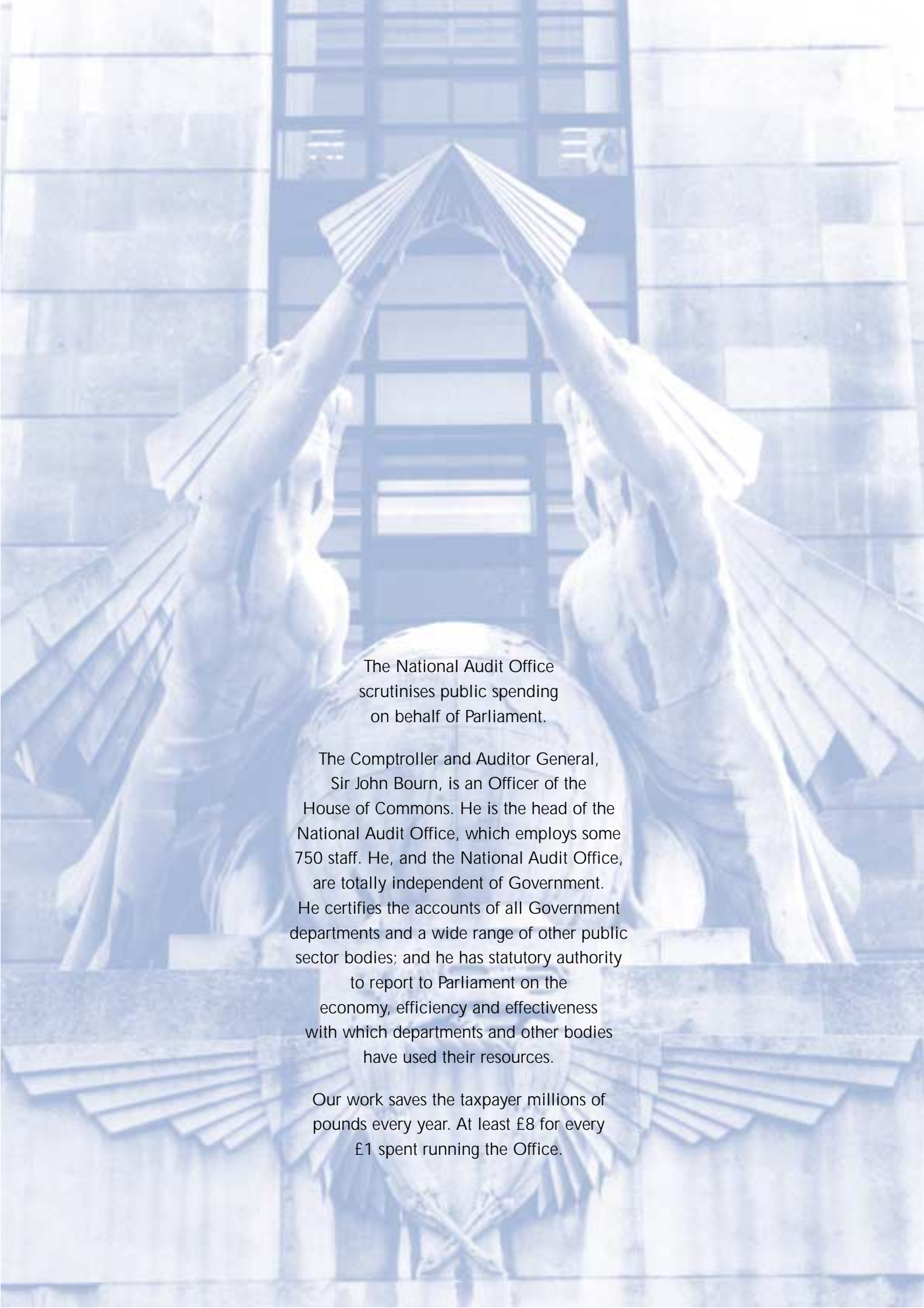


Highways Agency
Maintaining England's Motorways and Trunk Roads

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL
HC 431 Session 2002-2003: 5 March 2003





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Maintaining England's Motorways and Trunk Roads



REPORT BY THE COMPTROLLER AND AUDITOR GENERAL
HC 431 Session 2002-2003: 5 March 2003

This report has been prepared under Section 6 of the National Audit Act 1983 for presentation to the House of Commons in accordance with Section 9 of the Act.

John Bourn National Audit Office
Comptroller and Auditor General 19 February 2003

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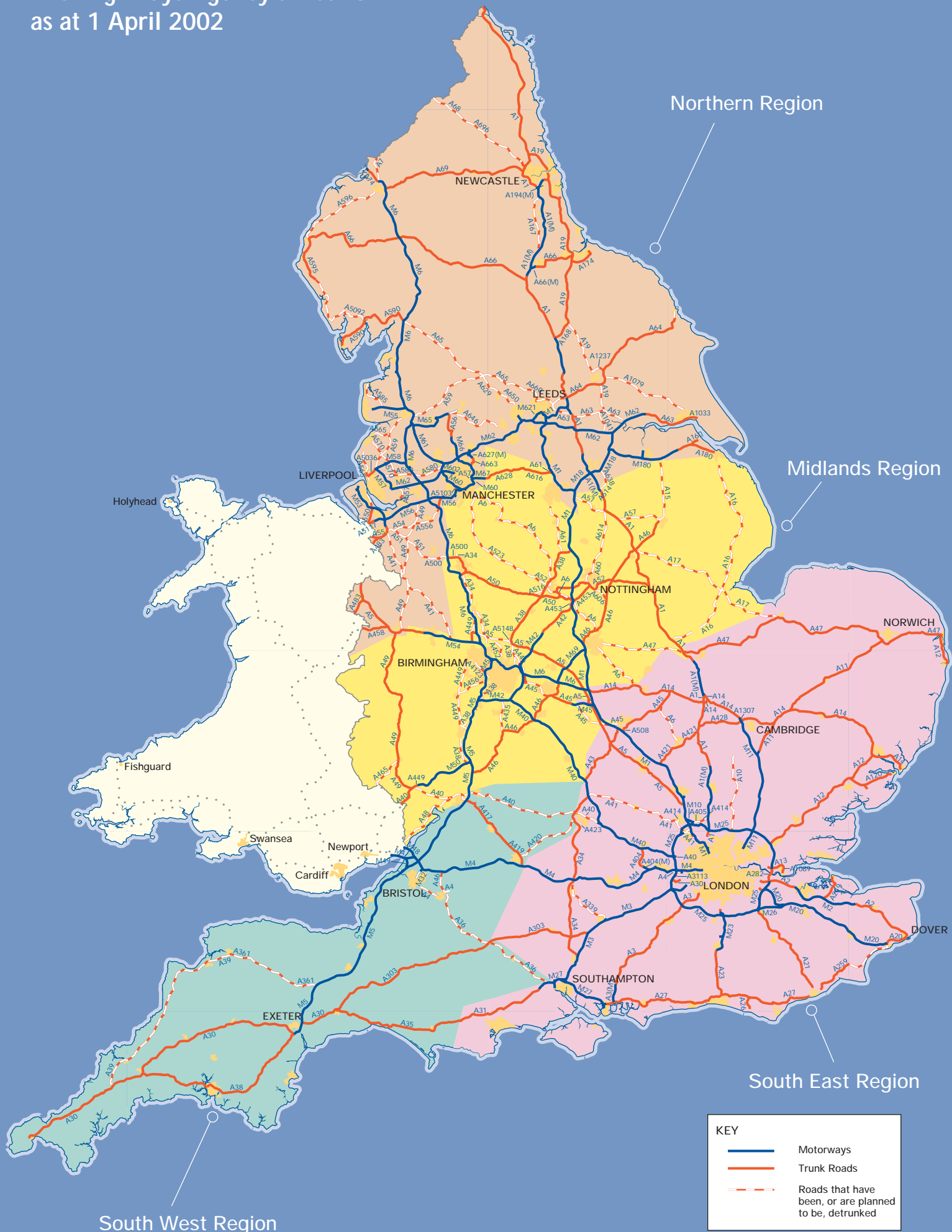
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The Highways Agency's Network as at 1 April 2002



KEY	
	Motorways
	Trunk Roads
	Roads that have been, or are planned to be, detrunked

executive summary

- 1 This report examines the maintenance of motorways and trunk roads in England by the Highways Agency (the Agency), an executive agency of the Department for Transport (the Department). Road maintenance consists of routine maintenance, such as keeping roads clear of debris and cutting grass, and capital maintenance, involving the renewal of assets, for example resurfacing or reconstructing roads. There are 9,500 kilometres of motorways and trunk roads on the network, 8,900 of which the Agency manages¹. In 2001-02, the Agency spent £502 million on maintenance of the 8,900 kilometres that it manages directly, over £56,000 per kilometre. The Agency's aim is to maintain the network in a safe and serviceable condition, while minimising whole life costs, disruption to road users and others, and any adverse effect on the environment. Maintenance is contracted-out to third parties. Managing Agents investigate, design, manage and control repair work, while Term Maintenance Contractors actually carry out the work.

Main findings

- 2 In recent years, the Agency has improved the condition of the network and has also strengthened the management and delivery of its maintenance programme:

- ✓ **The condition of the network has improved.** Surface condition is good and fairly stable, stakeholders' views are generally favourable and payments for damages arising from poor road condition are low.
- ✓ The allocation of funds to Regions and capital maintenance projects has been strengthened so that **funding decisions more closely reflect need**.
- ✓ The Agency has introduced a new financial monitoring system and has also changed how it contracts for maintenance work, **allowing for improved cost control**.
- ✓ The Agency **assures the quality of maintenance work** by specifying the materials that can be used and the quality of finish, and by requiring completed work to be certified by Agents' engineers.
- ✓ The Agency has **reduced the impact of maintenance on the motorist**, in particular, by carrying out more work at night and at off-peak times of the day.

There is, however, scope for further improvement:

Measurement of network condition and the Agency's performance can be further improved

- 3 Roads need to be reconstructed when they reach the end of their natural lives and are deemed to have a 'zero residual life'. However, others require reconstruction when they have not been maintained on a timely basis. Our

¹ Some 600 kilometres of the network are managed by contractors who have designed, built, financed and now operate, as well as maintain, eight roads on the network.

earlier reports on road maintenance² found that, in the 1970s and 1980s, failure to maintain some roads in a timely fashion was resulting in damage to the roads' underlying structure. By 2001, around 5 per cent of the network had a zero residual life or less, down from 13 per cent of trunk roads and 14 per cent of motorways in the late 1980s. However, the Agency does not differentiate between roads requiring reconstruction because they have reached the end of their natural lives and those that require reconstruction due to untimely maintenance. Such information would allow the Agency to assess whether it had eliminated reconstruction work that could have been avoided if more timely maintenance had been carried out.

- 4 The Agency has a national target of ensuring that 7 to 8 per cent of the network requires maintenance in the following year. Although the Agency has met the target, performance varies significantly between regions, ranging from 5.2 per cent of the roads in the South West to 9.1 per cent in the North West as at March 2002. Three regions - the East Midlands, East of England and the North West - breached the 8 per cent upper limit. The Agency takes account of several factors to measure its performance against the target, including roads' residual life, skid resistance and rutting - where wheel tracks develop in the road under the weight of vehicles. For 2003-04, it intends to supplement these with information about cracking, texture and ride quality. It does not, however, take account of road users' experience of the network. Our survey of road users showed that some users were not completely satisfied with the condition of the network. Drainage systems need to be kept in good condition to prevent damage to the structure of roads. However, information on the condition of roadside assets, such as lights and drainage systems, is incomplete and inaccurate and the Agency's 'Technical Audits'³ raised doubt over the thoroughness and completeness of Agents' inspections of these roadside assets. The Agency is developing databases on the condition of roadside lights and telephones. It considers that drainage condition surveys using CCTV are the most effective way of compiling and maintaining a comprehensive inventory of drainage systems. Before committing to a comprehensive programme of such surveys, however, the Agency plans to assess the value for money of this approach and how often such surveys should be carried out.
- 5 Several targets in the Agency's Road Users Charter concern maintenance work. The Agency's performance against some of the targets could not be verified. There are also problems, more generally, in how the Agency reports against these targets, where targets are not clearly or consistently defined and performance data are not systematically validated.
- 6 In its 1991 report, *Management of Road Maintenance*, the Committee of Public Accounts noted the Department's assumption that the effects of increased traffic growth on the costs of delays from roadworks would be offset by more effective traffic management measures. However, it is difficult to evaluate the effectiveness of traffic management, and the Agency's measure of lane availability does not reflect the full impact of roadworks on the road user. Accident risks at roadworks increased from 1982 to 1993. The Agency has no more recent data. Since then, however, it has increased the use of speed cameras, and adopted other techniques to improve safety, at roadworks. The Agency expects these developments to have reduced the risk of accidents at roadworks and is currently working on a study to assess their impact.

The Agency would make better use of its resources by selecting the highest priority projects, where maintenance is most needed

- 7 Weaknesses remain in the Agency's approach to assessing proposals to spend £100,000 or more on major capital maintenance projects. Although safety is the most important concern, it is not assessed rigorously and safety benefits are not

² *Expenditure on Motorways and Trunk Roads (1985), Backlog of Maintenance of Motorways and Trunk Roads (1989), and Management of Road Maintenance (1991).*

³ *Technical Audits are carried out by external consultants on behalf of the Agency and examine the Agents' compliance with their contract, the Trunk Road Maintenance Manual and other relevant Agency procedures, standards and instructions. They were introduced by the Agency in 1997, and each Agent is audited once a year.*



quantified. Projects are not ranked against any quantitative measure of the financial savings that the Agency would make by carrying out a particular project now rather than in the future, reflecting the 'spend to save' principle. The Agency plans to use such ranking from April 2004. However, Agents' investigations and presentations of their proposals for major capital maintenance projects are often of poor quality, undermining the information on which such ranking would be based. The prioritisation of, and allocation of some £51 million a year to, small capital projects are also not based on evidence of need or urgency and there are no controls to prevent individual Agents over-bidding for such work.

The Agency could go further to strengthen cost control and improve its record in recovering sums due from people who damage the network

- 8 Unit costs of capital maintenance work have increased sharply in real terms over recent years, partly reflecting higher than general inflation in the construction industry but also the adoption of higher quality and more durable treatments, greater night time working and more expensive techniques. Controlling in-year spending on capital maintenance projects is a priority. We found that, in a sample of 9 of the 20 Areas, all but three Areas kept in-year capital maintenance spending close to or under budget in 2001-02. However, cost control was much less effective over projects' lifetimes, where we found an average overspend of 27 per cent and which involved the Agency delaying new projects in order to keep spending within in-year budgets. The Agency's focus on in-year cost control, therefore, hides the extent of overspending on individual projects over their lifetime. Poor budget estimation has been a key problem, reflecting insufficient design work carried out before projects are approved. The Agency has recognised that cost control needs to be improved and expects to have a new process in place for managing project costs, from April 2003.
- 9 The Agency is now merging the roles of its contractors, using lump sums and outcome targets for routine maintenance and setting target prices for major capital schemes up to £5 million and financial incentives for contractors to stay within them. It has also improved the quality and performance specifications in the new Agent contracts. While offering several advantages in terms of cost control, these changes also bring risks to value for money, by removing the independent supervision of the work of contractors on routine and small capital jobs, opening up the possibility of disputes over the achievement of outcomes, and presenting a risk of contractors overstating the amount or complexity of the work in order to justify a high target price.
- 10 The Agency does not recover all of the sums due when people damage the network. In 2001-02, the Agency was unable to recover, or abandoned claims for, some £6.2 million for damage to the network, because no culprit could be identified or pursued. The Agency's new contracting arrangements provide financial incentives for contractors to recover sums due for damage to the network, although the Agency will continue to deal with larger claims.

More attention needs to be given to assuring the quality of maintenance work, particularly over the longer term

- 11 Although Agents' engineers must certify work upon completion, they do not guarantee that the work will last a given lifetime. The Agency is monitoring how well maintenance work performs at a selection of sites. In its June 1991 report, the Committee of Public Accounts noted that the Department expected there to be reliable centrally collected data on the maintenance history of roads from April 1992. However, there is still inadequate information about maintenance histories and therefore about the performance of maintenance work over the longer term across the network as a whole.

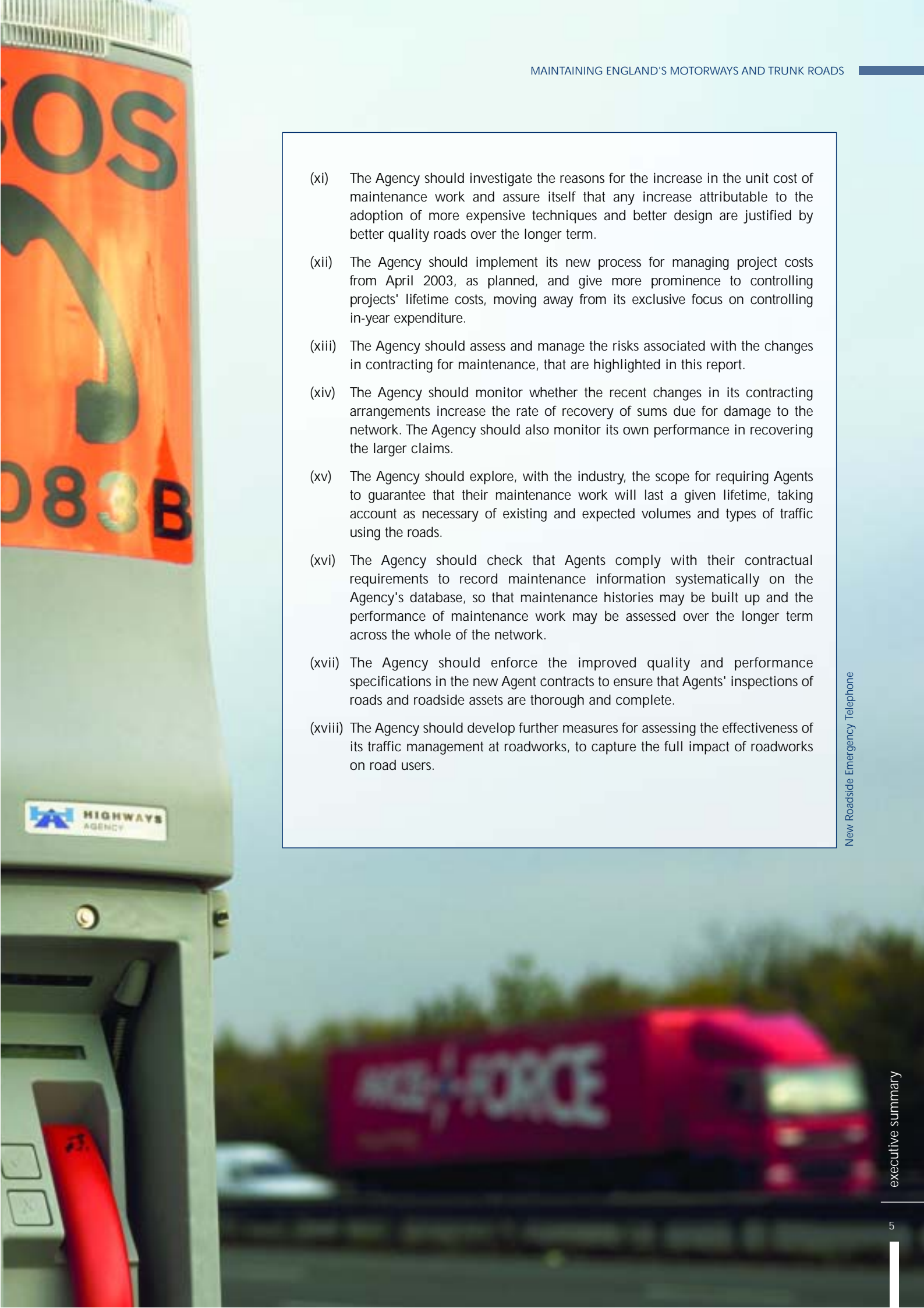


M1 Junction 28 contraflows and roadworks, October 2000

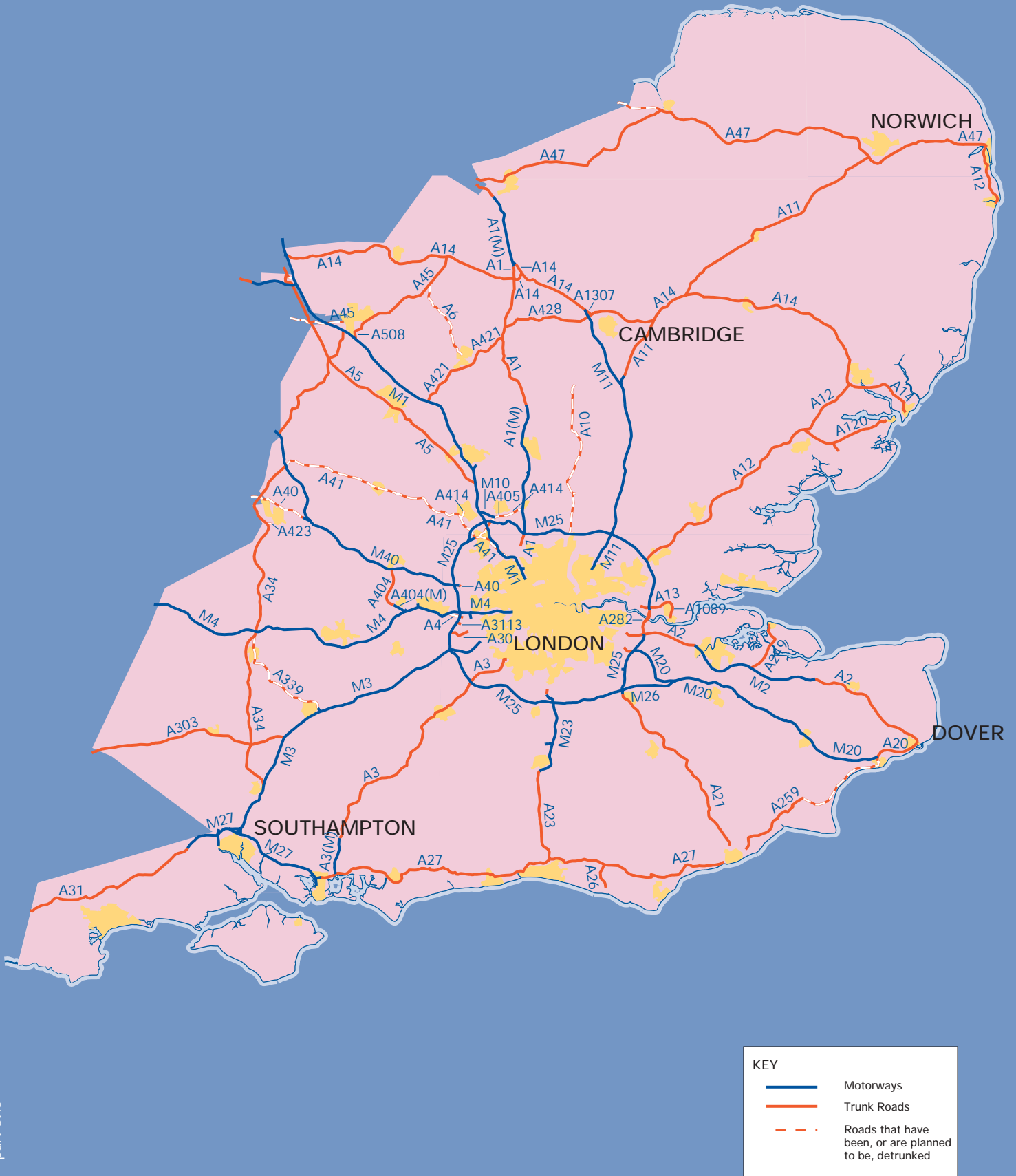
Recommendations

- (i) The Agency should assess whether it has eliminated reconstruction work that could have been avoided if more timely maintenance had been carried out.
- (ii) The Agency should introduce regional condition targets as soon as possible.
- (iii) The Agency should take user satisfaction into account in measuring its performance against its national target for maintaining the condition of the network.
- (iv) The Agency should implement, as soon as possible, a national database of roadside assets and their condition.
- (v) The Agency should put in place a cost-effective approach for assessing the condition of drainage systems across the network.
- (vi) The Agency should, in consultation with the Department, revise its Road Users Charter targets concerning maintenance so that they are clearly defined and that performance against them can be verified. The Agency should also require Agents to validate the performance data they submit to the Agency.
- (vii) The Agency should complete its study of safety and accident risks at roadworks as soon as possible, analyse the main causes of accidents and pursue further ways of reducing accident rates in conjunction with the police, the Driving Standards Agency and road user groups.
- (viii) The Agency should not accept Agents' proposals for major capital maintenance projects unless claimed benefits, such as safety, are clearly evidenced and quantified.
- (ix) The Agency should hold a series of training workshops with its Agents, and issue examples of project proposals that represent best practice, to improve the quality of Agents' proposals for major capital maintenance work, including the breadth of options considered as potential solutions.
- (x) The Agency should prioritise small capital projects based on evidence that the work is genuinely urgent and only approve funding for non-urgent work where there is clear evidence of need.



- 
- (xi) The Agency should investigate the reasons for the increase in the unit cost of maintenance work and assure itself that any increase attributable to the adoption of more expensive techniques and better design are justified by better quality roads over the longer term.
 - (xii) The Agency should implement its new process for managing project costs from April 2003, as planned, and give more prominence to controlling projects' lifetime costs, moving away from its exclusive focus on controlling in-year expenditure.
 - (xiii) The Agency should assess and manage the risks associated with the changes in contracting for maintenance, that are highlighted in this report.
 - (xiv) The Agency should monitor whether the recent changes in its contracting arrangements increase the rate of recovery of sums due for damage to the network. The Agency should also monitor its own performance in recovering the larger claims.
 - (xv) The Agency should explore, with the industry, the scope for requiring Agents to guarantee that their maintenance work will last a given lifetime, taking account as necessary of existing and expected volumes and types of traffic using the roads.
 - (xvi) The Agency should check that Agents comply with their contractual requirements to record maintenance information systematically on the Agency's database, so that maintenance histories may be built up and the performance of maintenance work may be assessed over the longer term across the whole of the network.
 - (xvii) The Agency should enforce the improved quality and performance specifications in the new Agent contracts to ensure that Agents' inspections of roads and roadside assets are thorough and complete.
 - (xviii) The Agency should develop further measures for assessing the effectiveness of its traffic management at roadworks, to capture the full impact of roadworks on road users.

The Highways Agency's Network in the South East Region, as at 1 April 2002



Part 1

Introduction

Background

- 1.1 This report examines the maintenance of the motorway and trunk roads network (the network) in England by the Highways Agency (the Agency). The Agency is an executive agency of the Department for Transport (the Department), created in 1994 to manage, maintain and improve the network, functions previously held by the Department.
- 1.2 The network consists of most⁴ of the motorways in England, together with the most important 'A' roads. Local authorities maintain other roads. The network totals around 9,500 kilometres by route length⁵ and is the largest single government asset, currently valued at over £60 billion. The network represents less than four per cent by length of all roads in England, but accounts for more than a third of total vehicle kilometres and two-thirds of heavy goods vehicle kilometres driven each year in England.
- 1.3 As a result of the high rate of wear caused by the heavy traffic carried on the network and the need for higher standards because of higher speed of traffic, the Agency spends proportionately much more money maintaining the network than local authorities do on their roads. In 2001-02, the Agency spent over £56,000 per kilometre on maintaining its roads, almost ten times the £6,100 per kilometre⁶ spent by local authorities on maintaining local roads. However, the Agency's spending per vehicle kilometre is less than local authorities', at 0.31 pence compared with 0.70 pence.⁷

Maintenance of the network has become the Agency's priority

- 1.4 *A New Deal for Trunk Roads in England*, published in August 1998 by the Department's predecessor, the Department of the Environment, Transport and the Regions, made maintenance of the network the Agency's first priority. This priority has been reflected in the balance of the Agency's spending. Maintenance made up almost half of the Agency's spending on roads and bridges in 2001-02 (**Figure 1**).
- 1.5 The road network consists of the road itself - the pavement - and roadside assets, such as signs, grass verges, cat's-eyes, lights, safety barriers and drains. The Agency is responsible for maintaining all of these components, as well as the embankments, bridges and viaducts that often support roads. Maintenance is carried out to:
 - protect the life of the assets making up the network. Most maintenance work - perhaps 90 per cent - is planned. Timely action can avoid damage to assets and save money in the long run. For example, repairing cracks in the road surface can prevent rain and frost penetrating and damaging the structure of the road; and
 - protect safety. For example, rutted roads need to be repaired so that they can continue to be safely used by vehicles travelling at high speeds and grass verges need to be cut so that drivers can see other traffic clearly at junctions.

⁴ Some 45 kilometres of motorways in urban areas are maintained by local authorities.

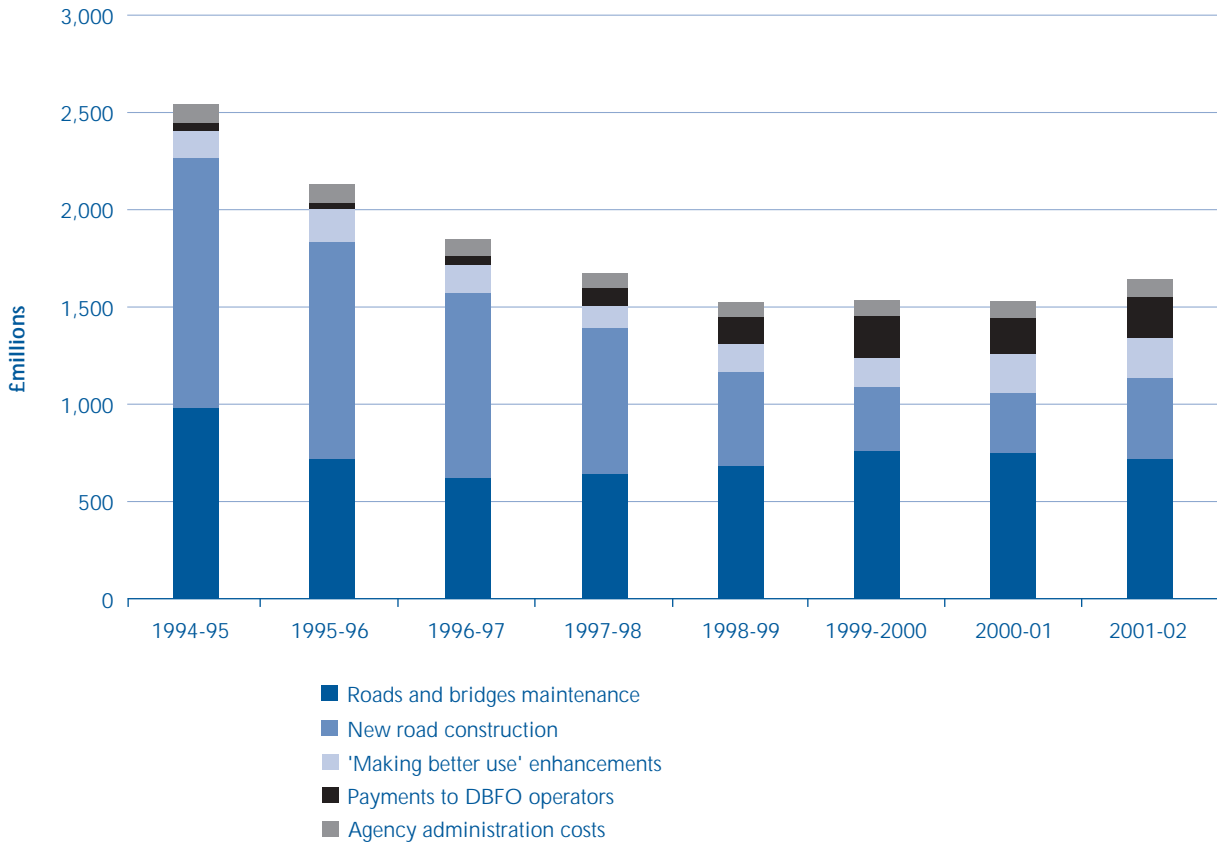
⁵ As at April 2002. The Agency directly manages some 8,900 kilometres of the network; a further 600 kilometres are managed by contractors who have designed, built, financed and now operate, as well as maintain, eight roads on the network.

⁶ Source: *The National Road Maintenance Condition Survey, 2001*; local authority spend includes bridge maintenance.

⁷ Spending is for 2000-01.

1 Highways Agency spending in real terms, 1994-95 to 2001-02

Since 1996-97, as new build has diminished, maintenance has grown to become the single biggest item in the Agency's spending on roads.



NOTES

1. All amounts are adjusted to 2001-02 prices and show spending on roads, bridges and other structures.
2. Payments to DBFO operators are payments made under contracts with consortia of private sector firms to design, build, finance and operate roads. There are currently eight DBFO roads, covering 7 per cent of the Agency's network.

Source: National Audit Office

The Agency aims to keep the network in a safe and serviceable condition whilst minimising whole life costs

1.6 The Agency's *Strategic Plan for Maintenance* points out that the emphasis on maintenance brings new responsibilities, not least to minimise costs over the whole life of the road network. In deciding how much maintenance to do and when it should be done, the Agency seeks to maintain the network in a safe and serviceable condition, while minimising whole life costs. The Agency seeks to minimise input costs plus the time value of disruption caused by roadworks to road users and others, the social costs of accidents at roadworks and any adverse effect on the environment.

This report focuses on maintenance of the road network in England

1.7 We examined the Agency's maintenance of bridges and structures in our report *Highways Agency: The Bridge Programme* (HC 282, 1995-96). We have also reported on the Agency's use of private consortia to design, build, finance and operate, as well as maintain, new roads *PFI: The first four DBFO Roads Contracts* (HC476, 1997-98). This report therefore examines the maintenance of the roads managed by the Agency itself, excluding bridges and structures. In 2001-02 the Agency spent £502 million on road maintenance activities covered by this report (Figure 2).

We carried out our examination at a time of change for the Agency

The Agency is changing its system for managing maintenance

1.8 For many years, maintenance has been divided into two functions, both contracted-out to third parties:

- The network is divided into Areas, grouped into four Regions. **Managing Agents** (Agents) are responsible for investigating and designing large-scale repair works and for managing and controlling maintenance in each Area. Before 1997, most Agents were local authorities, principally county councils. Since then, however, the Agency has opened up all Agent appointments to competitive tender, with the result that by 2001 local authorities were involved in only three of the then 20 Areas. The Agency has also reduced the number of Areas, from 85 in 1995 to 20 in 2001-02; it will reduce the number to 14 from 1 July 2003.
- **Term Maintenance Contractors** have been responsible in each Area for actually carrying out maintenance work, except large-scale repairs (above £100,000) which are subject to competitive tender.

1.9 **Figure 3** overleaf shows the organisational structure for managing and delivering maintenance work. Further changes have recently been introduced. Following consultation with the industry and other stakeholders in 1999, the Agency has started to combine the Managing Agent and Term Maintenance Contractor functions within a single contractor called a Managing Agent Contractor. The Scottish Executive has also adopted this model.

The Agency is transferring some of the network to local authorities

1.10 *A New Deal for Trunk Roads in England* distinguished between core and non-core roads. Core roads were of strategic importance, such as those linking major cities, ports and airports. They accounted for around 60 per cent of the Agency's network in 1998. The Agency is transferring its non-core roads, often single carriageway 'A' roads, to local authorities to allow it to concentrate on the strategic road network. This process, known as 'detrunking', is expected to reduce the size of the Agency's network from some 9,800 to some 6,600 kilometres over the period 2001-02 to 2005-06. By the end of 2002-03, half of the non-core road network should have been detrunked and 90 per cent transferred to local authorities by the end of 2003-04.

2 Breakdown of Highways Agency road maintenance spending in 2001-02

The Agency's road maintenance costs, consisting of five main components, totalled £502 million in 2001-02.

Component	£ Million
Capital maintenance: mostly repairs to road pavements, but also includes repairs to road lighting, drains and embankments. Also includes smaller repair works, known as summary schemes, costing around £51 million in 2001-02.	252
Routine maintenance: such as cleaning drains, repainting white lines, cutting grass and repairing damaged safety barriers.	141
Winter maintenance: gritting roads and clearing snow.	32
Other costs: such as technical consultancy and advice, press and compensation to third parties for damage attributed to poor network condition.	26
Fees: mainly management fees to Managing Agents, and preliminary fees to Term Maintenance Contractors to cover their cost of holding spares and their site overheads.	51
Total	502

NOTE

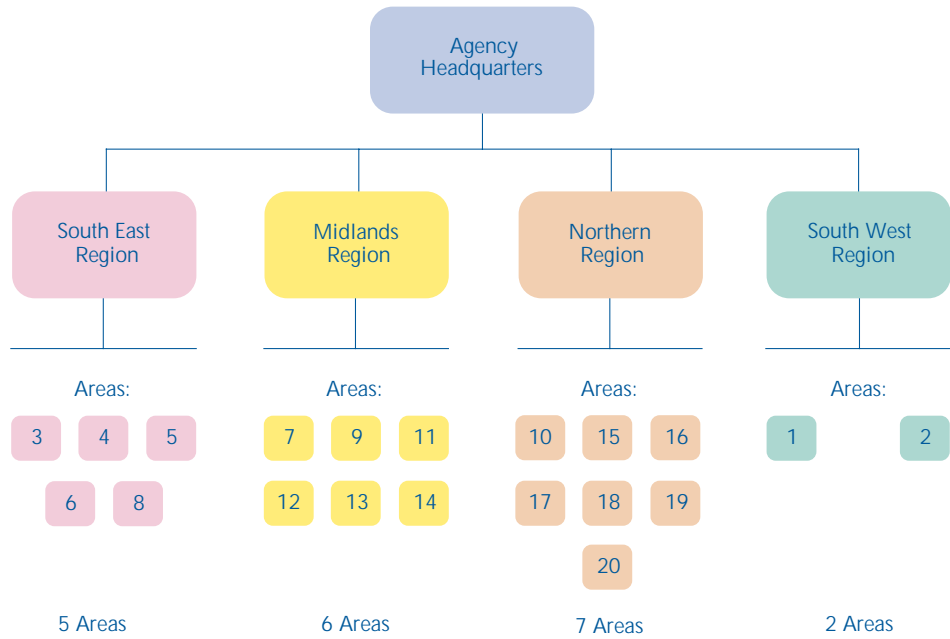
An element of 'Other costs' concerns new road construction or other Agency activity, but it is not possible to separate out this element.

Source: National Audit Office

3 The organisational structure for delivering road maintenance

The Agency organises its maintenance work on a regional and area basis.

The Agency has 4 Regional Offices, each headed by a Regional Director



There are 20 Areas, each with a Managing Agent and Term Maintenance Contractor plus local Agency representatives

NOTES

1. This organogram represents the situation during 2001-02; by July 2003, the number of Areas will be reduced to 14.
2. See Appendix 2 for more detail on the geographic coverage of, plus the identity of, the Agent and Term Maintenance Contractor in each Area.

Source: National Audit Office

The Highways Agency's Network in the Midlands Region, as at 1 April 2002



KEY	
	Motorways
	Trunk Roads
	Roads that have been, or are planned to be, detrunked

Part 2

Network condition

2.1 The Agency needs to monitor the condition of the network to assess what maintenance work needs to be carried out and to report to the Department on its performance against targets. We examined:

- trends in the condition of the network;
- the Agency's performance against its target for maintaining the condition of the network; and
- the Agency's monitoring of the condition of individual assets.

The condition of the network has improved

The proportion of the network requiring reconstruction has diminished

2.2 Our earlier reports on road maintenance⁸ found that, in the 1970s and 1980s, failure to maintain some roads in a timely fashion was resulting in damage to the roads' underlying structure. In our 1991 report, we found that by the late 1980s 13 per cent of trunk roads and 14 per cent of motorways had a 'zero residual life' or less, meaning that the asphalt surface no longer fully protected the base. Roads need to be reconstructed when they reach the end of their natural lives. However, others require reconstruction when they have not been maintained on a timely basis. Most of the roads that had a 'zero residual life' or less in the late 1980s required reconstruction, some to repair the structural damage that would have been avoided if more timely maintenance had been carried out. In 1989, the Department estimated that the additional costs of dealing with the reconstruction work then required would be up to £120 million over the subsequent four years.

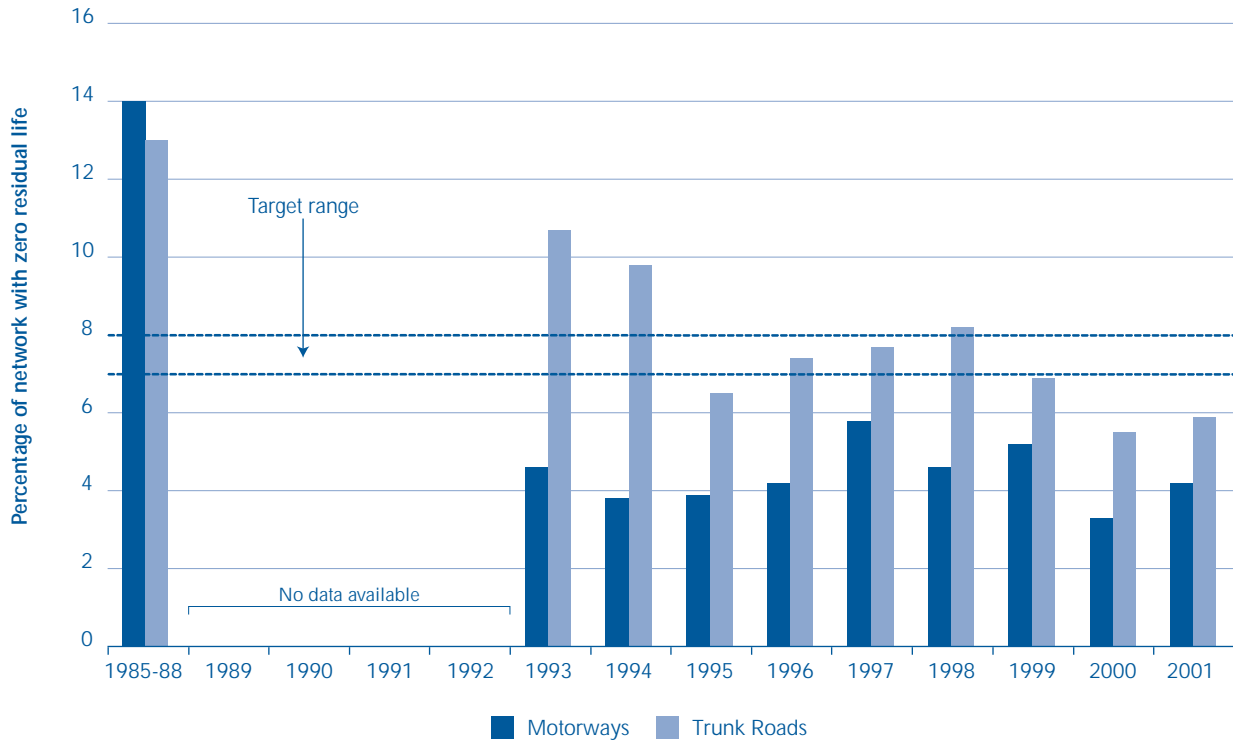
2.3 The Department had already set about addressing these problems before the Agency was established in 1994. It set the newly formed Agency the aim of ensuring that, by the year 2000, the proportion of the network with a zero residual life had been reduced to between 7 and 8 per cent. **Figure 4** shows that the condition of motorways and trunk roads has been better than the target for most of the time since 1994. Around 5 per cent of the network had a zero residual life or less in 2001. The Agency does not differentiate between roads requiring reconstruction because they have reached the end of their natural lives and those that require reconstruction due to untimely maintenance. We were therefore unable to establish whether the Agency had eliminated reconstruction work that could have been avoided if more timely maintenance had been carried out.

2.4 The condition of the network has improved since the mid-1980s partly because of the emergence of what are known as 'long life' roads. In the 1990s the Agency found that successive surfacing of roads had created roads of such thickness that their structural bases were protected from damage indefinitely. Periodic maintenance is still needed to maintain surface condition (for example, to maintain skid resistance), but such roads should not need reconstruction. The Agency estimates that 60 per cent of motorways and 25 per cent of trunk roads are now long life.

⁸ *Expenditure on Motorways and Trunk Roads (1985), Backlog of Maintenance of Motorways and Trunk Roads (1989), and Management of Road Maintenance (1991).*

4 The trend in the condition of the network, 1985 to 2001

The Agency has maintained the condition of the network as a whole at or below the target level since 1995.



NOTES

1. The figures for 2000 and 2001 are not strictly comparable with those of earlier years because of a change in the Agency's method of estimating residual life.
2. A lower percentage of motorways than of trunk roads have a zero residual life because the Agency gives motorway maintenance a higher priority.

Source: National Audit Office

Other measures also suggest that the network is in a good condition

Surface condition is good, although robust national data have only recently become available

2.5 The road user's perception of the quality of a road is an important indicator of the condition of the network and surface condition is a major factor in influencing users' perceptions. The Agency has collated national data on some aspects of surface condition since 1990, but did not start covering all aspects or combining the data until 1998, when it recognised that the existence of long life roads made surface condition an increasingly important aspect of road condition. Only the data since 1998 are easily accessible. The Agency does not have any specific targets for surface condition, but data on key aspects suggest that surface condition is fairly good and stable (Figure 5).

Payments for damages arising from poor road condition are low

2.6 The Agency receives claims for compensation from members of the public alleging that the Agency is responsible for personal injuries or damage to vehicles as a result, for example, of poor road condition or debris on the road. In 2000 and 2001, the Agency received 725 claims for damages caused by defective road or footpath surfaces and paid out £680,000 on 296 of them, an average of £2,297 per claim. Annual expenditure on such claims is equivalent to 0.1 per cent of the Agency's annual spend on capital maintenance of roads. In comparison, on the basis of a survey of local authorities, the Asphalt Industry Alliance estimated that in 2001-02 local authorities spent the equivalent of 18 per cent of their capital road maintenance budgets on compensation for poor condition of their roads.

5 Trends in key aspects of surface condition

The surface condition of the network is reasonably good and relatively stable.

Measure	Meaning	Outcome
Rutting	Deformation of the road under the weight of vehicles, leading to wheel tracks developing in the road.	Over the period 1998 to 2002, between 1 and 2 per cent of the network was at the Agency's 'warning' level for rutting, where ruts are between 1 and 2 centimetres deep. However, none of the network had ruts more than 2 centimetres deep.
Skid resistance	Polishing of the surface of the road, reducing its resistance to skidding.	The proportion of the network below the investigatory level for skid resistance remained at around 5 per cent over the period 1999 to 2002.

NOTE

The investigatory level for skid resistance is the point at which accident rates are likely to increase significantly.

Source: National Audit Office

Stakeholders' views are generally favourable

2.7 We surveyed a range of stakeholders, including commercial road users, motoring organisations and technical bodies with an interest in road maintenance. These stakeholders had few concerns about the Agency's maintenance targets or performance, and National Express commented that great improvements had been made in the way in which the Agency maintained and operated the network. However, National Express considered that the Agency's condition targets could be tougher, and the Agency's own Road Users Committee considers that more attention should be given to the extent of rutting on the network. The Road Haulage Association and Automobile Association considered that the Agency should give more consideration to road condition as experienced by the road user and that some recently resurfaced sections of roads, whilst meeting the required standard, were still 'bumpy'. The Agency's road user surveys have also found that, although respondents considered the condition of the network had improved, further improvement of the surface of roads was their top priority.

in relation to the target - how much life the road had left based on how much asphalt surface remained - was not appropriate for concrete roads or long life asphalt roads, which together accounted for 40 per cent of the network in 2000. The Agency therefore commissioned the Transport Research Laboratory to develop a revised indicator. The new indicator, which measures the proportion of the network likely to need maintenance in the coming year, draws where relevant on residual life information, but also takes into account skid resistance and rutting across the whole of the network.

2.9 The Department used this new indicator to set the Agency a new condition target from 2000-01 onwards. The Transport Research Laboratory estimated in March 2000 that around 7.5 per cent of the network would require maintenance in 2000-01. Aiming to ensure that the network was kept in a steady state, the Department therefore set the Agency a target of ensuring that 7 to 8 per cent of the network would require maintenance in the following year. To date, the Agency has met the new target. The Agency estimated that, at the end of 2000-01, 7.1 per cent of the network required maintenance and, although it increased to 7.5 per cent at the end of 2001-02, it remained within the target range.

The Agency has adopted and met a new target for maintaining the condition of the network, but there is scope for further improvement

The Agency has refined its indicator for assessing the condition of the network

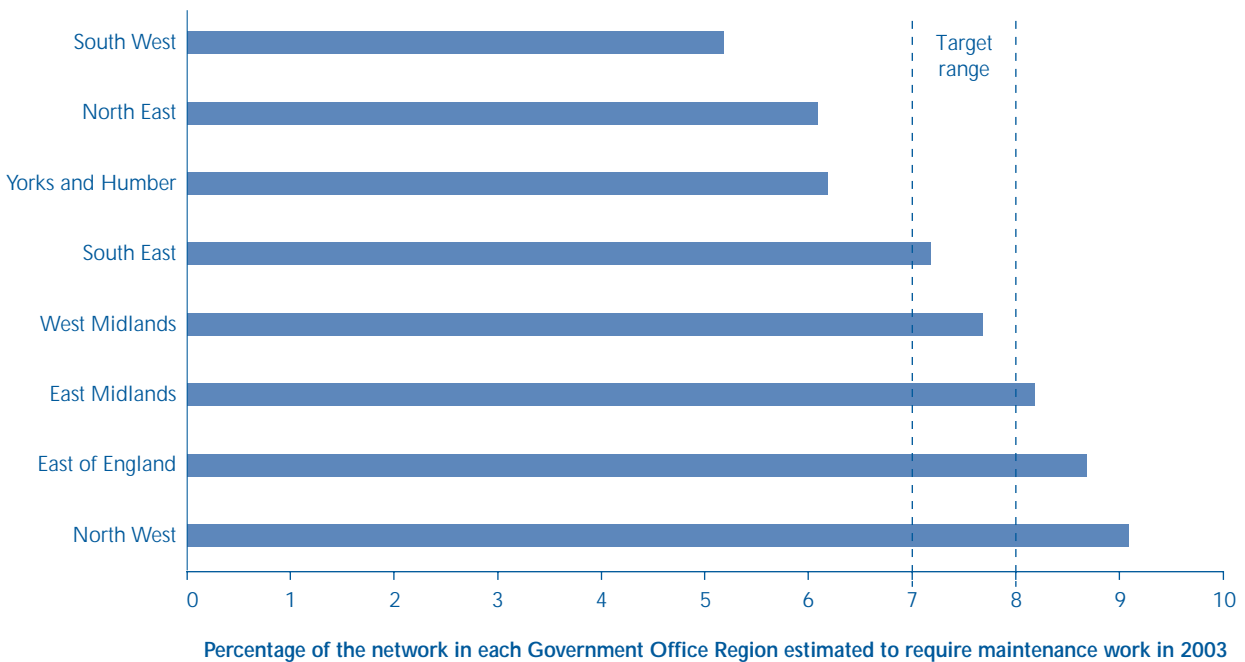
2.8 The original target that the Department set for the Agency - to reduce to between 7 and 8 per cent the proportion of the network with a zero residual life by 2000 - provided only a single measure of the condition of a conventional asphalt road. As roads become longer life, surface rather than structural condition becomes more important. In addition, what the Agency measured

Performance against targets, and measurement of network condition, can be further improved

2.10 The Agency's target is a national average, masking significant regional variations in the condition of the network (Figure 6). Use of a national average also masks larger changes between regions over time. For example, in the South East region the percentage of the network requiring maintenance increased from 5.3 in 2000 to 7.2 in 2002, while in the North East it fell from 6.9 to 6.1 over the same period. The Agency has recognised that regional targets for network condition should be introduced, but has not yet set any specific date for their introduction.

6 Regional variations in the percentage of the network requiring maintenance, as at March 2002

The percentage of the network requiring maintenance as at March 2002 varied significantly between regions.



Source: National Audit Office

2.11 The Agency intends to refine its indicator further from 2003-04 by taking account of three other aspects of road condition - cracking, texture and ride quality. However, there is scope for further improvement. The indicator does not assess directly the condition of the network, measuring only the amount of work required on the network. The Agency has recognised that network condition should be reported on directly and plans to do this from 2003-04.

2.12 The Department set the target range of 7 to 8 per cent of the network needing repair based on information about the state of the network and the amount of maintenance being carried out in late 1999. The Department more recently asked the Agency to do further analysis to assess whether a higher or lower level of condition or maintenance work would provide better value for money in the longer term. In response, the Agency has developed a computer model to estimate the amount of maintenance required to keep roads in a safe and serviceable condition at least financial cost to the Agency over the lifetime of the roads. It aims to start implementing the model during 2003-04.

2.13 Road condition also, however, brings costs to road users through wear and tear on their vehicles. The Agency assessed these costs when developing its new computer model but considered they were immaterial in relation to the overall costs of maintenance. However, the results of our survey of road users (paragraph 2.7) suggest that some users are not completely satisfied with the current condition of the road network. The Agency does not take user satisfaction into account when assessing the optimal level of maintenance on the network.

Information on the condition of roadside assets is incomplete and inaccurate

2.14 The Agency does not have a complete national inventory of its roadside assets, such as drainage systems and street lights, and their condition. The Agency instead requires Agents to maintain local inventories. However, the Agency's 'Technical Audits'⁹ of Agents' adherence to their contractual requirements have persistently found that these inventories, particularly those relating to drainage networks, were incomplete and inaccurate. The inventories were also often not updated after maintenance works. The Agency has asked Agents to rectify these deficiencies and expects to have a national inventory in operation from April 2003.

⁹ Technical Audits are carried out by external consultants on behalf of the Agency and examine the Agent's compliance with their contract, the Trunk Road Maintenance Manual and other relevant Agency procedures, standards and instructions. They were introduced by the Agency in 1997, and each Agent is audited once a year.

- 2.15 Agents told us that, when they took over a new appointment, they often had significant difficulty retrieving asset records from the previous incumbent. Agents' local computer systems also only hold information about the condition of assets on an exception basis, where those assets have been inspected and found to be defective. However, detailed inspections of assets such as lights, for example, are carried out only once every six years and the Agency's Technical Audits cast doubt over the completeness and thoroughness of inspections. We also found that use of CCTV to assess drainage systems has only been used sporadically. Drainage networks need to be kept in good condition to prevent damage to the structure of roads. We were therefore unable to make a reliable assessment of the condition of all of the Agency's assets.
- 2.16 Better information about the condition of assets would help the Agency plan maintenance and assess the long term impact of different maintenance strategies. The Agency is developing databases on the condition of communications infrastructure, such as telephones, and lighting, and will set performance indicators for these assets from 2003-04 and 2004-05 respectively, initially based on the age of the asset and condition thereafter. The Agency considers that drain condition surveys using CCTV are the most effective way of compiling and maintaining a comprehensive inventory of its drainage systems. Before committing to a comprehensive programme of such surveys, however, the Agency intends to carry out an analysis of the value for money of this approach. The results of the analysis will then be used in reviewing the requirement of the Trunk Road Maintenance Manual that surveys be carried out at least once every ten years.

The Highways Agency's Network in the Northern Region, as at 1 April 2002



KEY	
	Motorways
	Trunk Roads
	Roads that have been, or are planned to be, detrunked

Part 3

Determining the work to be done

- 3.1 The Agency needs to ensure that the right maintenance work is carried out at the right time, reflecting priorities and the need to minimise lifetime costs. We examined whether the Agency:
- allocates funds for capital maintenance work across the country on the basis of need;
 - targets capital maintenance work on the highest priority projects in different parts of the country; and
 - uses a reliable system to determine how much routine maintenance is required.

Funding allocations to Regions take account of maintenance need, but there is scope for further improvement

3.2 When planning capital maintenance work for 2001-02 and 2002-03, staff at the Agency's headquarters set 'indicative allocations' of how much they considered each Region would need for capital maintenance work. The Agency based these allocations on the results of its new condition indicator for the network, which measures the proportion of the network likely to need maintenance in the coming year (paragraph 2.8). Previously, the Agency had allocated funds to Regions

largely on a pro rata basis, reflecting the size of Regions' bids. **Figure 7** shows that the new approach resulted in a large redistribution of funds between Regions. We found that funding allocations were based more closely on maintenance need. For example, South West Region's allocation fell by 29 per cent because its roads were in the best condition compared with those of other Regions.

3.3 However, we found that although funding allocations were based more closely on maintenance need than in previous years, the relationship between funding and need across all Regions could be further improved. **Figure 8** shows that, in 2002-03, indicative funding allocations per kilometre per percentage point of the network requiring maintenance varied between Regions, ranging from £892 in the South West to £1,140 in the Midlands. The Agency allocated the Midlands Region £248 (28 per cent) more per kilometre per percentage point than it did to the South West. The Agency told us that these variations partly reflected differences in the expected cost of treatments required between Regions. Indicative funding allocations also took account of historic spending on maintaining roadside assets. In conjunction with the development of its databases on the condition of roadside assets (Part 2), the Agency should start allocating funds for roadside asset works based on condition, in the same way as for the road itself, rather than on historic patterns.

7 Regions' indicative funding allocations in 2002-03 compared with 2000-01 spend

Indicative allocations based on the proportion of the network likely to need maintenance in the coming year brought a large redistribution of funds between Regions in 2002-03 compared with 2000-01.

Region	Spend in 2000-01 (£/lane kilometre)	Indicative Allocation in 2002-03 (£/lane kilometre)	Increase/decrease (per cent)
North	5,805	8,043	39
South West	6,490	4,639	-29
Midlands	8,663	9,003	4
South East	10,284	8,875	-14

Source: National Audit Office

8 Regions' 2002-03 indicative funding allocations compared with need

Indicative funding allocations varied between Regions in 2002-03, where there was no consistent relationship between funding and the percentage of the network requiring maintenance.

Region	2002-03 allocation (£/lane kilometre)	Percentage of network likely to require maintenance in 2002-03	Allocation per percentage point
North	8,043	7.8	1,031
South West	4,639	5.2	892
Midlands	9,003	7.9	1,140
South East	8,875	7.8	1,138

Source: National Audit Office

The Agency seeks to prioritise proposals for individual capital maintenance projects, but there is scope for further improvement

3.4 Capital maintenance involves renewing parts of the network, such as resurfacing roads and replacing life-expired assets such as lights and barriers. The Agency's Trunk Road Maintenance Manual gives Agents advice both on when capital maintenance might be required and on the type of work that is needed. Often, however, there is scope to vary both the timing and nature of the work. For example, patching a road might enable more substantial resurfacing to be postponed. The Agency has therefore developed processes to:

- assess the technical and other merits of proposals for major capital maintenance; and
- prioritise proposals for major and small capital maintenance projects and allocate funds.

The Agency needs to improve how it assesses and allocates funds to proposed major capital maintenance projects

3.5 For many years, the Agency has assessed Agents' proposals for major capital maintenance projects (over £100,000), sometimes using informal 'workshops' for this purpose. Since 1999 it has made Value Management workshops a formal requirement for assessing all projects. In these workshops Agents score their own proposals under six criteria (Figure 9), arriving at a score out of 100 for each project. The Agents then meet the Agency to discuss each project, following which the scores might be revised.

3.6 Although this approach aims to assess proposals in a systematic and consistent way, there are some limitations in its implementation and use of results:

- **Safety is the most important criterion, but is not rigorously applied:** Agency guidance stipulates that proposals should only be given high scores if the work 'will positively address a recognised safety

9 The criteria used to score proposals for major capital maintenance projects

The Agency uses six criteria to score proposals for major capital maintenance projects.

Criterion	Points available	How a high score is obtained
Improving safety	30	If the works will positively address an identified accident problem.
Obtaining value for money	20	If a whole life cost analysis of the proposed scheme shows it is more cost effective than doing nothing or addressing the problem in a different way.
Level of service	20	The works will improve the road condition/quality, there is no realistic alternative for many users for the route, and more minor works are not realistic.
Road Priority	10	Key motorways such as the M25 score 100 per cent, dual carriageways less, and single carriageway A-roads least.
Protecting the environment	10	The works address an identified environmental problem.
Minimising disruption	10	The works might cause disruption, but the effect has been minimised as far as possible.

Source: National Audit Office

problem or accident risk.' However, we found that projects generally scored well for safety on the basis of much less specific safety risks and where the benefits of the work were not expressed. For example, some high scores were obtained on the basis of Agents asserting that an embankment was showing signs of slipping or that a road's skid resistance was below the guideline level, with little indication of how the proposed maintenance would reduce the risks.

- Comparison between projects is difficult: for example, under the safety criterion, a high score is obtained if the proposed project would bring safety benefits. However, safety benefits are not quantified, preventing comparison between projects. Nor are projects ranked on the basis of a quantitative measure of the financial savings that would accrue to the Agency by carrying out a particular project now rather than in the future, reflecting the 'spend to save' principle. The Agency intends to calculate such a measure for each new maintenance proposal from April 2004.

3.7 A Transport Research Laboratory report in 2000 concluded that the quality of investigations and the presentation of proposals were deficient in many cases. The Agency also commented internally that the quality of proposals, though having improved, continued to be low. In many cases the information provided by Agents to support proposed projects was poor, making it difficult to assess whether the proposal had merit or not. In some Areas, no data were provided to support some of the criteria, such as calculations to indicate the financial savings offered by proposed schemes, or unrealistic alternatives were presented in attempting to assess the value for money of a proposed project. In other cases, data or calculations were not presented in the format required by the Agency, making it difficult to compare scores.

3.8 Within Regions, the Agency's four Regional Directors allocate funds to Areas and individual projects. In doing so, they draw on the results of the scoring exercises described above. However, we found in 2001-02 a strong tendency for funds to be allocated in proportion to Agents' bids and road lengths rather than focused on the projects with the highest scores within each Region. We found several low scoring projects in the Northern Region, for example, that were funded in 2001-02 whilst other projects with higher scores were not.

3.9 We found, however, that the Agency's funding allocations for 2003-04 in the Northern Region focused on the highest scoring projects. The one exception to this was Area 15 (the Greater Manchester motorways), where the Agency allocated funds for four schemes with much lower scores than in any other Area. These low scores reflected the Agency's view that, whilst the works were necessary, the problems and solutions had not been adequately investigated by the Agent. For these schemes the Agency allocated only sufficient funding to allow for urgent repairs pending further investigation of the problems.

3.10 The Agency plans to improve its assessment of the need for capital maintenance by integrating into its network-wide condition database a model currently used for assessing the cost-effectiveness of individual schemes. The resulting model (see also paragraph 2.12) is intended to calculate the budget and the most cost-effective schemes and priorities to achieve a given condition by a given year. The Agency expects to have the model in operation by April 2004.

The Agency also needs to improve the prioritisation of small capital projects

3.11 Small capital maintenance projects have a budget of no more than £100,000. They are identified by Agents who submit an annual bid to the Agency for such work. These projects are usually carried out by Term Maintenance Contractors. The threshold is raised to £500,000 under the new Managing Agent Contractor arrangements (paragraph 1.9). In 2001-02, the Agency allocated around £51 million to these types of works.

3.12 We found that the process by which the Agency allocates an annual sum to each Agent for these projects had no regard for evidence of need. Before receiving Agents' bids, the Agency tells Agents what percentage of each category of work, such as drainage or barrier repairs, is 'urgent' on a national basis. It relies on historic spending patterns to determine the percentages for each category and does not request or receive any evidence of 'urgency' from Agents to inform its decisions. It then funds these percentages of Agents' bids in full. The Agency also funds, as a matter of policy, half of the total bid that it receives from Agents for non-urgent work, again without any assessment of need. There is no upper value limit on these bids. Although the Agency limits the total amount of monies available for capital maintenance schemes (see paragraph 3.2), there are no controls to prevent individual Agents over-bidding for these small capital projects.

There have been problems in establishing how much work is actually required for routine maintenance

3.13 Routine maintenance refers to the wide range of activities such as minor repairs, replacing light bulbs, cutting verge grass and clearing drainage gullies that are not part of the capital renewal of the road. Routine maintenance is important both to ensure user safety and to help prevent more significant and costly maintenance problems building up over time. Winter maintenance involves work such as gritting roads and clearing snow. Term Maintenance Contractors carry out both types of maintenance, which consists of:

- Preventative work: the Agency's Trunk Road Maintenance Manual sets out the frequency of such work - for example, bolts on safety fences should be re-tensioned every other year and grass should be cut once or twice a year - or the outcome required - for example, that all signs are kept clean and visible.
- Reactive work: to repair defects in the road network, identified either through inspections or by the police or through third party complaints.

3.14 Although much routine maintenance is determined by set timetables and the scope and volume of such work should therefore not change much year on year, Agents' requests for funds have been increasing. Expenditure on routine and winter maintenance grew by nearly 23 per cent between 1997-98 and 1999-00, reaching £199 million at 2002 prices in 1999-00 (**Figure 10**), although spending fell back in 2000-01 and 2001-02.

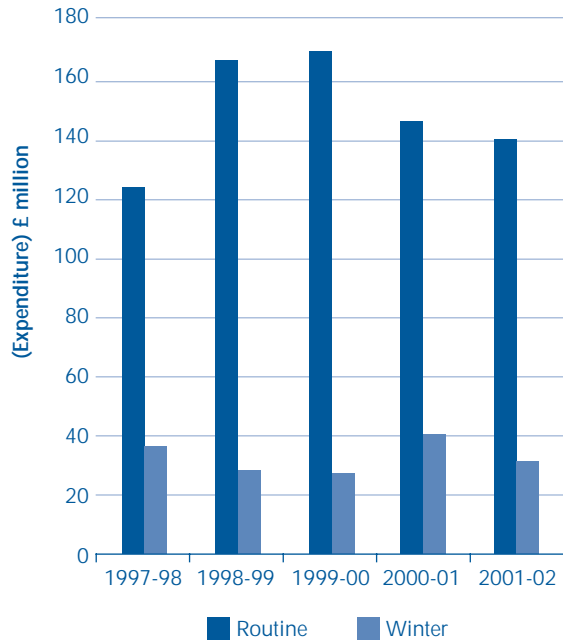
3.15 For 2001-02, the Agency received routine maintenance bids from Agents that were more than £35 million in excess of the available funds. The Agency therefore fixed budgets for routine maintenance simply by applying a pro rata cut across the board to all bids, making no attempt to assess the reasonableness of respective bids. This approach created the risk of further escalation in bids by Agents in subsequent years.

3.16 As part of the 2002 Comprehensive Spending Review, the Agency commissioned a firm of consulting engineers to assess the increased demand for routine maintenance funding. In their report, the consultants considered that the inflationary pressures on routine maintenance funding could in part be explained by Agents gaining a better understanding of the condition of the network and therefore of the work required. They also considered that different levels of bids and



10 Expenditure on routine and winter maintenance, 1997-98 to 2001-02

Expenditure on routine maintenance has been reduced in recent years, while winter maintenance spending, although affected by the severity of the weather, has been broadly stable.



Source: National Audit Office

spending between Agents could be explained by some Agents having better knowledge about the network and its condition than others. Agents had different evidence bases for their funding bids.

3.17 We found, however, that the Agency's bid assessment process did not do enough to assess the evidence on which Agents based their bids:

- Agents developed their bids with differing levels of rigour, some providing much, whilst others produced little, supporting evidence. The Agency made no attempt to differentiate the more robust bids from the weaker ones; and
- the Agency's data on Agents' actual expenditure was not detailed enough to allow useful analysis, and made it difficult to carry out any meaningful benchmarking.

3.18 These weaknesses have, however, been overtaken by the introduction of the new maintenance contract arrangements (paragraph 1.9), under which contractors bid competitively for longer term contracts to carry out routine maintenance against a specification for a fixed quantum of work. The implications of this change for cost control are considered further in Part 4.



Snow plough and gritter lorry at Heston Depot, off M4

The Highways Agency's Network in the South West Region, as at 1 April 2002



KEY	
	Motorways
	Trunk Roads
	Roads that have been, or are planned to be, detrunked

Part 4

Controlling costs

4.1 Whilst seeking to maintain the network in a safe and serviceable condition, the Agency also aims to minimise costs over the lifetime of the network. The Agency has taken action in several areas in recent years to improve value for money in road maintenance. We therefore examined:

- trends in the cost of road maintenance;
- control of the costs of individual projects;
- recent changes made by the Agency to improve value for money; and
- the recovery of costs from people who damage the network.

Unit costs of capital maintenance work have been increasing and are set to continue to do so

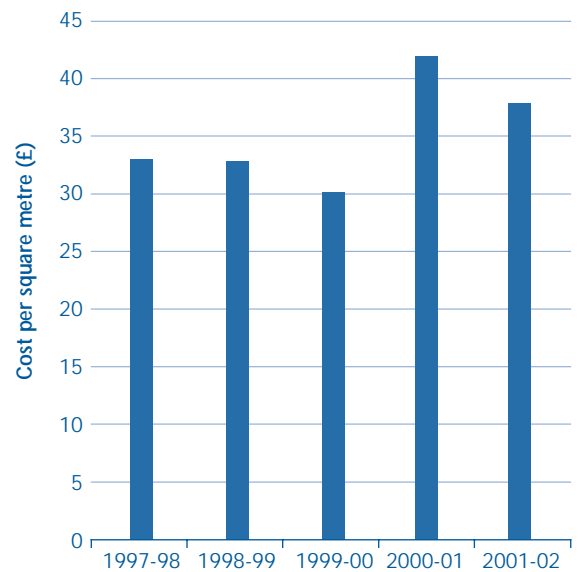
In recent years, unit costs have risen significantly in real terms

4.2 After adjusting for inflation, unit costs of capital maintenance increased from £34 per square metre in 1997-98 to £42 per square metre in 2000-01, an increase of 24 per cent in real terms (Figure 11). Within this 24 per cent, around 7 per cent was due to construction industry costs, and therefore tender prices, rising faster than the general rate of inflation. The Agency has not investigated the cause of the remaining 17 per cent increase above inflation, but told us that it was likely to be attributable to the adoption of higher quality and more durable treatments, greater use of night time working and the introduction of more sophisticated traffic management systems.

4.3 The increase in unit costs included an increase in the fees paid to Agents for designing and supervising capital works, which increased from £15.5 million in 1997-98 to £25 million in 2001-02, and from around 7 per cent of total capital works costs in 1997-98 to 11 per cent in 2001-02. The increased fees were mainly incurred in design and reflect the Agency's increased emphasis on the quality of work done at this stage of a project. The Agency will need to demonstrate that increases in cost through more expensive techniques and better design are being justified by improvements in quality and that the expense will be justified by a reduction in long term whole life maintenance costs.

11 Cost of capital maintenance per square metre, adjusted for inflation, 1997-98 to 2001-02

In recent years, unit costs of capital maintenance have increased significantly in real terms.



NOTE

Unit costs are the total cost of all capital maintenance, including Agents' fees, at 2001-02 prices, divided by the number of square metres of road affected.

Source: National Audit Office

Costs look set to rise in real terms from 2003-04 onwards

- 4.4 The size of the network has been reduced over recent years as the Agency has transferred roads to local authorities, and this is set to continue. Spending per lane kilometre was relatively steady in real terms from 1998-99 to 2002-03. However, the 2002 Comprehensive Spending Review, which set budgets for 2003-04 to 2005-06, indicates a real-terms increase in planned spending per lane kilometre. This increase will be over 5 per cent, although the exact amount will depend on which roads and how much of its maintenance budget the Agency transfers to local authorities in 2003-04.
- 4.5 The increase in planned spending per lane kilometre partly reflects the fact that most of the roads being transferred to local authorities are single carriageway 'A' roads. The Agency spends more on maintaining motorways and dual carriageway 'A' roads than on single carriageway roads because it maintains them to a higher standard and they carry more traffic.

The Agency has had problems controlling project costs

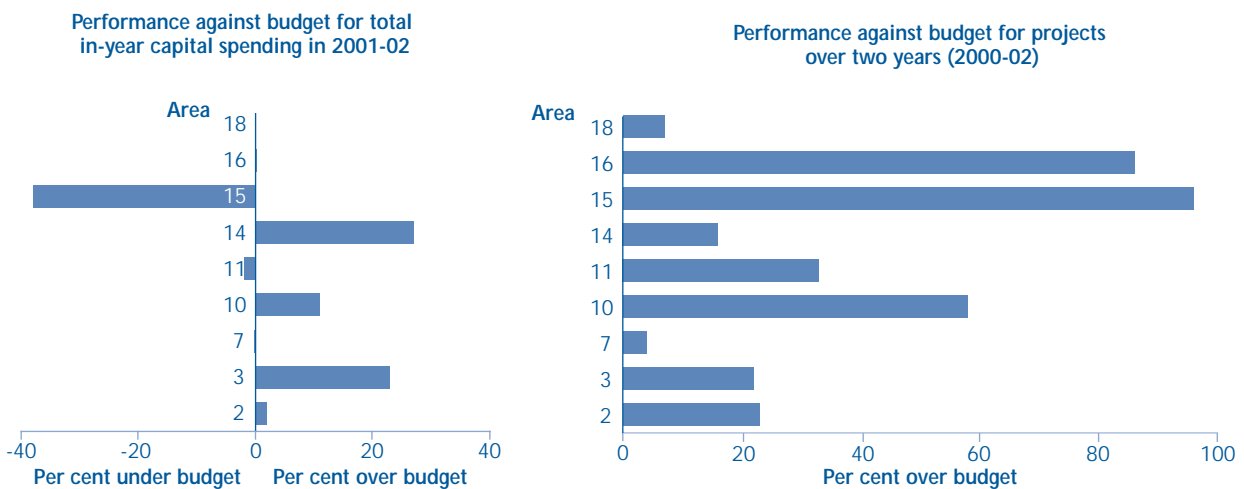
- 4.6 The Agency must keep within its annual expenditure limits set by the Department for Transport. Controlling in-year spending on capital maintenance projects is therefore a priority for the Agency and its Agents.

We found in 2001-02 that, in a sample of 9 of the 20 Areas, all but three Areas kept in-year capital maintenance spending close to or under budget (Figure 12). The biggest overspend in absolute terms was in Area 3 (covering chiefly Hampshire, Berkshire and parts of Surrey), where emergency works needed to deal with landslips on the M25 resulted in an overspend of £3 million (23 per cent). Cost control was much less effective, however, over projects' lifetimes. Figure 12 shows that there was substantial overspending against projects' lifetime budgets in 7 of the Areas over the period 2000-02. Capital maintenance projects in these Areas were a total of £21 million (27 per cent) over budget.

- 4.7 In addition, all three of the projects forecast to cost more than £10 million in 2001-02 are expected to overspend against tender price (Figure 13).
- 4.8 The Agency has been able to keep spending within in-year budgets whilst at the same time overspending over the lifetime of projects chiefly by delaying new projects in order to fund cost-overruns on projects not yet finished. The Agency's focus on in-year cost control, therefore, hides the extent of overspending on individual projects, allowing for a culture of poor cost control over the lifetime of projects and hindering the progression of new projects. It also cuts across the Agency's efforts to decide on what capital maintenance should be done (Part 3), which requires reasonably reliable estimates of project costs if it is to be effective in securing the best use of the resources available.

12 Budgetary control on an annual basis in 2001-02, compared with spend on a project lifetime basis, 2000-02

Although all but three in our sample of 9 Areas kept in-year capital maintenance spending close to or under budget in 2001-02, there were substantial overspends against projects' lifetime budgets in 7 of the Areas over the period 2000-02.



NOTES

1. Spend and budgets are for capital maintenance projects, excluding summary schemes, technical surveys and general scheme preparation spending.
2. Total in-year spend against budget represents total maintenance spend in 2001-02 against the 2001-02 budget. The two-year calculation takes in all projects with spend in 2001-02 and related 2000-01 budgets and spend.

Source: National Audit Office

13 Forecast spend against tender on three major maintenance schemes

All three of the projects expected to cost more than £10 million in 2001-02 are now forecast to overspend against tender price.

Scheme	Cost at tender (£million)	Forecast spend (£million)	Percentage over tender
M25 Clackett Lane Services to Junction 5	11.743	13.572	+16
A12 Brentwood Major (Phase 1)	10.516	11.75	+12
M27 Junctions 8 to 10	9.4	11.93	+27

Source: National Audit Office

4.9 A key problem is poor budget estimation, where costs are usually estimated before detailed design work has taken place or the precise nature of the problem known. The limited design work carried out when projects are proposed is reflected in the fact that only 74 per cent of the capital maintenance work carried out in 2001-02 was of the type and location planned at the start of the year (Figure 14). Even after tenders are placed, further changes in the nature of the work carried out often take place. In 2001-02, the work done on site differed significantly from that planned in 9 per cent of the work carried out. Such changes pose a particular risk for cost control because, once the contractor is on-site, the Agency is under pressure to secure rapid completion of the work and the contractor's bargaining position is strengthened.

- the preparation of risk registers, identifying the key risks to cost control on individual projects;
- quantity surveyors validating the methods used by Agents to estimate the cost of works;
- the triggering of a formal management approval system if, in particular, project costs increase by 10 per cent or more; and
- a formal review of the scope of the project at key stages during the project's life.

4.10 The Agency recognises improved control over project costs is necessary and is examining how it might do so. In July 2002, it introduced a new computerised financial monitoring system, which enables it to track lifetime project expenditure. It has also given Agents additional ring-fenced funding to investigate proposed projects in more detail at an early stage and thus better estimate their cost. The Agency has also developed a new process for managing project costs. The new process, which the Agency expects to use from April 2003, will involve:

Recent changes in contracting offer benefits, but also present risks, to value for money

4.11 Over the period from 1997 to 1999, the Agency gradually put out to competitive tender all Agent and Term Maintenance Contractor appointments. Whereas most Agents had until then been local authorities, local authority involvement was reduced to just 3 of the 20 Agent positions, and to one of the 20 Term Maintenance Contractor positions by 2001. We examined the tendering process for these appointments and concluded that it had been undertaken fairly. The Agency is now pushing through four further changes in its relationship with Agents and contractors. Although these changes offer several advantages in terms of cost control, we point out below that they are not without risk.

14 Differences between work planned and work carried out in 2001-02

Much of the work carried out in 2001-02 was different from that planned.

Type of work	Lane Kilometres	Percentage of work in year
Projects planned at start of year and carried out in the way planned (e.g. resurfaced when resurfacing was planned) (see Note)	974	74
Projects planned at start of year but carried out a different way from that planned (e.g. reconstructed when resurfacing was planned)	120	9
Additional work carried out as a result of extensions of planned projects	91	7
Additional work carried out in new projects not planned at the start of the year	127	10
Total work done	1,312	100

NOTE

In addition, 104 kilometres of work planned at the start of the year was not done.

Source: National Audit Office

The Agency is merging some Agent and Term Maintenance Contractor roles

- 4.12 The Agency has started to combine the Managing Agent and Term Maintenance Contractor functions within a single contractor known as a Managing Agent Contractor. The first such appointment was made in 2001 and four were in place by July 2002. The Agency expects there to be a further four in operation by July 2003. The other six of the Agency's now 14 Areas are under the Managing Agent and Term Maintenance Contractor structure.
- 4.13 Merging the two roles removes a valuable level of independent supervision of the work of contractors on routine and small capital jobs. And, risk is compounded by the Agency raising the threshold for competitive tendering for capital works has been raised to £500,000 for Managing Agent Contractor contracts and to £250,000 for the new Term Maintenance Contractor contracts, from the £100,000 previously used.

Routine maintenance is now carried out for a lump sum

- 4.14 Contractors bidding for all new appointments tender a price for undertaking routine maintenance to the Agency's specification for the duration of the contract. The winning contractor then receives this amount in a lump sum every year. The Agency expects this system to have several advantages:
- The cost of routine maintenance is fixed and is known by the Agency in advance.
 - The use of a lump sum, rather than allocating funding on the basis of specific activities, facilitates the introduction of outcome targets. This provides an incentive for contractors to develop more efficient ways of achieving the desired outcomes, and should allow the Agency to focus on benchmarking and on improving the efficiency of achieving those outcomes.
 - The Agent has an incentive to control costs since it bears in full the cost of any overspending.
- 4.15 The use of outcome targets in routine maintenance contracts should encourage innovation by contractors, but it might also be difficult to agree whether desired outcomes have been achieved. We found some evidence even within existing Term Maintenance contracts that time was being taken up by Agents and the Term Maintenance Contractor disputing whether a certain outcome, such as keeping verge grass below a maximum height, had or had not been achieved.

The Agency is extending the length of Agents' appointments

- 4.16 Until recently, the Agency appointed Agents for three years, with an option to extend the appointment to a fourth year. All of the Agents we spoke to considered that a contract duration of three to four years was too short, arguing that they spent their first year acquainting themselves with their Area and the third year preparing to re-tender for the contract. The Agency has recognised this and, since 2001, has increased the period of new appointments. The latest contracts are for four years, with an option to extend them to seven. Longer term contracts should lead to lower transaction costs from the re-tendering process, and also allow the Agency to benefit from having Agents with progressively greater experience of their parts of the network.
- 4.17 The Agency currently monitors Agents' performance through a system of 'Technical Audits' of their adherence to contractual requirements. The Agency is replacing these Technical Audits with a new system called Performance Review Improvement Delivery (PRIDE), which is intended to focus much more on Agents' own systems and quality controls. The lengthening of periods of contract will increase the importance of this new system and of ensuring that Agents carry out their work to the standards required. Like the earlier contracts, the new contracts can be terminated by the Agency if the Agent persistently or materially fails to comply with its obligations. However, the new contracts include improved quality and performance specifications, which strengthen the Agency's ability to enforce standards of performance.

The Agency is building partnerships with contractors through 'framework' contracts

- 4.18 The Agency is also changing how it places contracts for major capital schemes up to £5 million. Traditionally, competitive tendering has been used to place these contracts. However, in common with much of the construction industry, the Agency found that this approach often led to problems such as cost overruns, an adversarial relationship with contractors and a lack of innovation by contractors. After consulting the industry on how to improve contracting methods, the Agency introduced a system of 'framework' contracts in 1999 to encourage partnership between itself and contractors. Contractors bid for the contracts in competition and, if successful, carry out schemes as they are called off for the life of the contract.

4.19 A key element in the new contracts is the agreement of a target price for each scheme based on an agreed assessment of the amount and complexity of the work required, multiplied by unit rates agreed at the time that the contractor wins a framework contract. The contractor has an incentive to stay within budget, receiving or bearing between 25 and 50 per cent of any savings or cost overruns. In Area 19 (covering Cumbria) in 2001-02, for example, we found that all three framework contractors came in under target price on all of their jobs. In contrast, on the traditionally tendered schemes, outturns were slightly over tender price.

4.20 There is a risk, however, that a contractor will overstate the amount or complexity of the work to arrive at a high target price, whilst expecting to be able to do the scheme for much less than that agreed price. In Area 19 one of the three framework contractors delivered 7 of its 8 capital maintenance schemes at savings of 10 per cent or more on the target prices in 2001-02.

The Agency recovers only some of the costs it incurs when people damage the network

4.21 Our case studies showed that a significant proportion of the work carried out by Term Maintenance Contractors involved repairing damage caused by accidents. For example, we found that, on the M1 between junctions 29 and 30, 30 per cent of all requests by the Agent to the Term Maintenance Contractor concerned repairs to fences or barriers, and between junctions 30 and 31 the proportion was 50 per cent. Similarly, well over half of all emergency call-outs for the Term Maintenance Contractor to respond to an incident on both sections of the M1 related to fencing or barrier repairs.

4.22 The Agency has a policy of seeking to recover the costs of repairing damage caused by others, where possible. However:

- In many cases the culprit cannot be identified; for example, if no one is injured and the vehicle is either driveable or is removed before the Agency's contractors become aware of the incident. The Agency monitors the value of the work done when the culprit cannot be identified. In 2001-02, the Agency was unable to recover over £5.5 million because no culprit could be identified.

- In other cases, the culprit is known but the Agency decides not to continue with a claim. This can be for a variety of reasons including a consideration that the claim is not cost-effective to pursue through the small claims courts, the culprit cannot be traced or no proof of liability can be obtained. In 2001-02, nearly £650,000 was authorised for such abandoned claims.
- In 2001-02, it issued invoices for such damage, in most cases against motor insurers, amounting to nearly £7 million. However, the level of debtors for such damage claims increased in that year by nearly £700,000 to around £4 million. We found that 30 per cent of outstanding claims were more than a year old, and some claims were up to four years old.

4.23 We also noted that:

- Managing Agents have no performance specification or targets for chasing and recovering claims.
- Managing Agents have little incentive to identify or recover sums due because they do not retain any recovered sums.
- The Agency's records are largely held on manual files, and lack of computerisation hinders the efficiency of following up these people suspected of damaging the network. However, in 2002 the Agency moved its claims handling work from London to offices in Birmingham and Hemel Hempstead as part of its decentralisation initiative. It is taking this opportunity to computerise its records to improve claim handling and management information.

4.24 The Agency has taken some steps to address these problems with the new contracting arrangements. Contractors receive a lump sum for routine maintenance, so any damage that has to be repaired out of this sum is a direct cost to them, although in some cases they will also retain amounts recovered as an incentive to identify culprits and pursue recoveries. The Agency will, however, continue to deal with claims worth over £2,000 or £5,000, the exact figure varying between contract as the Agency seeks to identify the most effective threshold.

Part 5

Ensuring maintenance work is of a good quality

5.1 Whilst controlling costs, the Agency also needs to ensure that maintenance work is of an appropriate quality. We examined how the Agency checks that the work:

- is carried out to the appropriate standard; and
- stands the test of time.

The Agency relies primarily on standards and engineers' certificates to assure the quality of major maintenance work

5.2 The Agency requires capital maintenance schemes to meet standards for selection of materials and workmanship as laid down in its Design Manual and its Specification for Highways Works. The Design Manual outlines which approved material types are acceptable in which situation, while the Specification for Highways Works sets out site-specific performance standards for skid and rut resistance and road surface noise limits. The Specification also contains details about how and when to lay various materials, for example, whether weather conditions are suitable for laying the particular material in question.

The Agency's standards are based on a body of expertise built up across the industry over many years

5.3 Unlike for road vehicles, where there are European Union-wide standards for build quality and safety, there are no internationally recognised standards for the quality of motorways and trunk roads. The Agency has developed its Design Manual and the Specification for Highways Works over a period of years, combining practical experience, trials and laboratory research mostly carried out by the Transport Research Laboratory. The standards have been developed in conjunction with

the Welsh, Scottish and Northern Ireland highway authorities. The County Surveyors Society, which represents local authorities, told us that they and their members have worked and continue to work closely with the Highways Agency on design standards and specifications. A Roads Liaison Group was set up in 2001, at which all of these highway bodies discuss and share information on technical and research issues.

Contractors must use materials approved by the Agency

5.4 Materials used to repair and maintain the network must conform to the Agency's 'type approval', which sets minimum specifications for the material in question. The type approval process involves testing each 'type' or 'system' of surfacing in the laboratory and in the field over a period of two years. Only once it has passed these tests can the type be approved for use and manufacturers then market products based on the approved type. The Agency has recently delegated its type approval process to a body known as the Highways Authorities Product Approval Scheme (HAPAS)¹⁰, a collaboration between the Agency, the County Surveyors Society, the Technical Approval Group representing metropolitan authorities and the British Board of Agrément, a commercial engineering assessment organisation.

5.5 Materials generically described as 'thin surfacings' are now the only ones that are normally allowed for use on major repairs. These surfacings have been widely used in France, and they offer several benefits, such as a greater resistance to rutting, use of fewer materials per kilometre of road and lower noise levels for both motorists and nearby residents compared with conventional asphalt surfacings. However, in some other countries, such as Holland, 'porous' asphalt surfacings are the preferred choice and these can offer an even greater level of noise reduction and also

¹⁰ HAPAS members set assessment criteria for the evaluation of each product or system, and the British Board of Agrément then carries out the testing against those criteria on behalf of HAPAS members. Firms have to pay the Board a fee to have their products or systems tested. If successfully tested, and in consultation with other HAPAS representatives, an approval certificate is issued by the Board. The Board is also the UK's representative body for European approval of construction products.

reduction in spray. The Agency has used some porous asphalt, but considers that it can be easily damaged and is not generally suitable for roads in England with their high traffic volumes.

- 5.6 Thin surfacings can be laid in a range of thicknesses, from 40 millimetres to 18 millimetres thick. The choice of thickness for a given route is influenced by several factors, including traffic levels and the structural condition of the road. The Agency's specifications are based on the lanes under the heaviest use, usually the inside lane on motorways. Like other countries, the Agency does not specify a lower specification for less heavily used lanes. However, it does allow for different overall construction requirements for roads carrying greater or lesser volumes of commercial traffic.

The Agency has specified the quality of finish that it requires on newly repaired road surfaces

- 5.7 The Specification for Highway Works sets out permitted tolerances, in terms of the quality of finish, for the surfaces of different types of roads. It has set higher specifications for motorways than for trunk roads where lower speed limits apply, on the basis that vehicles moving at higher speeds are less tolerant to variations in the quality of the road surface. For example, the maximum number of surface irregularities permitted along the length of a newly repaired road is 20 per 300 metre stretch of motorway, compared with 40 on an 'A' road. An irregularity is defined as a variation in profile of 4 millimetres or more, measured over a length of 3 metres.

Although Agents' engineers must certify the work upon its completion, they do not guarantee that the work will last a given lifetime

- 5.8 A year after the work has been completed, a Completion Certificate must be issued by the Agent responsible for supervising the contractor on the Agency's behalf. This Certificate states that the work is complete, to standard and free from defect and allows the release of the final payment, known as a 'retention', for the work done. The Technical Audits¹¹ examination of specific capital maintenance schemes did not find any problems in terms of the quality of maintenance work done.

- 5.9 The Agency does not, however, require Agents to guarantee that the overall design and approach for the work will last a given lifetime taking into account factors such as traffic volumes. The life of the surfacing material will be affected significantly by whether, for example, the sub-base has been properly prepared and whether other factors have been properly taken into account, such as drainage. The Agency's Value Management workshops showed, however, that the quality of capital maintenance proposals put forward by Agents was often low and led, in particular, to the Agency's experts requesting Agents in numerous cases to make a much wider assessment of other possible solutions or reasons for the maintenance problem. Provided that they comply with the Agency's standards and specifications, project proposals no longer need to receive formal technical authorisation before the projects are undertaken. The Agency does not systematically ensure that key recommendations made by its own technical experts are taken into account in the work of the Agents, relying on Agents' own professional judgements in designing maintenance works.

Ensuring the quality of winter maintenance work

- 5.10 Winter maintenance mostly involves precautionary salting of roads to prevent their icing over. The quality of most winter maintenance work therefore depends on Agents salting roads on a timely basis. Salt applied too early can be removed from the carriageway by winds and the movement of vehicles, while salt applied too late is ineffective when roads have already iced over. The Agency has established a Code of Practice, which specifies how quickly Agents are required to grit the roads and the rate of spread required for different situations. The decision to grit, and judgements over the timing and extent of gritting, rest with the Agents. Agents receive weather forecasts from the Meteorological Office and also receive information about road temperatures from sensors under the surface of the roads. Agents model these data to predict whether, where and when temperatures are likely to drop to a point requiring pre-emptive gritting. They are required to respond through a pre-planned gritting regime, which sets out the pre-arranged routes for gritting vehicles intended to allow them to achieve the Agency's Road Users Charter target that roads should be salted 'within three hours of the instruction to salt'.

- 5.11 The effectiveness of these procedures was called into question, however, during the period of adverse weather conditions at the end of January 2003, when key parts of the network, including the M11 and parts of the M25, were severely affected by snow and ice. The result was substantial disruption to the network as roads iced up, vehicles were involved in accidents and drivers abandoned their vehicles after becoming stuck in traffic jams, often for many hours. Initial Agency investigation indicated that temperatures dropped much quicker than forecast, giving Agents less time to mobilise their gritting vehicles, and that gritting was hindered by unexpectedly heavy traffic flows. These problems were compounded by a breakdown in communications between gritting vehicles and their control centres.
- 5.12 In response, the Agency has commissioned an audit by its PRIDe team¹² of Agents' performance in the areas affected, primarily Area 6, with a view to recommending any changes that might be necessary in the Agency's winter maintenance standards or procedures. The audit will consider training, as well as the timing and density of gritting operations. The audit was expected to be completed by the beginning of March 2003. In the meantime, the Agency has already reminded Agents that they must err on the side of caution when marginal weather forecasts are received.
- 5.13 The Agency's Specification and its Design Manual set out general expectations about how long a particular material or type of repair should last, and the 'approved products' process sets down some 'defect free' periods. For example, the new thin surfacings must remain defect-free for two years after being laid. The Agency has had to request surfaces to be re-laid at the contractors' expense in some cases, including on the M6, A30, A17 and A34. The Agency told us, however, that the use of proprietary products means that the suppliers have been keen to rectify faults as speedily as possible to protect their commercial reputations.
- 5.14 Thin surfacing was used for the first time on the Agency's roads in 1994. It has displaced Hot Rolled Asphalt (HRA), which was the material of choice from the 1970s to the 1990s but which suffered a relatively high degree of rutting in hot summers. The Agency does not know, however, how long the thin surfacing is likely to last on different parts of the network.
- 5.15 To assess and predict the performance of maintenance materials over several years, the Agency needs information on the behaviour of different road materials and methods of construction under real life conditions. The Agency recognises that laboratory tests are no substitute for assessing how materials perform in the field. It has therefore been monitoring, since 2000, the rate of deterioration of materials on 79 sites with 22 different surfacing products, mostly thin surfacings. It is too early for the Agency to arrive at any definitive assessment of the longer term performance of thin surfacings, although initial data support the Agency's expectation that they will last 10 to 15 years compared with 10 to 20 years for HRA.
- 5.16 The Agency could, however, do more to retain and use information to improve its knowledge about the impact of maintenance works on road condition across the whole of the network. In its June 1991 report, *Management of Road Maintenance*, the Committee of Public Accounts noted that the Department expected there to be reliable centrally collected data on the maintenance history of roads from April 1992 (see Appendix 3, section (xi)). We found, however, that whilst the Agency's condition database could incorporate data on maintenance histories, such information had only been recorded for some recent major schemes. The Agency is examining whether the relevant data exist on maintenance histories to backload this system, and has also reminded Agents to record maintenance information for future works.

The Agency does not know how well maintenance works perform over the longer term

12 See paragraph 4.17.

Part 6

The impact of maintenance on road users

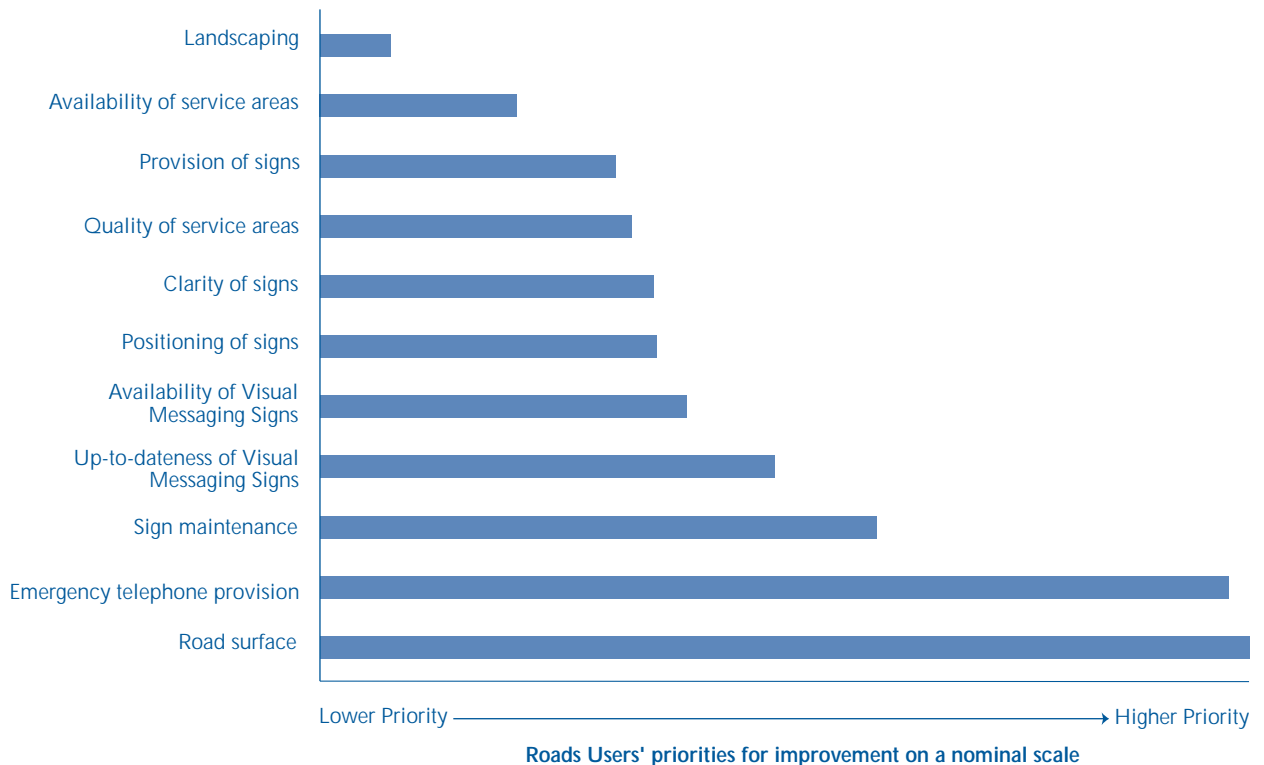
6.1 The Agency has commissioned Road User Satisfaction Surveys since 1995, covering both major business users and members of the public. The results (Figure 15) show that improving the road surface is the public's top priority for improving the network. Other important issues have been the serviceability of roadside telephones and sign maintenance. Business users' responses indicated that their first concern was congestion and delay, and that they perceived the most important cause of such problems, after the volume of traffic, was roadworks.

6.2 We examined:

- the Agency's performance against targets in its Road Users Charter; and
- how the Agency seeks to minimise the disruption to road users caused by maintenance.

15 Road users' priorities for improvement of the network

The quality of the road surface is road users' top priority for improvement of the network.



NOTE

Values are on a nominal scale and reflect an average of responses for motorways and trunk roads combined.

Source: National Audit Office analysis of the Highways Agency's Road User Satisfaction Survey, 2000

In 2001-02, the Agency met some, but not all, of its Road Users Charter targets concerning maintenance work

- 6.3 The Road Users Charter includes 16 targets covering various aspects of the Agency's business. Six targets are concerned directly with minimising disruption from roadworks and the Agency achieved five of them in 2001-02 (Figure 16).
- 6.4 The Agency's performance over the past six years against these targets has generally improved, and some of the targets have been tightened. For example, the target to keep lanes on the network free of works at all times was increased from 95 per cent in 1999-00 to 98 per cent in 2002-03. However, this target does not encourage maintenance to be carried out at off-peak times. The Agency has therefore replaced this target for 2003-04, with one of keeping the network free of works for 98 per cent during peak periods.¹³

Performance against some targets concerning maintenance cannot be verified

- 6.5 A further four of the targets in the Road Users Charter concern other aspects of maintenance (Figure 17). A review by the Agency's Internal Audit in 2002 found that performance against three of these targets could not be verified. For two of these targets (salting roads and carrying out inspections for and removing litter and debris) this was because records were only available on an exception basis; the targets reflect Agents' contractual requirements and only failures are reported. In the third case, emergency telephones, the data only allowed measurement against contractual requirements which contain several exclusions so that in some cases phones out of order are contractually considered to be working. Data was not therefore available to verify achievement against the public's likely understanding of 'working at all times'.

16 Road Users Charter targets for minimising disruption from roadworks

In 2001-02, the Agency met five of its six targets for minimising disruption from roadworks.

Target	Met in 2001-02?
To carry out routine maintenance works at off-peak times on 99.5 per cent of occasions.	✓ (Note 1)
Keep an average of 97 per cent of traffic lanes on the network free of works [at any point in time] during the year.	✓
Ensure a minimum of 90 per cent of roadworks during the year are no more than 2.5 miles long and are at least 6 miles apart.	✓
Where works may lead to delays of more than 10 minutes, road users should be informed of this two weeks in advance of the planned start date, at the site on 95 per cent of occasions during the year.	✓
Reasons to be displayed in 95 per cent of cases where roads are coned off but no works are ongoing.	✓ (Note 2)
Re-open traffic lanes where completion dates have been advertised by the expected completion date in 90 per cent of cases.	✗ Achieved in the fourth quarter only

NOTES

1. An Internal Audit report of September 2002 noted that this target was not initially quantified but implied that 100 per cent must be achieved. The Agency retrospectively quantified the target and reported performance against this target in its Annual Report for 2001-02.
2. In its 2001-02 Annual Report, the Agency reported that it had not met this target based on one Region achieving only 75 per cent against the target with the other Regions achieving 100 per cent. However, the 75 per cent figure applied only in the last quarter of the year. Averaged over the full year and across the network as a whole, the 95 per cent target was achieved.

Source: Highways Agency

¹³ Peak times are 7am to 10am and 4pm to 7pm; night is 7pm to 7am.

17 Road Users Charter targets concerning other aspects of maintenance

Achievement against three of the four targets could not be verified.

Target	Met in 2001-02?
Contractors must salt the roads within three hours of instruction to salt (on 99 per cent of occasions).	? (Note 1)
Contractors must carry out regular inspections to search for and remove debris and litter (100 per cent of contractually required inspections must be carried out).	? (Note 1)
Emergency roadside telephones must be maintained so 99.5 per cent are working at all times.	?
Ensure signs are clean and visible (100 per cent of signs).	X (Notes 1 and 2)

NOTES

1. See Note 1 to Figure 16.
2. Failure is noted here because one cleaning contract in the South West Region was not fulfilled during 2001-02. In practice, Internal Audit considered that the vast majority of signs, if not all, would still have been clean and visible.

Source: Highways Agency's Internal Audit

6.6 The Internal Audit review noted several issues with the Agency's recording of its performance against the Road Users Charter targets:

- Data initially produced indicated that the Agency had achieved its target to re-open traffic lanes by the expected completion date in 90 per cent of cases. The Internal Audit review found, however, that it had only done so in the last quarter of the year.
- There was little validation of data submitted by Agents in some cases, for example in relation to roadside telephone availability.
- Claimed performance on roadside telephone availability allowed various exclusions before a telephone was considered to be not out of order. For example, if a telephone is damaged by an accident, the Agent may request an extension of time for repair and the telephone is still considered 'maintained' in accordance with contract.
- There is inconsistency in target definition. Whilst some targets are focused on outcome, for example that roadside phones must be maintained so that 99.5 per cent are working, some other targets are based on a contractually required process, for example 'that the roads are regularly inspected to search for and remove litter and debris'.

6.7 The Agency is confident that, although performance against these targets cannot be verified, it is performing very close to target. However, it recognises that it should review its targets, in consultation with the Department, and the systems that it has for collecting and verifying performance data. Internal Audit intend to examine the information that underpins the Agency's reported performance against targets, during the course of 2003.

The Agency has sought to minimise the impact of roadworks on road users

'Lane rentals' have helped to discourage late completion of schemes

6.8 Lane rentals involve the payment of a bonus to a contractor if they finish works early, and a charge if they finish late. Lane rentals were first introduced in 1984, and our report in 1991 found that they had led to a reduction in time taken to carry out capital maintenance works. At the time the Department estimated that the contracts led to roadworks on average being completed 32 per cent faster than would be achieved using traditional contracts. Based on an estimation of the value to the motorist of this time saving, the Department calculated that £50 million had been saved between 1984 and 1989 in 100 lane rental contracts, with associated bonuses paid to the contractors amounting to £8 million.

6.9 By the late 1990s, lane rentals were used in most of the Agency's capital maintenance schemes. We were unable to obtain direct evidence to confirm the continued effectiveness of lane rentals, because there are few traditional-style contracts to use for comparative purposes. However, Agents we spoke to told us that in their opinion lane rentals had continued to produce a significant shortening in time for works compared with other forms of contract.

6.10 The Agency has phased out the use of lane rentals, relying instead on new contract arrangements to incentivise contractors to complete work on time and minimise the impact of roadworks on road users.

Maintenance work has shifted from peak times to off-peak periods and nights

6.11 The Agency has sought to reduce the impact of maintenance works on peak time users by concentrating works into night-time and day off-peak periods wherever possible. For example, our report in 1991 found that, on a third of the network, no nightworking was undertaken, but now the period with the most lanes coned off is at night (Figure 18).

6.12 In recent years the Agency has also introduced many techniques for managing the flow of traffic through roadworks, including mobile lane closures and narrow lanes. It has issued guidance on recommended designs for traffic management at roadworks, with the aim of ensuring that as far as possible motorists are familiar with the layout and signing they encounter, and are directed safely and efficiently through the site. It also seeks to publicise planned roadworks, for example with leaflets, helping drivers to avoid peak times or find alternative routes.

18 Network availability by time of day, 2001-02

The largest proportion of lane occupancy by roadworks is now at night

	Available lane kilometres as a percentage of the network	Lane kilometres not available
Peak Times	98.96	344
Off-Peak	98.37	540
Night	98.29	566

Source: National Audit Office

6.13 In its June 1991 report, the Committee of Public Accounts noted the Department's assumption that the effects of increased traffic growth on the costs of delays from roadworks would be offset by improved traffic management measures (see Appendix 3, Section (x)). It is, however, difficult to evaluate the effectiveness of the Agency's traffic management. A key measure is the proportion of network lane kilometres available across the year - however, this measure does not capture the full impact of roadworks on road users, who might for example encounter safety risks and delays because of lane narrowing or loss of hard shoulder whilst technically the normal number of lanes is still 'available'. In terms of individual roadworks layouts, the Department's guidance for modelling traffic delays in roadworks notes that the results might not be robust because outcomes are very specific to sites, traffic characteristics and driver behaviour and delays can have a wide range of costs for similar situations and traffic flows.

Safety and accident risks at roadworks need more attention

6.14 Roadworks and associated traffic management have an impact on road safety. In 1994 a study for the Department by the Transport Research Laboratory examined the personal injury accident rate on a sample of roadwork sites on three-lane motorways and found that the accident rate was 130 per cent higher than at sites without works. The study also showed that the accident risk at roadworks had increased between 1982 and 1993, while the risk at sites without works had decreased over the same period. The Agency has made no more recent studies, but since the 1994 report the Agency has increased the use of speed cameras, and adopted other techniques to improve safety, at roadworks. The Agency expects these to have reduced the risk of accidents at roadworks and is currently working on a study to assess the impact of these developments.

Appendix 1

Study Methodology

Our key methods

Data analysis

We analysed data on:

- the condition of the motorway and trunk road network;
- the Agency's key performance against its key targets; and
- the unit costs of maintenance.

Review of systems and procedures

We reviewed the Agency's systems and procedures, including those relating to the allocation of funds, the appraisal and prioritisation of schemes; the Technical and Internal Audits; and the letting of maintenance contracts.

Review of Managing Agents

We reviewed the work of eight Managing Agents and interviewed Agents' key personnel:

Area 2: WS Atkins

Area 3: Mott MacDonald

Area 7: PLAN Consortium

Area 10: Babtie

Area 13: Opus International

Area 14: Scott Wilson Kirkpatrick

Area 16: WSP Civils

Area 18: Halcrow

Review of key documents and interviews with key staff

We interviewed key personnel and reviewed key documents held by the Agency and the Department.

Surveys

We surveyed key users of the road network and industry representatives:

The Automobile Association

The RAC

The British Motorcyclists Federation

The Institute of Highways and Transportation

The County Surveyors Society

The Civil Engineering Contractors Association

The Refined Bitumen Association

Freight Transport Association

Road Haulage Association

Hays Logistics

National Express

TNT Express

Wincanton

Society of Motor Manufacturers and Traders

Consultation with experts

We consulted with a small panel of experts, inviting their comments on our findings:

- Professor Martin Snaith: Professor of Highway Engineering, Birmingham University; and
- Richard Barrett: Managing Director, Highways Management, WS Atkins.

Appendix 2

Agency Areas, Managing Agents and Term Maintenance Contractors as at 1 April 2002

Number	Area covered	Managing agent	Total income (2001-02) £m	Term maintenance contractor	Total income (2001-02) £m	Kilometres of carriageway km
1	Cornwall, Devon	Mott MacDonald	1.4	Amey Construction	9.8	745
2	Somerset, Avon, Wilts, Gloucestershire, Oxfordshire	WS Atkins	2.6	Raynesway Construction Southern	9.4	908
3	Berkshire, Bucks, Dorset, Hants, Surrey, Oxfordshire	Mott MacDonald	5.2	Raynesway Construction Southern	23.7	1203
4	Kent, Surrey, Sussex	WS Atkins	2.2	Carillion	13.1	799
5	Berkshire, Bucks, Essex, Hertfordshire, Kent, Surrey	Kennedy and Donkin	3.1 (first five months of year)	Amey Construction	8.1 (first five months of year)	831
5	Berkshire, Bucks, Essex, Hertfordshire, Kent, Surrey	Mouchel	2.5 (last seven months of year)	Carillion	13.5 (last seven months of year)	
6	Hertfordshire, Essex, Cambridgeshire, Suffolk, Norfolk	Owen Williams	1.5 (first five months of year)	Ringway Highway Services (re-won Term Maintenance Contractor contract Sept 2001) £12.7m income (12 months)		917
6	Hertfordshire, Essex, Cambridgeshire, Suffolk, Norfolk	WS Atkins	0.8 (last seven months of year)			
7	Leicestershire, Nottinghamshire, Lincolnshire, Rotherham	PLAN Consortium	1.8	BLN Routecare	6.6	623
8	Bucks, Herts, Beds, Essex, Cambs, Northants	Thorburn Colquhoun	1.8 (first five months of year)	Carillion	7.5 (first five months of year)	998
8	Bucks, Herts, Beds, Essex, Cambs, Northants	Carillion-URS joint venture (the first Managing Agent Contractor) £9.4m income (last seven months of year)				
9	Gloucestershire, Hereford & Worcester, Shropshire	WSP Civils	2.4	Ringway Highway Services	9.3	612
10	Cheshire, Shropshire	Babtie	2.0	Amey Construction	7.8	628

Number	Area covered	Managing agent	Total income (2001-02) £m	Term maintenance contractor	Total income (2001-02) £m	Kilometres of carriageway km
11	Northants, Warwickshire, Leicestershire, Staffs, Shropshire	WS Atkins	3.3	Accord-Jarvis joint-venture	9.4	1154
12	West Midlands	WS Atkins	2.5	Accord-Jarvis joint-venture	2.6	265
13	Lincolnshire	Opus International	1.4	Amey Construction	4.3	325
14	Derbyshire, South Pennines, Staffs, South Cheshire	Scott Wilson Kirkpatrick	2.3	Carillion	6.9	500
15	Greater Manchester Motorways	Parkman	2.1	Alfred McAlpine	8.9	374
16	Yorkshire, Humber Ports Motorways	WSP Civils	1.9	Carillion	10.5	751
17	Lancashire, North Merseyside, Craven, Calderdale	Lancashire County Council	4.2	Edmund Nuttall	12.5	818
18	Durham, Yorkshire	Halcrow	2.4	Amey	8.6	826
19	Cumbria	Mouchel-Amey joint-venture	2.6	Carillion	7.2	570
20	Northumberland	Northumbria Trunk Road Agency Partnership	0.6	COLAS	3.6	282

Source: National Audit Office analysis of Highways Agency data

Appendix 3

Previous PAC conclusions

Since 1985, the C&AG has published four reports concerning the maintenance of the motorway and trunk road network: *Expenditure on Motorways and Trunk Roads* (1985), *Backlog of Maintenance of Motorways and Trunk Roads* (1989), *Management of Road Maintenance* (1991), *Highways Agency: The Bridge Programme* (1996).

In June 1991, the Committee of Public Accounts took evidence from the Department of Transport based on the C&AG's report *Management of Road Maintenance* (HC438 1990-91). This Appendix sets out the Committee's key conclusions from their 3rd Report of 1991-92 (HC53), and the Treasury Minute response. Where the issues are covered in this report, paragraph numbers are given.

PAC conclusion	Treasury Minute	Current position
(i) We are concerned that about one third of every single lane of motorway is expected to be coned off at sometime in the next five years.	We will not increase the current level of lane closures.	<p>Nearly 1,800 lane kilometres were repaired and coned off by capital maintenance (both large and summary schemes) in 2001-02. This compares with the predicted need in the early 1990s to cone off over 2,300 kilometres a year.</p> <p>The Agency has also introduced mobile lane closures for some routine works where workers are protected by moving safety vehicles rather than by cones (paragraph 6.12).</p> <p>The Agency is therefore bearing down on the proportion of the network coned off to traffic.</p>
(ii) We are disappointed that the clearance of the backlog (a build-up of roads which are overdue timely maintenance) has now been extended by a further five years to 1997-98. We expect the Department to make every effort to deliver the increased rates of annual renewal needed to meet this revised target.	The best way to reduce the backlog to its economic minimum is to do so over seven to eight years. The Department will aim to achieve this target by the end of 1999-2000.	<p>The Agency achieved its target to improve the structural condition of the road network by 2000 (paragraph 2.3). Improved structural condition is measured by a reduced percentage of roads which have 'zero residual life' or are life-expired.</p> <p>The Agency, however, does not collect data to distinguish between those roads which have a zero residual life because they have reached the end of their natural lives and those arising from a lack of timely maintenance. We were therefore unable to establish whether the Agency had eliminated unnecessary reconstruction work (paragraph 2.3). See Recommendation (i).</p>
(iii) The Department needs to have better information on the condition of roads in order to deploy their funds most cost-effectively.	The Department has a continuing programme to improve monitoring and reporting of condition, including the introduction of the High Speed Road Monitor (HRM).	<p>The Department has continued to improve its technologies for monitoring road condition, the HRM having been replaced by the TRACS machine which will measure a greater number of condition indices and cover the whole network every year. This will be in full operation by the end 2002-03 and will enhance the recent national collation of data on surface condition (paragraph 2.5).</p> <p>Inventory information on roadside assets such as lights and drains is however incomplete and inaccurate, and information on their condition is not systematically held. The Agency intends to introduce a database on the condition of the key roadside assets such as lighting and emergency telephones by 2004-05 (paragraph 2.16). See Recommendation (iv). The Agency also intends to review the value for money of surveying its whole drainage network before committing to a formal programme of surveys (paragraph 2.16). See Recommendation (v).</p>

PAC conclusion	Treasury Minute	Current position
<p>(iv) We are concerned about the past inadequacies of the data on road condition, and note that the national structural survey of the condition of road had to be abandoned because the data provided by Agents were incomplete and inconsistent.</p> <p>(v) We are pleased that the Department are tightening up their agreements with Agents and they will have a consistent method for obtaining data across the whole picture of the nation's roads in future.</p>	<p>Problems are now being overcome by the structural condition report. The Department is introducing a new agreement with its Agents to ensure that actions are carried out as required.</p> <p>The terms and conditions of the Agents' agreements are being revised by the Department to make responsibilities clear, and specifically to clarify the basis and timescale on which Agents will collect, process and analyse survey data.</p>	<p>Improvements have been made in increasing network coverage following the introduction of the structural condition report and Agents have had specific survey targets every year. There have been problems however in achieving the target survey coverage every year. This should be addressed through the Agency's use of the TRACS machine (see iii above) which should be able to cover the whole network annually and will be run under a central contract, but not with the Agents.</p> <p>Technical Audits have questioned the accuracy and completeness of roadside asset inventories. The Agency has asked Agents to rectify the deficiencies in inventories and expects to have a nationally agreed inventory in operation from April 2003 (paragraph 2.14).</p> <p>Technical Audits have also cast doubt over the thoroughness and completeness of Agents' inspections of roads and roadside assets (paragraph 2.15). See Recommendation (xvii).</p>
<p>(ix) We emphasise the importance of establishing reliable estimates of the cost of delays to road users.</p> <p>(x) We note that the Department's assessment of the cost of delays assumes that the effects of increased traffic growth will be offset by improvements in traffic management measures.</p>	<p>The Department uses the QUADRO computer model, which is regularly updated, to help assess the right time and type of maintenance work.</p> <p>As traffic flows increase, measures involving higher works costs are likely to be justified. The assessment assumed that such measures would be used.</p>	<p>The QUADRO model has been updated twice in the 1990s and remains a key part of the assessment of the whole life costs of a maintenance proposal.</p> <p>The Department has made progress in improving traffic management efficiency through the use of narrow lanes and tidal flows in particular, reducing the amount of roadspace taken up by works (paragraph 6.11-6.12).</p> <p>The Agency however needs to develop further measures for assessing the effectiveness of its traffic management (paragraph 6.13). See Recommendation (xviii).</p>
<p>(xi) We note that the Department has hitherto not had reliable centrally collected data and analysis on the maintenance history of roads. We expect them to remedy this weakness in the design and operation of the new information system to be introduced by April 1992.</p>	<p>The new information system already allows Agents to input information as they complete new works and maintenance. Survey data will be added systematically.</p>	<p>Further revisions to database requirements have been made since the early 1990s. Centrally held national condition survey data were not available until a new database system was introduced from 1998. The database was not populated sufficiently widely for some indices until the year 2000 (paragraph 2.5).</p> <p>Data on maintenance works carried out remains patchy and focuses on only recent, major schemes. The Agency has reiterated to Agents that they must ensure the current database is loaded with accurate maintenance and construction information (paragraph 5.16). See Recommendation (xvi).</p>
<p>(xii) We endorse the efforts to minimise delays by developing improved traffic management measures.</p> <p>(xiii) We expect the Department to take every available step to minimise the inconvenience of roadworks.</p>	<p>Current policies include making increased use of nightwork; use of lane rentals; designing traffic management layouts which permit the maximum through-put of traffic, and improving the quality of information available to road users.</p>	<p>The Agency has made progress on reducing the impact of maintenance work on the road user, in part driven by several Road Users Charter targets (paragraph 6.4).</p>

PAC conclusion	Treasury Minute	Current position
(xiv) We expect the Department to give added attention to increase nightworking.	The Department aims to increase its use of night working.	The Agency has significantly increased the use of night working, such that the greatest number of lane closures are now at night (paragraph 6.11).
(xv) We welcome the evidence that lane rental contracts have made a significant contribution to reducing delays.	This form of contract has resulted in traffic delay savings of some £70 million from 1984 to 1990.	Lane rentals remain important and are still considered to keep works times down. However, changing procurement structures are likely to reduce the use of lane rentals (paragraph 6.10).