway	-	43
Chieveley Coachway	-	67
Calcot Coachway	75	75
Heathrow	120	110
London Victoria	150	130

4.2.22 The future journey times have been developed assuming that priority measures are introduced to protect coaches and buses from the impacts of traffic congestion on the approach to urban areas. This makes it possible to develop a regular clockface coach service between the majority of the key locations along this corridor. If

reliably maintained this timetable would significantly improve the quality of the service and the ability to attract more time sensitive passengers from car to coach.

4.2.23 There is an issue of whether this level of service will complement or compete with rail along this corridor. Despite the forecast reduction in journey times and increase in service frequencies of coaches, rail will retain its significant advantage over coach in terms of journey times for all destinations other than Heathrow Airport where coach journey time competitiveness against rail will be strengthened.

4.2.24 It is likely that coach will remain the favoured public transport mode of price sensitive market segments. Table 4.4 compares the coach and rail journey times between the major towns and cities along the London – Bristol corridor.

Table 4.4: Typical Journey Times from Bristol

Location	Typical Journey Times from Bristol (mins)	
	Rail	Coach
Bath	11	29
Chippenham	23	59
Swindon	39	94
Heathrow	130	110
London	98	130

4.2.25 The effect of improving the quality of coach services will be to increase the public transport choice for car users rather than abstracting a significant amount of rail demand. This is consistent with the current policy of improving the quality of sustainable transport modes and increasing public transport accessibility.

Coach Operating Costs

4.2.26 The suggested improvements in coach levels of service will lead to increases in operating costs. These have been assessed using the Halcrow OpCost model which employs unit costs agreed with National Express. Table 4.5 summarises the results of the analysis for those routes which use the Bristol / South Wales – London corridor for some part of their journey.

Table 4.5: Existing and Forecast Operating Costs (£'000s)

Service	Estimated Annual Operating Costs (£'000s)	
	Existing	Proposed
040	1,440	1,900
200	1,000	970
201	2,100	3,375
202	1,000	1,530
348	250	250
403	1,170	3,200
404	325	327
412	1,250	2,950
413	550	515
500	950	910
501	1,550	1,565
502	755	760
504	617	620
505	302	303
508	800	1,740
509	1,100	2,950
Total	15,159	23,865

Notes:
040/403/200 – Bristol to Heathrow/London
201/202/508/509 – South Wales to Heathrow
348 – Bristol to Cambridge
412/413 – Midlands via Gloucester to London
500/501/502/504/505 – South West to London
508/509 – South Wales to London

4.2.27 It should be noted that the costs will be 'upper-end' estimates as they assume that new vehicles will be acquired to operate the services, the full cost of vehicle depreciation is allocated to the services and there is no interworking between separate coach routes. The latter can result in significant reductions in overall vehicle requirements. In addition, the level of services has not been optimised in the light of demand forecasts. This iterative process would be likely to lead to changes in levels of service to maximise operating surplus (or minimise operating deficit).

4.2.28 The table shows an overall increase in operating costs of approximately 57%. This is largely due to increases in service frequency, although some of the marginal

increases are due to diversions to serve the proposed Coachways. Where the service frequency and routeing is unchanged between the existing and forecast scenarios, a slight reduction in operating costs is forecast due to the effect of journey time reductions brought about by priority measures.

4.2.29 Table 4.6 presents the operating costs only for those coach services which operate wholly within the Bristol/South Wales – London corridor. This shows a higher percentage increase in operating costs of approximately 80%. A significant proportion of the increase is due to the level of service increases on coach routes 403 (Bristol – Bath – Chippenham – Swindon – London), 508 (Brecon/Cardiff – London) and 509 (Cardiff – London).

Table 4.6: Existing and Forecast Operating Costs (£'000s)

Service	Estimated Annual Operating Costs (£'000s)		
	Existing	Proposed	Change
040	1,440	1,900	32%
200	1,000	970	-3%
201	2,100	3,375	61%
202	1,000	1,530	53%
403	1,170	3,200	174%
508	800	1,740	118%
509	1,100	2,950	168%
Total	8,610	15,665	82%

4.2.30 The frequency on route 403 has been enhanced to provide a better quality coach service between Bristol and London via Bath, Chippenham and Swindon. As proposed, this route operates as a 'semi-fast' service linking the majority of intermediate key towns and Coachways along the corridor. This increases the journey times and the operating costs. The frequencies of routes 508 and 509 have been increased to improve the coach service between Cardiff and London via the M4 corridor to half hourly through the core part of the day.

Passenger Demand Necessary to Cover Operating Costs

4.2.31 The iterative process of optimising coach service levels to demand has not been undertaken for the Plan stage work; however, an assessment has been undertaken of the coach demand required to cover the forecast operating costs. This uses an average fare based on an assessment of the coach user surveys undertaken in 2000 upgraded to 2001 prices. The average fare used in the assessment is £9.50 per

single journey. This has been agreed with National Express as being representative of average fares on the SWARMMS coach network.

4.2.32 Table 4.7 summarises the results of the assessment for those coach routes operating largely within the South Wales/Bristol – London Corridor. This shows that the number of passenger journeys required to cover coach operating costs increases from approximately 900,000 per annum to 1.65 million per annum (+85%) with the average number of passengers per coach vehicle journey remaining at around 20 passengers.

Table 4.7: Coach Demand to Cover Operating Costs

Service No	Estimated Coach Demand / annum		Estimated Coach Demand / veh / journey	
	Existing	Proposed	Existing	Proposed
040	151	201	13.0	13.1
200	105	102	16.1	15.6
201	221	355	27.6	25.7
202	104	161	20.4	20.1
403	123	339	16.9	15.5
508	83	183	37.9	31.4
509	111	311	22.3	19.4
Total	898	1,653	22.0	20.1

4.2.33 Clearly, a significant increase in coach demand will be required to avoid incurring an operating deficit, although the relatively low load factors required to cover operating costs should be noted. This scale of growth in demand will require changes in the methods of promoting coach travel and in the public perception of coach as an alternative to car travel. There are a number of examples of best practice where a coach service or network of services are effectively promoted as a real alternative to car. These include frequent shuttle-type coach services such as the Oxford Tube (Oxford – London) and the National Express Airlink services to major airports and high quality express bus services such as those operated by Trent Buses between Sheffield, Chesterfield and Derby and between Nottingham and Derby. The frequency and reliability, and relatively low cost, combine to make such services a success. All are run on a commercial basis.

Priority Measures

4.2.34 The majority of the M4 between Bristol and London is forecast to have (via the SWARMMS strategic transport model) average speeds which will enable the achievement of a 50-55 mph average speed. However, the approaches to urban areas, particularly Bristol and London, will suffer from increased levels of congestion. Suitable priority measures for coaches (and buses) will greatly assist in improving their journey time reliability.

4.3 Interchanges

4.3.1 An essential component of the public transport strategy is the development of high quality transport interchanges where seamless passenger transfers can occur between the local bus/express bus/coach and rail network. In addition, key interchange locations also represent primary nodal points in the network, and as such, enhancement of their facilities would also improve the start and/or end of journeys that do not involve interchange. Consequently, improvements to interchange facilities and bus/coach priority measures are required at a number of key locations, along the corridor, including:

- Chippenham Rail Station
- Chippenham Bus Station
- Didcot Rail Station
- Newbury Bus Station
- Newbury Rail Station
- Swindon Bus Station
- Swindon Rail Station

4.3.2 From a review of the existing form and facilities in these locations, packages of improvements have been developed. The improvements have been defined under five main headings, namely:

- Waiting environment
- Levels of facilities
- Level of information
- Visible staff presence
- Physical linkage for next stage of journey

4.3.3 The following sections describe the packages of improvements required at each of the interchanges.

Chippenham Bus Station

- Waiting Environment – Ensure all waiting areas are well heated and lit, and have full passenger information. Install benches outside close to platforms and ensure they are sheltered and well lit.
- Levels of Facilities – Ensure toilets are well signed and have full disabled access. Ensure these are well signed. Ensure car park is well signed and the route to it is well lit. Add CCTV.
- Level of Information – Full timetables should be provided in the waiting areas. Install automatic display screens. Provide audio announcements.
- Visible Staff Presence – Station supervisor and/or ticket office attendant should be working during busy times of day.
- Physical Linkage – No measures identified.

Chippenham Rail Station

- Waiting Environment – Ensure all waiting areas are well heated and lit, and have full passenger information.
- Levels of Facilities – Improve access to second platform by installing barrow crossing or a lift. Ensure toilets are well signed and have full disabled access. Ensure payphones are well signed.
- Level of Information – No measures identified.
- Visible Staff Presence – Ensure that station is staffed all times it is open.
- Physical Linkage – No measures identified.

Didcot Rail Station

- Waiting Environment – Ensure waiting areas are well lit and heated, provide full timetable information.
- Levels of Facilities – Ensure toilets are well signed and have full disabled access. Ensure payphones well signed. Upgrade to a modern eating area with good buffet facilities.
- Level of Information – No measures identified.
- Visible Staff Presence – Ensure that station is staffed at all times it is open.
- Physical Linkage – No measures identified.

Newbury Bus Station

- Waiting Environment – Extend waiting area to provide adeqaute seating and also passenger information, toilets and payphones.

- Levels of Facilities – Toilets and payphones should be provided in the waiting area. A small café/shop should be opened serving hot & cold food/drinks. Add CCTV.
- Level of Information – Full timetable information should be provided in waiting area. Provide audible announcements. Install automatic information displays.
- Visible Staff Presence – Ensure that station is staffed at all times it is open.
- Physical Linkage – No measures identified.

Newbury Rail Station

- Waiting Environment – Install a small waiting room, should have adequate seating, be well heated, lit, have passenger information and toilets.
- Levels of Facilities – Ensure there is disabled access to second platform either by barrow crossing or via a lift. Ensure toilets are well signed and have full disabled access. Ensure payphones are well signed. Upgrade to a modern eating area with good buffet facilities.
- Level of Information – Add real time information to screens.
- Visible Staff Presence – Ensure that station is staffed at all times it is open.
- Physical Linkage – No measures identified.

Swindon Bus Station

- Waiting Environment – Ensure waiting areas are well lit and heated, provide full timetable information.
- Levels of Facilities – Ensure toilets are well signed and have full disabled access. Upgrade to a modern eating area with good buffet facilities. Ensure payphone is well signed and possibly install another on the platform/in waiting area. Add CCTV.
- Level of Information – Install automatic display screens with real time information.
- Visible Staff Presence – Station supervisor and ticket office attendant should be working during busy times of day.
- Physical Linkage – No measures identified.

Swindon Rail Station

- Waiting Environment – Ensure waiting area is well lit and heated, and also has passenger information.

- Levels of Facilities – Ensure toilets are well signed and have full disabled access. Ensure payphones are well signed. Upgrade to a modern eating area with good buffet facilities. Ensure this is well lit and signed.
- Level of Information – No measures identified.
- Visible Staff Presence – Ensure that station is staffed at all times it is open.
- Physical Linkage – No measures identified.

4.4 Costs

4.4.1 Table 4.8 provides the indicative costs of implementing the measures described in this chapter.

Table 4.8: Indicative Costs of Other Public Transport Measures

(@ Q3 2001 prices)

Scheme/Measure	**Cost (£m)**
Coach Services	Commercial
Coachways (Swindon and Chieveley)	1.5
Interchanges (1)	2
Total	**3.5**

Notes : (1) 7 interchanges at average of £300,000

5 Highway Measures

5.1 *Introduction*

5.1.1 This chapter begins by describing those sections of the M4 between London and Bristol/Severn Estuary covered in this Plan. It goes on to describe the current characteristics of the corridor and its likely future operation, then describing the highway measures proposed. It continues by describing the effect these measures will have on operating conditions along the route, at the forecast year of 2016.

Coverage of the Plan

5.1.2 This Plan covers the following sections of the M4 corridor:

- West of Junction 12 (A4 Reading) to east of Junction 15 (A419 Swindon east); and
- West of Junction 16 (A3102 Swindon west) to east of Junction 18 (A46 Bath).

5.1.3 Note that the following sections of the M4 are not covered by this Plan, but are reported elsewhere, as indicated below:

- Junction 12 (A4 Reading) to the M25 (M4 Junction 4b) – this section is included in the Thames Valley Multi-Modal Study (TVMMS);
- Junctions 15 (A419 Swindon east) to Junction 16 (A3102 Swindon west) – this section is discussed in the Swindon Area Plan; and
- Junction 18 (A46 Bath) to the Severn Bridges – this section is part of the Greater Bristol Area Plan.

5.1.4 Moreover, the Highways Agency has carried out a Route Management Strategy for the M4 between Junction 1 and east of Junction 15. Discussions have been held with the Highways Agency on this work, and their findings incorporated as appropriate.

5.2 *Characteristics of the Corridor*

5.2.1 The route is 3-lane motorway standard throughout (D3M).

5.2.2 Traffic flows vary from about 88,000 vehicles AADT (2000, two-way) between Junctions 12(A4) and Junction 13 (A34), to about 77,000 vehicles AADT (2000)

between Junctions 17(A429) and 18(A46). The M4 on this section also experiences seasonal variation in traffic flow, with August monthly averages showing increases up to 15% over the AADT.

5.2.3 These traffic flows are of sufficient volume to cause some congestion along the M4 on a daily basis. However, this congestion tends to be limited to movements on and off the motorway at junctions, and even then only at the morning and evening peak periods. Traffic generally flows smoothly on the M4 between junctions, albeit that 'stop-start' conditions sometimes result from incidents. In general, congestion is more of an issue east of Reading and in the Bristol area.

5.2.4 Traffic flows are expected to grow on the M4 in the future, and this will place additional pressure on operating conditions. The extent of growth and its impact upon operating conditions will, at least in part, be influenced by the Preferred Strategy for this corridor. This is discussed later in this chapter.

5.2.5 Accident rates on this section of the M4 are generally near to or slightly below national average levels for motorways.

5.3 M4 Junction 12 (A4) to Junction 13 (A34)

Key Problems and Issues

5.3.1 Flows on this section are about 88,000 vehicles AADT (2000). Despite some peak period congestion, this section operates reasonably well and experiences low accident rates.

Proposed Measures

5.3.2 This section of motorway necessarily interacts with the section between Junctions 11 and 12 immediately to the east, which will be covered in detail by TVMMS. In the absence of the TVMMS recommendations, any proposals for this section must be provisional. In essence, however, we do not see a case for increasing capacity by the provision of new highway infrastructure although we do recommend an upgrade to the existing ITS infrastructure (see Section 5.11).

5.4 M4 Junction 13 (A34)

Key Problems and Issues

5.4.1 The Highways Agency has a Targetted Programme of Improvements (TPI) scheme for Junction 13 which it is currently progressing. This will provide further grade-separation to improve the operational performance of the junction.

Proposed Measures

5.4.2 No additional measures are proposed and it is assumed that the TPI scheme will be implemented.

5.5 ***M4 Junction 13 (A34) to Junction 14 (A338)***

Key Problems and Issues

5.5.1 Traffic flows on this section are about 86,000 vehicles AADT (2000). There are no particular accident problems.

Proposed Measures

5.5.2 No measures are proposed in addition to the ITS measures.

5.6 ***M4 Junction 14 (A338)***

Key Problems and Issues

5.6.1 The junction operates satisfactorily and no particular problems have been identified.

Proposed Measures

5.6.2 No measures are proposed.

5.7 ***M4 Junction 14 (A338) to Junction 15 (A419/A346)***

Key Problems and Issues

5.7.1 Flows on this section are about 82,000 vehicles AADT (2000). As with other sections, there are no particular accident problems.

Proposed Measures

5.7.2 No measures are proposed in addition to the ITS measures.

5.8 ***M4 Junction 16 (A3102) to Junction 17 (A429/A350)***

Key Problems and Issues

5.8.1 Flows on this section are about 78,000 vehicles AADT (2000). As before, there are no particular accident problems.

Proposed Measures

5.8.2 No measures are proposed in addition to the ITS measures.

5.9 ***M4 Junction 17 (A429/A350)***

Key Problems and Issues

5.9.1 The junctions operates reasonably well and the number of recorded accidents is low.

Proposed Measure

5.9.2 No improvements are proposed.

5.10 ***M4 Junction 17 (A429) to Junction 18 (A46)***

Key Problems and Issues

5.10.1 Flows on this section are about 77,000 vehicles AADT (2000). Again, there are no particular accident problems.

Proposed Measures

5.10.2 No measures are proposed in addition to the ITS measures (see next section).

5.11 ***Traffic Control (ITS)***

5.11.1 The M4 between London and Bristol currently has an operational motorway communications system comprising emergency telephones and matrix signals. For the majority of the section of motorway the matrix signals are central reserve signals located at approximately 3km intervals. On the approach to Bristol there are some gantry mounted signals. CCTV is only installed in the Bristol area and not at the other junctions.

5.11.2 Between Junctions 12 and 14, there is a trial in progress to assess the performance of the new MS4 variable message signs. This trial will encompass the upgrade of the communications infrastructure to the current NMCS2 standards and the implementation of the MIDAS (Motorway Incident Detection and Automatic Signing) system. Proposals are currently being developed for the future installation of MIDAS, additional gantries and CCTV in the Bristol area from west of Junction 18 to west of Junction 20 (M4/M5 Almondsbury Interchange).

MIDAS

5.11.3 This Plan recommends a MIDAS system for the full length of the M4 from Junction 12 to the Severn Bridges. The system should include:

- Traffic monitoring every 500 metres; and

- Variable message signs at each junction and at least every 1500 metre spacing between junctions. Signs to be mounted on gantries and verge mounted as appropriate.

5.11.4 The MIDAS system will continuously monitor the traffic flows and automatically set advisory speed limits and queue warning messages on the signs when congestion or incidents on the motorway is detected.

5.11.5 The Variable Message signing installed as part of MIDAS would perform supplementary functions giving hazard warnings (such as ice, high winds) and diversion information. Hazard warnings and local diversion requirements would be under the control of the Local Police Control Centre with strategic/wider network diversions being under the control of the Traffic Control Centre (TCC).

Controlled Motorway

5.11.6 In addition, Controlled Motorway facilities are proposed on the section of motorway west of Junction 18 to west of M4/M5 interchange. This is described in the Greater Bristol Plan.

Traffic Data Dissemination

5.11.7 The installation of MIDAS and other traffic monitoring equipment along the motorway will provide a wealth of 'real time' data on the status of the motorway and its junctions. This data is available in the Police Control Centre to enable them to undertake the local incident responses and also be passed on to the TCC, which is currently under development, to make any strategic response. Within the TCC framework this data is to be made available to the traffic organisations, broadcasters, route guidance system operators and the public domain. Development of the data dissemination facilities should be progressed to provide and improve the capabilities for businesses and the general public to make better informed journey planning decisions before and during their journeys.

5.12 ***Future Traffic Volumes***

5.12.1 Future traffic volumes and operating conditions along the M4 corridor are shown in Figure 5.1. Along with the Base 2000 traffic flows, two future scenarios are also presented; the '2016 Do Minimum' presents flow estimates if only the committed schemes and interventions (across all modes) were provided, and the '2016 Preferred Strategy' presents estimates if all parts of the Preferred Strategy (again across all modes) were provided.

5.12.2 Figure 5.1 shows that there will be significant growth in traffic levels on all parts of the M4, for both the Do Minimum and Preferred Strategy. This is due to the projected increase in movements throughout the travelling population, plus the specific effects of development proposals contained within Regional Planning Guidance.

5.12.3 The 'v/c ratios' give a broad indication of operating conditions along the corridor. Given that the SWARMMS Strategic Transport Model is based on Average Annual Daily Traffic, it is reasonable to assume:

- *Ratio above 0.70* – congestion occurs on a regular basis, and at times throughout the day;
- *Ratio between 0.50 and 0.70* – congestion occurs on a regular basis, but normally only at periods of peak demand;
- *Ratio between 0.30 and 0.50* – congestion occurs on an intermittent basis; and
- *Ratio below 0.30* – congestion rarely occurs.

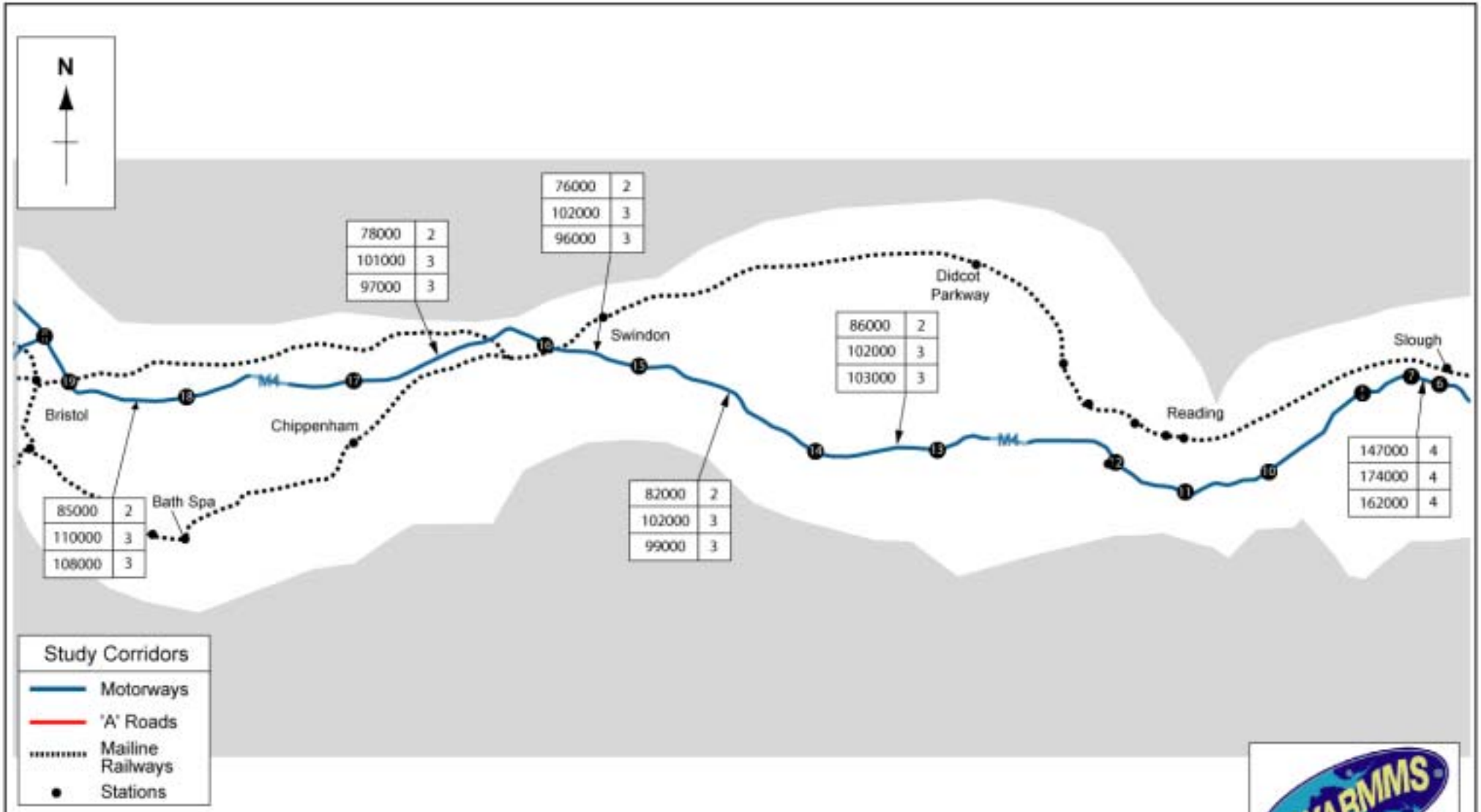
5.12.4 It can be seen from Figure 5.1 that all the v/c ratios suggest a deterioration in operating conditions with the Preferred Strategy in place compared to the present day. The levels on the central and western parts of the corridor suggest that congestion will become a more regular occurrence, albeit limited to the periods of peak demand. For the majority of the day the M4 will remain free-flowing. The section of the M4 to the east of Reading is under greater pressure. This emphasises the need for TVMMS to address satisfactory operating conditions along the M4.

5.13 ***Costs***

5.13.1 Table 5.1 provides the indicative costs of implementing the measures described in this Chapter.

Table 5.1 : Indicative Costs of Highway Measures (@Q3 2001 prices)

Scheme/Measure	Cost (£m)
New Highway Schemes	Nil
ITS Measures	25
Total	**25**



Scenario	Flow	Operating Index
Base 2000	26000	2
2016 Do Minimum	32000	3
2016 Preferred Strategy	31000	3

(Flows given as two way AADT)

Index

1 Congestion rarely occurs
2 Congestion occurs on an intermittent basis
3 Congestion occurs on a regular basis, but normally only at peak times
4 Congestion occurs on a regular basis, at times throughout the day

SWARMMS

Transport Flow Data
London-Bristol/Severn Estuary Plan

Figure 5.1

6 Summary of Findings

6.1 ***Conclusions***

6.1.1 The London-Bristol/Severn Estuary Plan contains a Preferred Strategy which includes investment across all modes on the M4 and GWML strategic corridors. By far the highest level of investment, however, is targetted at the rail corridor, and the expectation would be that the recommendations from TVMMS will significantly increase this amount yet further.

6.1.2 The Preferred Strategy incorporates substantial increases in frequencies of both long-distance and local services to provide greater opportunities to use rail as an alternative to the private car. The strategy recognises the existing capacity constraints within this corridor and therefore recommends substantial infrastructure works to increase GWML rail capacity. These capacity improvements are recommended to enable increased rail service frequencies to be operated but more importantly to create the increased flexibility in rail operations to improve service reliability.

6.1.3 The Preferred Strategy also includes a significant upgrade to the existing coach services operating along the M4. Two new Coachways are proposed, at Swindon and Chieveley, which will significantly improve the attractiveness of coach travel, both in terms of offering new, accessible locations for interchange and reducing some existing journey times.

6.1.4 A comprehensive programme of upgrading existing public transport interchanges (both rail and coach/bus) is also proposed. A first class transport system demands that travellers have levels of comfort, security and information which are above those that currently exist in many locations. The upgrading of interchanges can have a major impact on people's perception of public transport and is a central part of the Preferred Strategy.

6.1.5 Highway measures along the corridor, again excluding the sections around Bristol, Swindon and Reading eastwards, are focussed on implementation of an upgraded Intelligent Transport System (ITS). This will assist in better management of traffic flow at busy times, providing higher standards of information to the travelling public and reducing the adverse impacts of incidents along the corridor.