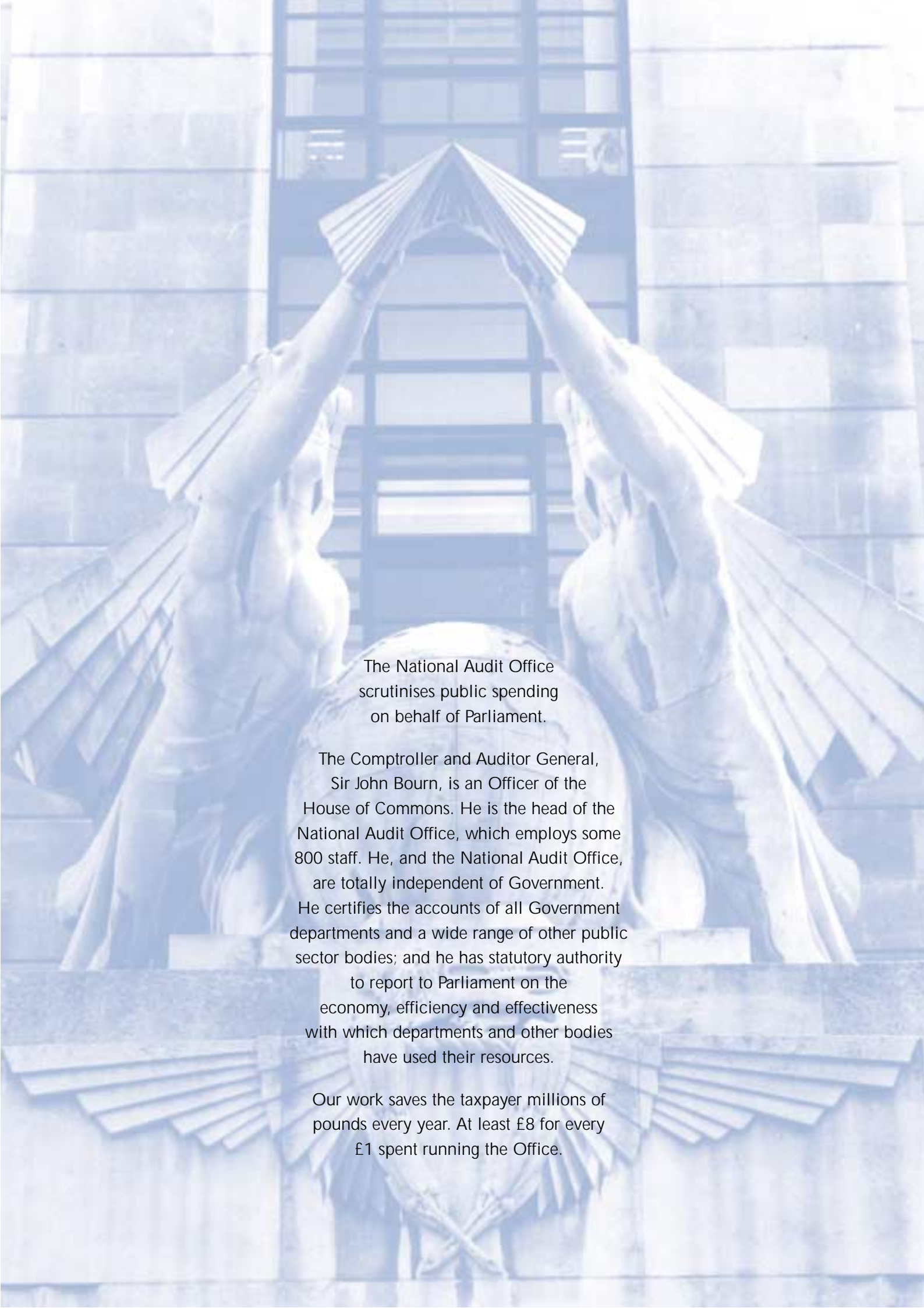


Out of sight - not out of mind

Ofwat and the public sewer network in England and Wales

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL
HC 161 Session 2003-2004: 16 January 2004





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HC 161 Session 2003-2004: 16 January 2004

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 22 December 2003

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executive summary

- 1 The public sewer network is an essential part of the national infrastructure, comprising 189,000 miles (302,000km) of underground piping. Public sewers collect and remove waste water from customers and a proportion of surface water during rainfall. Being out of sight and long-lived, sewers can often be taken for granted. When sewers fail or become overloaded the environment and the public can suffer from pollution through discharges of sewage into watercourses and, most seriously, sewage flooding into or under houses, onto gardens or open spaces.
- 2 The ten regional water and sewerage undertakers in England and Wales¹ that were privatised in 1989² have responsibility for maintaining and extending the public sewer network. They have broadly-framed statutory duties to provide an effective system of public sewers, to maintain sewers so as to ensure effectual drainage, and to make provision for emptying of the contents of those sewers. Each water authority, now water and sewerage company, inherited its assets from a wide range of municipal bodies with differing systems for recording and maintaining their assets and differing standards of construction and maintenance.
- 3 The Director General of Water Services is the economic regulator of water and sewerage services in England and Wales and the head of the Office of Water Services (Ofwat), and is accountable directly to Parliament and to the National Assembly for Wales.³ Ofwat has a statutory duty to ensure that each company carries out its functions properly and must use its powers in ways best calculated to ensure that each company, operating economically and efficiently, is able to finance its functions. Subject to these duties, Ofwat has a duty to protect customers' interests in relation to price and quality of service. Ofwat also has powers to enforce the companies' duties described in paragraph 2. The Environment Agency has responsibilities in relation to environmental regulation of sewerage services. The Department for Environment, Food and Rural Affairs (the Department) has general responsibility for the water sector, the overall regulatory regime, and water and environmental policy nationally. The Welsh Assembly Government has devolved responsibilities for most of these issues in Wales. WaterVoice represents the interests of customers of water and sewerage companies.⁴

¹ The arrangements for regulating the government owned company (Scottish Water) responsible for sewerage in Scotland are different and are not covered in this report.

² Under section 15 of the Water Act 1973 district councils undertook the sewerage function for the water and sewerage authorities. This arrangement continued beyond vesting of the new water companies but companies started to bring these functions in-house from the mid-1990s and some are still doing so.

³ Ofwat is used as shorthand for the Director General in this report.

⁴ WaterVoice operates through nine regional committees in England and a committee for Wales, and the ten WaterVoice committee chairmen form the WaterVoice Council. WaterVoice is currently a semi-autonomous part of Ofwat. The Government intend that it will become independent in 2005.

- 4 To meet its duties, Ofwat monitors the performance of each company and its sewerage networks and sets limits every five years on the prices that each company can charge. In terms of the performance of sewerage networks, Ofwat requires each company to maintain or improve performance. If a company performs below this level, Ofwat takes action to ensure that the company restores its performance.⁵ As part of monitoring companies' service performance, Ofwat analyses and assesses the trends in each company's performance using four indicators that cover: sewer flooding incidents due to insufficient sewer capacity; sewer flooding incidents due to sewer collapses; the number of sewer collapses; and the number of pollution incidents at combined sewer overflows and at sewers.
- 5 We examined how Ofwat has fulfilled its role in relation to the public sewer network including:
 - A the performance of the sewer networks over the last ten years (Part 1);
 - B the challenges for sewerage companies and Ofwat from sewer flooding (Part 2);
 - C the scope for Ofwat to develop the way it regulates sewerage companies (Part 3).
- 6 Our report covers Ofwat's regulation of the public network of sewers owned by the ten sewerage companies. It excludes the connection of new properties to the public sewer network, and Ofwat's regulation of other aspects of sewerage company operations including sewage treatment works. It also excludes the management and maintenance of private sewers (sewers not owned by sewerage companies), which are not regulated by Ofwat. The Department has recently undertaken a consultation exercise with stakeholders on responsibility for private sewers, and the Water Act 2003 included enabling powers for the government to make regulations on the transfer of ownership of private sewers. Our methodology is at Appendix 1.



⁵ Improvements in sewerage service performance generally form part of price limit determinations, these include stepped improvements in the removal of properties from sewer flooding risk registers.

The performance of the sewer networks over the last ten years

7 Our main findings are:

A The indicators of sewer network performance show a fairly stable trend.

Overall these assessments show stability or slight improvement at industry level in recent years with some variations in performance between companies. In August 2003, Ofwat reported its preliminary assessments of the 'serviceability' of sewer networks as 'stable' for eight companies, and 'deteriorating' for two. Currently, Ofwat is reviewing its findings with the two companies and will then decide whether the action proposed by them is sufficient to rectify the performance shortfall.

B Around 5,000-7,000 properties each year are flooded internally by sewage, less than 0.1 per cent of all properties in England and Wales.

Sewer flooding is a key measure because it is one of the worst service failures customers can suffer. Flooding can be caused either because the capacity of the network is insufficient to cope with the level of flow, particularly during heavy rainfall, or because of blockages or, less commonly, collapses. The overall number of internal flooding incidents (including severe weather events) has remained fairly static since 1994. The number of properties at the highest risk of flooding (i.e. once or twice in ten years) has fallen since 1992-03 partly due to company action and partly due to changes in the assessment of properties at risk. As well as monitoring incidents, Ofwat monitors the number of properties likely to be at risk of repeat flooding due to overloading of sewers.

C Companies report that external flooding of gardens and streets is more common than flooding inside properties.

On the basis of unaudited company data, Ofwat estimates that there may be three times as many such incidents as there are of internal flooding. Some companies estimate that external flooding is as much as ten times more common than flooding inside properties in their area.

D In 2002-03 the companies spent over £650 million on the sewerage networks of which just under £190 million was spent on sewer network maintenance, including replacement of sewers.⁶

Investment varies from year to year and is currently on a slightly rising trend linked to work associated with the national environment programme decided by Ministers and progress in dealing with sewer flooding.



⁶ Expenditure on maintaining the sewer network is recorded as "infrastructure renewals expenditure". The remainder includes expenditure on increasing the capacity of the system.

The challenges for sewerage companies and Ofwat from sewer flooding

8 Our main findings are:

- A The unusually wet weather in late 2000 and early 2001 resulted in extensive sewer flooding and this raised the profile of the problem.⁷ In 2002, Ofwat consulted water industry stakeholders and agreed on the need for more rapid progress on relief from sewer flooding.** During this period WaterVoice (and other bodies) increasingly raised the need for more rapid progress on the relief from sewer flooding. In response to Ofwat's consultation, WaterVoice called for companies to clear the backlog of properties known to be at risk of sewer flooding by 2010.
- B Companies report 11,600 properties (less than 1 in 1,000) as being at risk of internal sewer flooding at least once in every ten years.** Flooding from sewers can also be caused by relatively unpredictable factors such as more extreme weather events, and it would not be justified economically to eliminate the potential of flooding from these events. The risk of flooding to properties could increase in the future with many of the factors outside an individual company's control such as new development and increased storm intensities arising from climate change.
- C Compensation for sewer flooding is limited, and does not vary in proportion to the damage caused.** The statutory Guaranteed Standards Scheme provides for payments to be made to customers when a property is flooded internally with sewage. On Ofwat's recommendation the Secretary of State extended the arrangements in 2000, providing for a rebate of annual sewerage charges for each flooding incident. Customers receive the same rebate regardless of the damage caused to their property. Some companies choose to provide an ex gratia payment for external flooding and uninsured losses, and Ofwat and WaterVoice encourage them to do this, but the arrangements are not generally intended to substitute for household insurance. Owners of some properties blighted by sewer flooding are said to find it very difficult or even impossible to obtain household insurance against such a risk.
- D A recent court case has clarified responsibilities in relation to sewer flooding.** In 2002 the Court of Appeal upheld the claim for substantial redress by a customer who suffered repeated sewer flooding.⁸ The case, if upheld, would have increased the incentive on companies to make redress and tackle sewer flooding. The case was appealed to the House of Lords and judgement was handed down on 4 December 2003. The Lords concluded that the appropriate route for dealing with such cases was that set out in the Water Industry Act which provided for the regulator to balance the interests of individual flooded customers and customers generally, who bear the cost of avoiding sewer flooding. There was no cause for compensation under the Human Rights Act or the general law of nuisance. The Lords also highlighted the issue of compensation for customers subject to flooding.⁹



⁷ The unusually wet weather in this period also caused extensive fluvial flooding. Since then the Government has embarked on a major programme of further fluvial flooding protection.

⁸ *Peter Marcic v Thames Water Utilities Limited* [2002 EWCACiv 65].

⁹ *House of Lords, Marcic (Respondent) v. Thames Water Utilities Limited (Appellants)* [2003] UKHL 66.



- E The statistics on the number of properties at risk of sewer flooding are not fully consistent between companies.** The information companies provide to Ofwat to measure the risk of sewer flooding is not fully consistent from one company to another. These inconsistencies hamper direct comparisons between companies and may distort the national picture. Ofwat asked company reporters¹⁰ to comment on the consistency of recording treatment, but wishes to minimise changes to the trend data for each company which it believes is vital to assessing company performance over time.¹¹
- F Knowledge of the extent of flooding is incomplete.** Ofwat plan to collect data from companies on external flooding from 2004 to provide a more robust basis for tackling this issue in future price control periods. Companies try to identify all customers affected by sewer flooding incidents but the scale of under-reporting is unknown. Ofwat believes that the level of under-reporting of sewer flooding incidents is likely to be limited.
- G Ofwat has developed a number of regulatory tools to influence how companies meet their responsibilities.** Ofwat has established a comprehensive reporting regime to record and compare company performance both year-to-year and from company to company. Ofwat has developed an overall service incentive mechanism (Overall Performance Assessment or OPA) that financially rewards the best performing companies and penalises the worst performers through comparative competition. This incentive mechanism looks at measures across the sewerage service, including both environmental aspects and sewer flooding. Ofwat also sets output expectations for the networks in terms of their performance in providing sewerage services to customers. Ofwat has not taken enforcement action against any company for its performance because they have dealt with any potential problems by having informal discussions with companies.
- H Sewerage companies have removed the risk of sewer flooding from 3,300 properties since 2000.** In 1999 Ofwat set price limits which assumed that companies would remove 4,500 properties reported to Ofwat as "at risk" during the 2000-05 period. Following consultation in 2002, Ofwat sought an acceleration and an increase in the relief from sewer flooding and has undertaken to remunerate additional programmes covering both internal and external flooding risks. Ofwat has discussed proposals for additional work from all ten companies which would address nearly 2,000 more internally flooded properties and 800 external flooding problems by March 2005.
- I Companies currently forecast the cost of dealing with the most severe internal flooding problems at around £1.1 billion with the worst external cases costing a further £0.5 billion.** The cost of tackling all sewer flooding problems, including external flooding, would be substantially greater.
- J Companies have to prioritise remedial work and in discussion with WaterVoice and Ofwat have developed priority criteria for their work programmes.** We commissioned a report into estimating the benefits of sewer flooding work from Professor David Pearce¹², an expert in environmental economics, which is available on the NAO website (www.nao.gov.uk). He concluded that the justification for tackling many properties is clear-cut. For other less severe sewer flooding problems, however, only one company has a robust economic approach to assessing the balance between the costs and benefits of tackling sewer flooding. The position of properties affected by sewer flooding where the costs significantly outweigh the benefits is unclear. In commenting on their draft business plans Ofwat challenged companies to set out clearly the benefits to customers of the investment they proposed.

¹⁰ Companies' licences provide for the appointment of independent professionals (known as reporters) to examine and test the information that companies are required to report to Ofwat, and to report their opinion to Ofwat.

¹¹ Ofwat's trend analysis of companies' performance over time relies on information being collected to the same definition, since any change in definition invalidates a time trend.

¹² Professor David Pearce of University College London.

The scope for Ofwat to develop the way it regulates sewerage companies

9 Our main findings are:

- A The relationships between operational and capital maintenance expenditure and the performance and condition of sewer networks are inherently complex.** Sewers are located underground, making them relatively inaccessible for monitoring and maintenance purposes. The sewer networks have been built-up over several generations and many sewers are well over 100 years old. A sewer's age is a poor guide to its condition or performance. Changes in the demands placed on sewers or differences in ground conditions may have a bigger effect.
- B Company information on the performance and condition of sewer networks is imperfect but improving.** Building on a diverse and patchy knowledge base at privatisation the companies are continuing to develop robust information systems to improve their understanding of these relationships to inform operation, planning and maintenance of the sewer networks.
- C Ofwat is developing the indicators it uses to assess the performance of the sewer networks and intends to keep them under review.** In 2002 Ofwat, following joint research with the Environment Agency, refined and extended the indicators of network 'serviceability' each company is required to report on year by year. Both regulators plan to keep the suite of indicators under review. Over time the longer data series will improve both company and Ofwat's ability to assess performance trends in the sewerage networks and so inform judgements as to whether a company is meeting its obligations.
- D Ofwat does not believe that there is sufficient evidence available to say whether there is a problem with sewer networks.** Ofwat considers that problems would come to light well before there are any serious consequences for customers or the water environment. Assessments of past performance and condition may, however, give a limited view of the future performance of networks, and how much activity properly directed each company should carry out on maintaining its sewer networks.
- E Since late 2000, the industry has been developing an economic risk based framework for the future maintenance needs of its networks (the "common framework"). Ofwat, the Environment Agency, the Drinking Water Inspectorate and the Department have all been involved in the research steering group and are all committed to its objectives and success.** At the 1999 price review the quality and robustness of most companies' forward plans for maintaining their asset systems led Ofwat to conclude that no company knew enough about its networks to provide reliable plans. Ofwat informed us that this was despite requiring each company to develop a coherent approach to asset management from as early as 1991. In 2000 Ofwat asked the industry to address the shortcoming and develop a sound economic basis for future capital maintenance needs.¹³ Responding to Ofwat's concerns and following just under two years extensive research by the industry working with Ofwat, the industry's report on the common framework was published in May 2002. All the companies will use the common framework in part for their business plans for the 2004 price review using their own expert judgements where there are data gaps.

- F Ofwat has recognised that full implementation of the common framework is unlikely to be achieved by many companies at the 2004 review but considers even partial use of the common framework will be an improvement on the plans submitted at the earlier reviews.** Ofwat has confirmed that if and when implemented effectively by a company, the common framework will result in robust forward-looking assessments and provide Ofwat with assurance that the company has a robust understanding of its networks. Ofwat expects full implementation for the 2009 price review. Ofwat will assess the degree to which each company has implemented the common framework in its draft and final business plans for the 2004 review. Ofwat has said it will give each company detailed feedback on its assessment to ensure there is transparency and it recognises there is a risk that the development of the common framework may be hindered if its assessments are not conducted in a robust and transparent manner.
- G There is a need to develop fully longer term plans for the sewerage networks that reflect the likely implications of economic growth, climate change and the requirements of environmental legislation.** Each company currently produces longer-term plans, drawn from local drainage area plans, as required by Ofwat for the purpose of price setting. Ofwat also requires assessments of supply and demand over the longer-term. Companies will also use the common framework to generate robust assessments of future capital maintenance needs but these may need to be supplemented by reviews of the need to increase network capacity in some areas. For example climate change may have an effect on the capacity of sewers to maintain existing service levels, or there may be additional environmental demands arising from legislation such as the Water Framework Directive.



RECOMMENDATIONS

10 Our recommendations are:

- A Sewerage companies have a duty to provide drainage and cannot stop additional flows into the network even though these may overload it and cause flooding. The Department should consult on the need for legislation to improve the planning and co-ordination of how additional burdens placed on the sewerage network are approved and on whom the cost implications should fall.
- B Companies apply Ofwat's guidance on categorising properties at risk of sewer flooding inconsistently, hampering comparisons between companies. The 'at-risk' measure is also difficult for customers to interpret. Ofwat should encourage meetings between the 'reporters' used to validate company data, to identify and reduce significant data inconsistencies in the information reported on properties at risk. Ofwat should also decide whether they wish 'at-risk' figures simply to be a record of the number of incidents over previous years or whether 'at-risk' figures should also provide an indicator of risks customers actually face and inform the scope for reducing flooding of properties.
- C Ofwat has encouraged companies to develop robust cost-benefit analysis techniques to inform decisions on which sewer flooding problems to address. Only one company has done so to date and our adviser Professor Pearce doubts whether the findings are transferable to other companies. Ofwat should encourage the industry to carry out co-ordinated studies on customers' willingness to pay that, according to Professor Pearce's paper, are needed to give a rigorous understanding of which more expensive schemes are worth pursuing in each company's particular circumstances.
- D WaterVoice and the industry can play a role in the dissemination of best practice around dealing with sewer flooding. The WaterVoice best practice register is a useful initiative in highlighting company good practice. WaterVoice should develop the register further and publicise it, to encourage the industry to improve by giving more detailed examples on matters such as methods of minimising underreporting and on company websites with respect to information for customers on sewer flooding. Although household insurance plays an important role, the industry could consider more formal arrangements for making payments to customers affected by sewer flooding above the rebate of sewerage charges that better reflect the damage and hardship involved.
- E Companies should develop a clearer understanding of the rate of deterioration of their sewerage network assets. The industry or individual companies could achieve this by instituting a long-term programme (over perhaps 25 years) of surveys of a selected sample of different types of sewer. Ofwat should consult on the benefits and costs of either an industry-wide initiative to research the rate of deterioration of sewers or a requirement for each company to include such a sample in its regular five-year asset inventory assessments. In the longer term, once there is a better understanding of the condition of these assets, Ofwat should place more reliance on this information in its assessment of the needs of the networks.

- F Each sewerage company needs to have a thorough risk-based understanding of its networks and the linkages between condition, performance and the likely impact of intervention options. The common framework provides a means by which each company can achieve such an understanding through a coherent and convincing forward plan. The importance of a successful implementation of the common framework to the industry, and ultimately to customers, should not be underestimated. Ofwat should continue to encourage each company to implement processes consistent with the common framework as quickly as possible. Ofwat should encourage companies by identifying where its judgements have been informed by robust early work by companies on implementing the common framework.
- G Full implementation of the common framework by each company at the 2009 review should enable them to make robust and convincing assessments of capital maintenance needs that can be largely relied upon by Ofwat when it sets price limits for 2010 and beyond. Ofwat should set out more good practice and give each company tailored feedback on weaknesses in their submissions. Companies can use this feedback to develop their understanding of what Ofwat expects of them in the years leading up to the 2009 review. Ofwat should also ensure that its process for reviewing company submissions is quality controlled and that the company reporters are used to quality assure the companies' common framework processes.
- H Developments such as climate change, the Water Framework Directive and new housing development will place new demands on the performance of the sewerage network and the way investment in the network is prioritised against other demands falling on the industry. Consequently, there may be a need for more robust assessments of future demands on the networks, as currently happens for clean water through water resource plans. There have been various previous initiatives where the industry, Ofwat and other interested parties have worked together successfully, such as the common framework and the tri-partite review of water leakage. The industry, Ofwat, WaterVoice, the Environment Agency, the Department, local authorities and other interested parties should work together to establish a framework so that each company can develop strategic, evidence-based assessments of the most likely longer-term requirements of their sewerage networks, how these will be met over time, and setting out the roles of the various interested parties.



Part 1

The performance of sewer networks in the last ten years

SEWERS are usually taken for granted, but they provide an essential service to households and businesses throughout the country. This report shows how the 10 sewerage companies in England and Wales have fulfilled their statutory duties relating to the stewardship and performance of the sewer network and how the Office of Water Services (Ofwat) has fulfilled its regulatory duties in relation to the network. This Part examines the roles and responsibilities in the sewerage industry, how sewers fail and how performance, as measured by Ofwat, has changed over the last 10 years.

Functions of sewers and the sewer networks

- 1.1 The sewerage network includes underground sewers, and associated surface assets such as sewage treatment works, sewage pumping stations and sludge treatment facilities. The underground networks stretch for 189,000 miles (302,000 km) and together form one of the largest capital asset networks in the country. The assets which make up the networks generally have very long lives and large parts were constructed before the 20th century. Sewers take wastewater - termed sewage once in the sewers - to sewage treatment works. They handle four main categories of flow:
- used/foul water from domestic and business customers;
 - surface water running off properties after rainfall, in some cases from additional connections (such as newly-built properties) for which the system was not designed;
 - surplus surface water draining from highways and other urban spaces after rain; and
 - water entering the pipes through defective joints, cracks, manholes and flap-valves, which can contribute a significant proportion of flow in some networks.

Roles and responsibilities

- 1.2 Until 1973, local boards run by local authorities provided sewerage (and water) services across the country. The industry was reorganised by the Water Act 1973 which set up 10 regionally-based water authorities whose responsibilities included the provision of drainage and sewerage services. The water authorities were privatised under the Water Act 1989, which created 10 water and sewerage companies (**Figure 1**). In some areas, the companies provide both sewerage services and water supplies, while in other areas water customers are supplied by companies responsible for water only. The companies charge all customers for using the sewerage network though sewerage charges.
- 1.3 The ten regional water and sewerage companies took over responsibility for the management of the public sewer network in England and Wales over the course of the 1990s. Until then district councils undertook the sewerage function for the water and sewerage authorities, under section 15 of the Water Act 1973. This arrangement continued beyond vesting of the new water companies but companies have been bringing management of this function in-house since the mid-1990s.
- 1.4 The Water Industry Act 1991 specifies the companies' statutory responsibilities. The Act defines the principal activity of the sewerage undertakers as the collection, treatment and disposal of sewage. Under the Act the companies have a duty to:
- provide, improve and extend such a system of public sewers (whether inside its area or elsewhere) and so to cleanse and maintain those sewers as to ensure that that area is and continues to be effectually drained; and
 - make provision for the emptying of those sewers and such further provision (whether inside its area or elsewhere) as is necessary from time to time for effectually dealing, by means of sewage disposal works or otherwise, with the contents of those sewers.

1 The 10 sewerage companies in England and Wales



Source: National Audit Office

- 1.5 The Director General of Water Services is the economic regulator of water and sewerage services in England and Wales, and is accountable directly to Parliament and to the National Assembly for Wales. The Office of Water Services (Ofwat) is the Director General's department, and was established by the Water Act 1989 as a Non-Ministerial Government Department.
- 1.6 Ofwat has statutory duties and powers set out by the Water Industry Act 1991, including powers to enforce the companies' duties as described in paragraph 1.4.¹⁴ Its primary duties are to exercise and perform its powers in ways it considers best calculated to:
- "secure that the functions of a water undertaker and of a sewerage undertaker are properly carried out as respects every area of England and Wales; and
 - "secure that undertakers are able (in particular by securing a reasonable rate of return of their capital) to finance the proper carrying out of the functions of such undertakers".
- Subject to these duties, Ofwat must:
- protect customers' interests as regards price and quality of service;
 - promote economy and efficiency on the part of companies; and
 - facilitate effective competition.
- 1.7 The Department for Environment, Food and Rural Affairs (the Department) has general responsibility for the water and sewerage sector. The Department has responsibilities for changes to the regulatory framework and setting new standards, and promotes new legislation. The Welsh Assembly Government has devolved responsibilities for most of these issues for water undertakers wholly or mainly in Wales.
- 1.8 The Environment Agency is the environmental regulator of water and sewerage services in England and Wales. It has a primary duty to protect and improve the environment, and a supervisory duty with respect to flooding. It is responsible for the standards of water discharged to the environment, including the control of discharges from sewers into controlled waters at combined sewer overflows, and emergency overflows at combined sewage pumping stations. It grants consents for discharges of treated wastewater into the

environment. It has powers to prosecute companies in relation to pollution incidents. The Drinking Water Inspectorate is responsible for quality standards for drinking water. Local authorities also have powers under public health legislation to ensure that the element of sewerage systems not owned by the 10 sewerage companies does not produce a public nuisance or health risk.

- 1.9 WaterVoice represents water and sewerage customers in England and Wales. It operates through nine regional committees in England and a committee for Wales, and the ten WaterVoice committee chairmen form the WaterVoice Council. WaterVoice is currently a semi-autonomous part of Ofwat. The Government intends that WaterVoice will become independent of Ofwat in 2005.

How sewers can fail

- 1.10 Because flows through sewers are generally at low pressure the stresses on pipework are limited and degradation is usually very slow. Sewers may collapse or become blocked, but the seriousness of the consequences depends on the extent to which it causes other infrastructure such as roads to collapse or causes sewage to flood above ground or into water courses.¹⁵ Sewers which are most likely to have serious consequences were they to fail are defined as 'critical' sewers¹⁶ and receive more attention. Our engineering consultants, Ewan Associates, noted that the concern over a deteriorating infrastructure is that the probability of failure will increase. The possible implication is that future extreme events (severe rainfall, drought or frosts) will result in greater and more widespread instances of failure.
- 1.11 In practice, the most serious consequence for individual customers of a failure in the sewer network is sewer flooding. This may result from a sewer collapse or blockage¹⁷ related to deteriorating pipework, but is most commonly the result of the system becoming overloaded by heavy rainfall as surface water floods into sewers. If the system becomes overloaded in this way ("hydraulic overload") sewage backs up through drains and into houses and other buildings (internal flooding) or gardens, parks and roads (external flooding). And overflows of sewage may cause pollution incidents. **Figure 2** shows the causes of sewer flooding, but the proportions vary across different parts of the country.

¹⁴ The Water Act 2003 will replace the Director General by a Statutory Board and change the duties, including giving primacy to the protection of customer interests, wherever appropriate by promoting effective competition.

¹⁵ Sewers also come under external pressures including heavy loads, ground conditions and tree root intrusion, and can be subject to blockages arising from siltation and the build up of fats from food outlets.

¹⁶ 'Critical' sewers are defined by the Water Industry Research Council's Sewer Rehabilitation Manual as those sewers where, in the event of failure, the engineering costs or traffic delay costs are likely to be high or those which are considered to be strategically important. All other sewers not falling into this category are termed 'non-critical' sewers. This categorisation of a sewer as either critical or non-critical is not an indication of its condition, and since the advent of the common framework for capital maintenance planning (explained further in Part 3), this has highlighted the need to give more priority to investment based on risk to customer service.

¹⁷ Some blockages are due to the nature of the sewers (such as poor layout or design of bends, poor workmanship), and others are caused by what flows through the sewers (such as accumulations of fat, nappies and large items of rubbish dumped into manholes).

2 Causes of internal sewer flooding incidents

Cause	Percentage of incidents
Hydraulic overload (insufficient sewer capacity)	45
Blockages	45
Sewer collapses	5
Equipment failure	5

Source: Ofwat

What this report covers

1.12 We examined how Ofwat has fulfilled its role in relation to public sewer networks including:

- A the performance of the sewer networks over the last ten years (Part 1);
- B the challenges for sewerage companies and Ofwat from sewer flooding (Part 2);
- C the scope for Ofwat to develop the way it regulates sewerage companies (Part 3).

1.13 The report also refers to the Environment Agency which has responsibilities for the standards of water discharged into the environment and tackling fluvial flooding and pollution incidents. There is a high degree of interconnection between the sewer network and the wider environment: for example sewer flooding can have adverse effects on wildlife and the natural environment. However, this report does not cover these wider environmental aspects which go beyond Ofwat's remit, nor the effects of more generalised flooding on the sewer network. The report refers to information reported to Ofwat by the Environment Agency on pollution incidents occurring at combined sewer overflows and sewers, where they relate to Ofwat's assessment of the overall performance of the sewer networks. And, in order to set network activity in context, the report refers to the expenditure on unsatisfactory combined sewer overflows associated with the national environment programme, a set of environmental improvements that companies are required to deliver by March 2005.

1.14 Our report covers Ofwat's regulation of the public network of sewers owned by the ten sewerage companies. It excludes issues relating to the connection of new properties to the network, and Ofwat's regulation of other aspects of sewerage company operations including sewage treatment works. It also excludes the management and maintenance of private sewers (sewers not owned by sewerage companies) which Ofwat does not regulate. The Department has recently undertaken a consultation exercise with stakeholders on responsibility for private sewers, and

the outcome of that consultation is expected to be published in 2004. However the Water Act 2003 contains enabling powers which would allow for the transfer of ownership to the sewerage undertakers if the Government decides it is appropriate.

Ofwat's measures of sewer performance

1.15 Ofwat measures aspects of service performance by sewerage companies, but has not attempted to prescribe or define what minimum compliance with the duties placed on companies is. Ofwat requires each company to maintain or improve service performance in each price control period. Were performance in an individual company to deteriorate below this level, Ofwat would take regulatory action to ensure that the company restores performance to the appropriate level as soon as reasonably practicable. Improvements in sewerage service performance, including reductions in the numbers of properties at risk of sewer flooding, generally form part of price limit determinations.

How Ofwat monitors company performance

1.16 Ofwat uses information collected from companies to compare performance both year-to-year and from company to company. It collects information from each company annually on the performance of the sewer networks, in the form of four "serviceability indicators" (Figure 3) and makes assessments of trends in serviceability for each company and for the industry, based on these indicators. It expects each company to achieve "stable" or "improving" serviceability over each five year price control period. Ofwat also makes annual assessments of serviceability, and the most recent assessments are that serviceability of sewer networks is "stable" at the industry level.

1.17 The measures for sewer flooding contribute to Ofwat's indicator for measuring levels of service (known as "DG5"), which also includes a measure of the number of properties at risk of sewer flooding due to lack of capacity in the network. The DG5 measure provides Ofwat with information on the scale of the sewer flooding problem in each company's area. In its annual Levels of Service reports, Ofwat publishes the number of sewer flooding incidents (per 100,000 properties), and the number of properties at risk of flooding once in ten years and twice in ten years respectively, for each company. These reports also contain details of performance under a number of environmental indicators, including unsatisfactory combined sewer overflows and pollution incidents. This information is collected by the Environment Agency and reported to Ofwat annually.

3 Ofwat's serviceability indicators for the sewer networks

- number of sewer collapses
- incidents of property flooding due to sewer collapses
- properties flooded because of insufficient sewer capacity
- number of pollution incidents¹⁸ occurring at combined sewer overflows and from foul sewers.

Source: Ofwat

The number of sewer flooding incidents

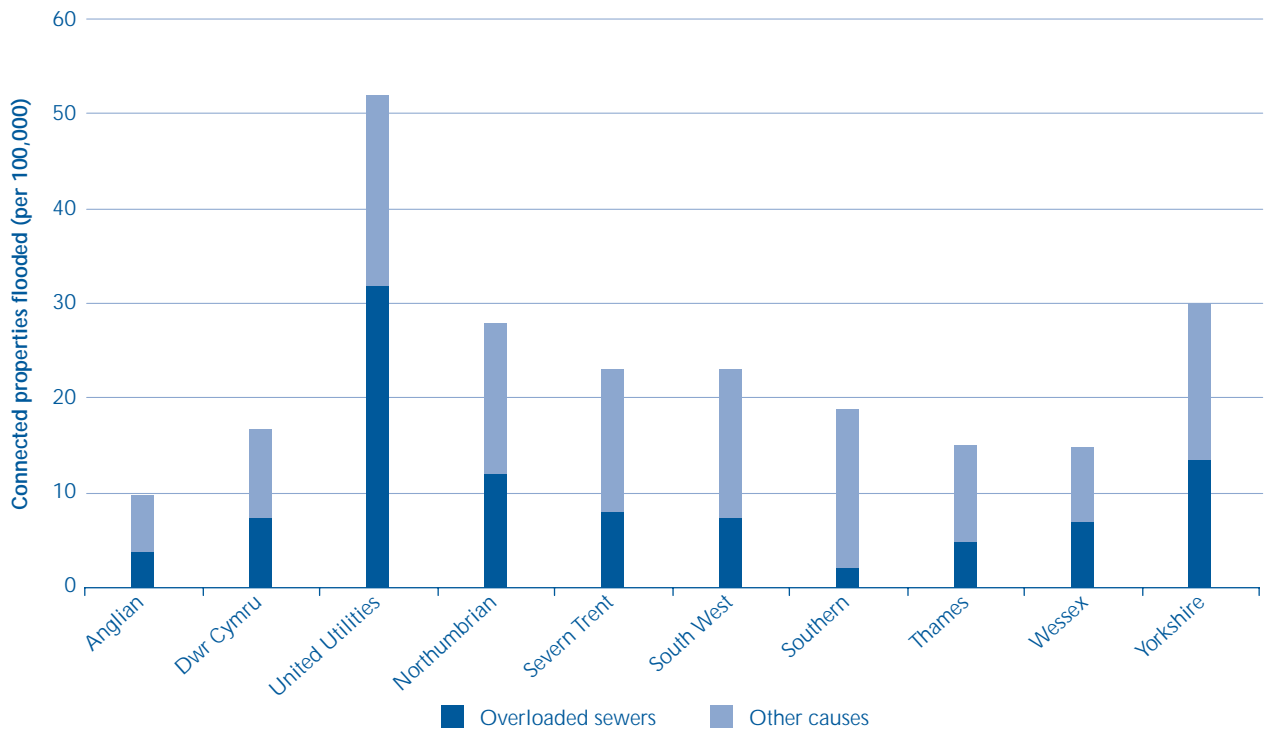
1.18 When compared to the total number of properties connected to the sewerage networks, the number of properties internally affected by sewer flooding is relatively low. Ofwat reported that some 6,000 properties were flooded in 2002-03, about 0.03 per cent of the 22 million properties in England and Wales. The number of incidents reported to Ofwat fluctuates considerably from year to year depending on a number of factors including the amount of rainfall. Following substantial reductions after 1993-94 there has been no obvious long-term trend. The number of incidents varies significantly between companies (Figure 4).

1.19 There is currently no measure of external flooding incidents, although Ofwat has asked companies to start collecting such data for reporting from 2004 onwards. Ofwat estimates that there are around three times as many external flooding incidents as internal flooding incidents. Some companies told us that in their regions the figure could be ten external flooding incidents to every internal flooding incident.

The number of properties at risk of sewer flooding

1.20 Ofwat requires each company to register and report on the number of properties at risk of sewer flooding. These figures reflect the frequency with which the properties have been internally flooded during the past 10 years. According to Ofwat's reported figures for 2002-03, some 11,600 properties were at risk of flooding at least once in 10 years, including some 3,300 properties at risk of flooding more than twice in 10 years. On this basis the number of properties at risk of sewer flooding declined between 1995 and 2002 (Figure 5).

4 Internal sewer flooding incidents in 2002-03 per 100,000 customers

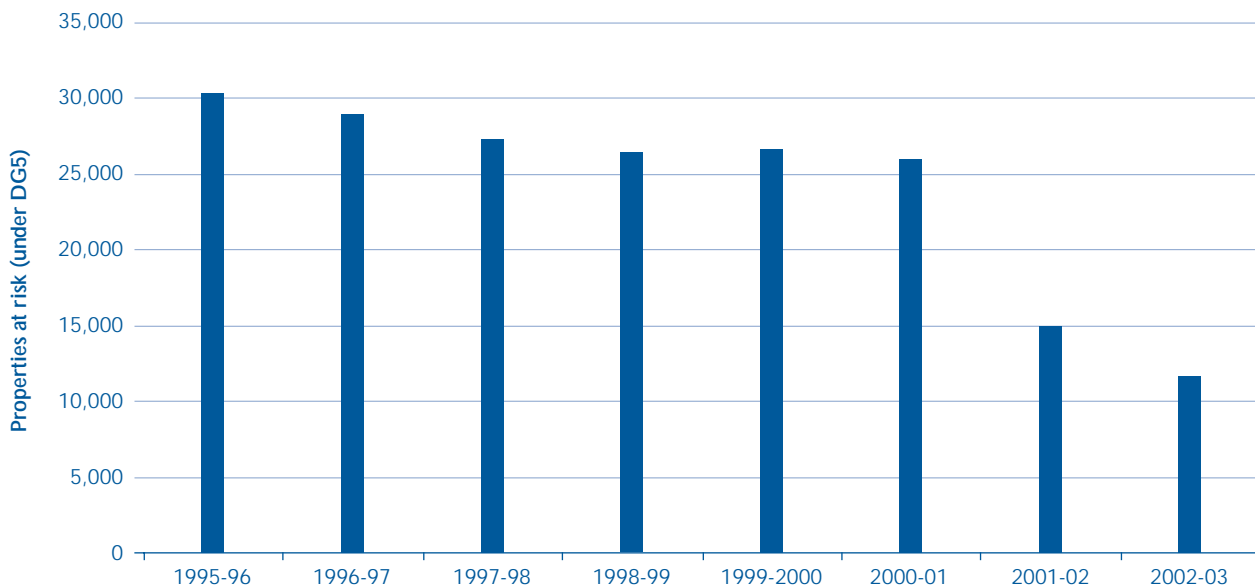


NOTE

This figure includes properties internally affected by sewer flooding as a result of severe storms. The United Utilities total includes 14.8 per 100,000 properties flooded as a result of a severe storm on 14 June 2002.

Source: National Audit Office analysis of Ofwat data

5 Properties at high risk of internal sewer flooding

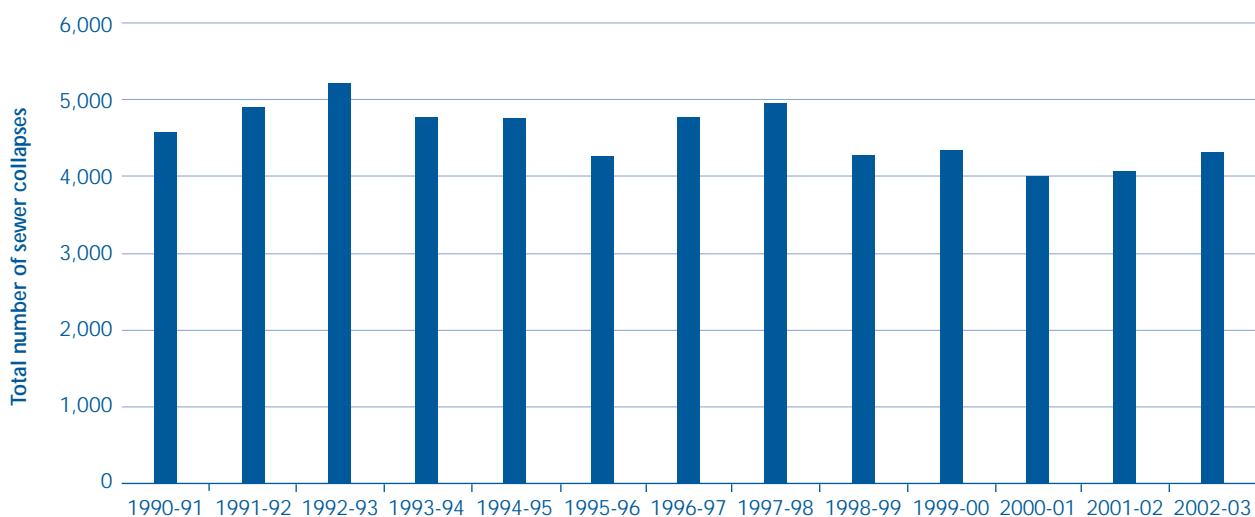


NOTE

This Figure shows aggregate totals for properties at risk of sewer flooding more than once in 10 years, and twice or more in 10 years. It covers the period 1995 to 2003 because prior to 1995 Ofwat only required the reporting of properties at risk of flooding twice in 10 years.

Source: National Audit Office analysis of Ofwat data

6 The total number of sewer collapses since 1990



Source: National Audit Office analysis of Ofwat data

1.21 There has been an improvement in performance as measured by the number of properties at risk, although the reduction in 2001-02 implied by Figure 5 should be treated with caution. While part of the reduction is due to companies' work to address sewer flooding problems, some is due to removing properties from "at risk" categorisation on the basis of changing assessments of which properties are considered to be at risk. In particular, the marked reduction in reported properties at risk in 2001-02 was primarily due to the removal of some 10,000 properties from Thames Water's register which had not flooded in the last ten years. Before this removal, the industry had reduced the reported number of properties at risk under DG5 by some 4,000 in the five years to 2000-01.¹⁹ Work by companies to reduce the number of properties at risk has accelerated since Ofwat's 1999 price review, and is discussed further in Part 2.

The number of sewer collapses

1.22 The data Ofwat collects from companies shows a gradual fall in the total reported number of sewer collapses since 1990. In the early 1990s the total number of sewer collapses rose to over 5,000 per year, whereas by 2003 the corresponding figure was some 4,300 (Figure 6). The national picture, however, masks regional differences, as the figures for some companies indicate either a relatively level or even an upward trend.

The number of pollution incidents occurring at combined sewer overflows and foul sewers

1.23 The number of pollution incidents at combined sewer overflows and foul sewers recorded by the Environment Agency has declined since the mid-1990s, although caution should be taken in interpreting the trends in pollution incidents, as the quality of data has improved since the first years of reporting this measure. The trend in unsatisfactory combined sewer overflows is broadly stable since 1995-96.

Expenditure on sewer networks

1.24 There has been a large and continuing programme of investment by water and sewerage companies over the last decade to meet requirements for environmental improvements arising from EU directives such as the Urban Waste Water Treatment Directive and the Bathing Waters Directive. This programme has included substantial expenditure on the sewer network, in addition to the amounts companies spend in maintaining their networks. Ministers (from the Department in England and from the Welsh Assembly) decide the scope and timing of programmes of quality and environmental improvement.²⁰

1.25 Ofwat sets limits on the prices that each company can charge customers for its sewerage services, at five yearly reviews. When setting price limits, Ofwat needs to assess what performance can reasonably be expected from each company's sewerage network, and how much this is likely to cost if the company operates prudently and efficiently.²¹ Ofwat considers that, provided each company delivers the outputs that Ofwat requires, companies are free to spend what is necessary on their networks to achieve these outputs.

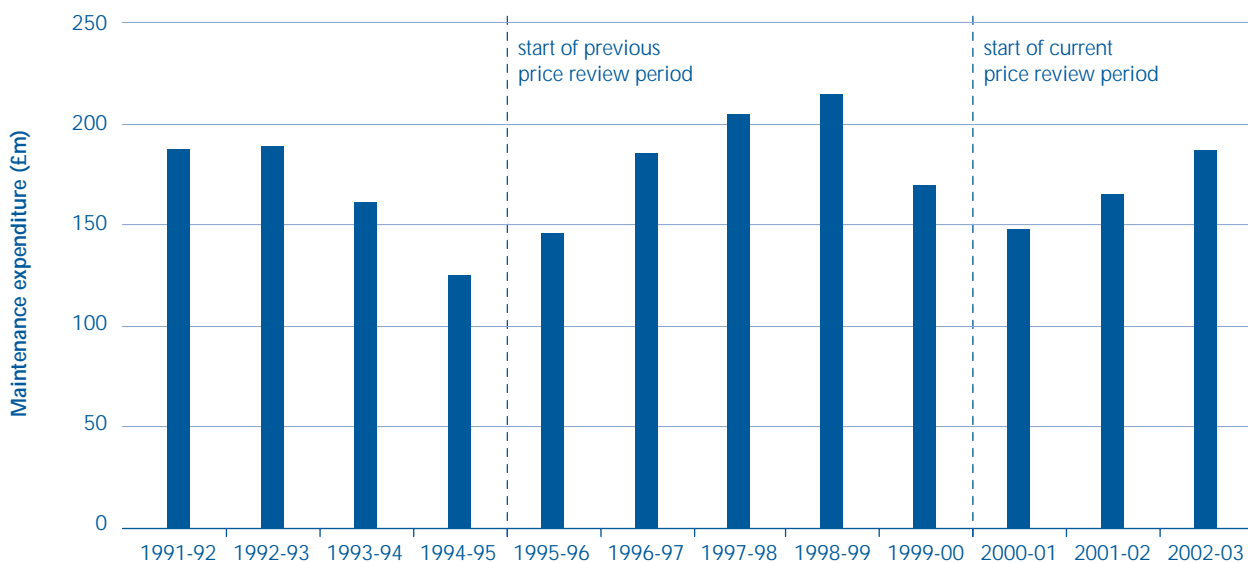
1.26 In 2002-03, the ten companies spent some £650 million on the sewerage networks, of which just under £190 million was spent on maintaining the sewer network. In 2002-03, companies renovated and replaced 114 miles of 'critical' sewers, out of a total network length of some 49,000 miles. Overall expenditure on maintaining the sewer network has fluctuated since 1991 and has averaged £170 million a year (Figure 7). The fluctuations show a cyclical pattern that broadly corresponds to the 5 yearly price review period, where expenditure has tended to peak in the middle of each period and to be lower at the beginning and end.

¹⁹ Companies' licences provide for the appointment of independent professionals (known as reporters) to examine and test the information that companies are required to report to Ofwat, and to report their opinion to Ofwat. This opinion covers the company process for developing its information submissions, and the accuracy and reliability of the information. The companies appoint and pay reporters after Ofwat has approved them. Company reporters comment on the reasons why companies have taken properties off, or added to the register.

²⁰ Ofwat, *Setting price limits for 2005-10: Framework and approach*, October 2002, paras 6.11, 6.19.

²¹ The Competition Commission acts as an appeal body for most of Ofwat's decisions.

7 Sewerage infrastructure maintenance expenditure 1991/92 to 2002/03



NOTE

Figures at 2002/03 prices.

Source: Ofwat

Part 2

The challenges for sewerage companies and Ofwat from sewer flooding

THE pressure on the industry to tackle the problem of sewer flooding has grown in recent years. While primary responsibility for tackling the problem lies with companies, Ofwat plays a role in ensuring that companies give priority to addressing sewer flooding problems, and that they do so efficiently to minimise the impact on customers' bills.

There has been increasing public concern about sewer flooding

- 2.1 The effects of sewer flooding can be distressing to those customers who have foul water entering their home or garden. Ofwat has called this "one of the worst service failures that water and sewerage customers can face".²² WaterVoice has stated that "sewer flooding has no place in the 21st century", and customer research suggests that preventing sewer flooding is one of customers' priorities.²³ **Figure 8** provides some case studies.
- 2.2 There has been increasing pressure in recent years to tackle sewer flooding:
- In March 2002, Ofwat consulted with industry stakeholders on the extent and causes of sewer flooding, noting that "the unusually wet winter of 2000-01 highlighted concerns that insufficient progress has been made in reducing the problem".²⁵ Ofwat published responses to the consultation and its proposed approach in September 2002.²⁶
 - In its January 2003 guidance to Ofwat on the forthcoming Price Review 2004, the Department concurred with the need for greater attention to tackling sewer flooding.²⁷ The Environment Agency additionally points to the environmental effects of sewer flooding, as well as other types of flooding, as a major problem potentially leading to serious effects on wildlife and the natural environment.

8 Extracts from letters about sewer flooding sent to WaterVoice

"(The flat) was inundated with raw sewage on the night of 9th/10th August. This filth flowed out of the two flats into the entrance lobby causing a health risk to the occupants of all six flats in the block, some of whom are young children. Long term residents say that this has happened on a number of occasions... My son has had to vacate his flat and will not be able to live there for at least three months while (the insurers) make arrangements for and carry out extensive repairs."

"The whole of the area beyond the cover in our garden is affected, including our vegetable garden. It is impossible to avoid the foul water, the physical deposits, the sanitary materials..., the smell, and, it is very difficult to prevent our pets from bringing such muck into our home on their feet"

The side of my house was flooded on numerous occasions.... Whilst the sewers are in discharge I am unable to flush my toilet or use much water until the pumping station copes with the problem²⁴, but this can take hours,... on 4th March I was unable to flush a toilet for eight hours as my anti-flood valve was shut... It became intolerable...not being able to use water, how do you tell children that they cannot flush the toilet for that length of time."

"Our garage was flooded with foul sewer water, and our kitchen sink was unusable; we were afraid to flush toilets, unable to operate the washing machine, or even to wash-up or have baths/showers because of water not draining away. To get out of our house, we had to wade through several inches deep of rainwater mixed with foul water... How much longer do we and other locally affected residents have to sit and worry about foul sewage water flooding every time we get significant rainfall?"

Source: WaterVoice

- In response to Ofwat's consultation on sewer flooding in 2002, WaterVoice called for action to clear the backlog of existing cases of sewer flooding as a matter of priority - and to complete this by 2010 at the latest. Companies told us that WaterVoice had raised the profile of the sewer flooding problem after Ofwat's 1999 price review.

²² "Flooding from sewers - a way forward": consultation paper, Ofwat, 2002.

²³ Joint industry research into customers' views on water and sewerage services, MORI, November 2002, and "Customer Research 2003", MVA, December 2003.

²⁴ Loss of sanitation occurs when the hydraulic capacity of the sewer is exceeded; such high water levels in the sewer is sufficient to prevent toilets flushing.

²⁵ Flooding from sewers - a way forward", Ofwat press notice, 13 March 2002.

²⁶ Ofwat MD180: Flooding from sewers, September 2002.

²⁷ Speech made to the House of Commons by Secretary of State on 21 January 2003 on the Department's Initial Guidance from the Secretary of State to the Director General of Water Services.

When incidents occur, there are ways of mitigating the effects on customers

The way that companies respond after incidents is an aspect of service to customers

2.3 Companies employ teams who are ready to respond to incidents quickly when customers report them. It is also helpful for companies to provide customers with advice and information. Most company websites give information about their customer charter detailing how soon they will respond and stating that compensation is available. Our review of company websites showed that some offered detailed advice and guidance on what to do if customers had frozen or burst pipes, but few offered detailed guidance on what to do in the event of sewer flooding.²⁸ WaterVoice has established a register of best practice by companies in how they deal with sewer flooding incidents on its website.

Compensation for sewer flooding incidents is limited, and does not vary with the damage caused

2.4 The statutory Guaranteed Standards Scheme (GSS) provides for payments to be made to customers when a property is flooded internally by sewage. Under the scheme, customers who suffer internal (but not external) property flooding receive a rebate of their annual sewerage charges.²⁹ On Ofwat's recommendation the Secretary of State extended the arrangements in 2000, providing for a rebate of annual sewerage charges for loss of service for each flooding incident. The scheme is intended to reflect service failure rather than compensate customers for the damage or losses incurred, and households are expected to obtain insurance cover for damage caused by flooding incidents. As a result, the GSS payment does not vary in proportion to the damage or losses caused by sewer flooding. There is also a risk that those who suffer repeated incidents of flooding may be unable to obtain appropriate insurance cover. Companies can also make further compensation or ad hoc payments to victims of flooding, and Ofwat and WaterVoice encourage them to do this. For example, some companies give a partial rebate for external sewer flooding³⁰, and companies can also provide help with uninsured losses. In 2002-03, companies made voluntary payments under circumstances not covered by the GSS of just over £1.2 million.³¹

2.5 Until recently, companies' legal liability to customers experiencing loss and damage because of sewer flooding was limited. This reflected the fact that companies have only limited control over the existing rights of potential customers to connect to the public sewer system.³² In 2002, however, the Court of Appeal upheld a claim by a customer against Thames Water, whose property had been subjected to repeated and extreme instances of external sewer flooding.³³ Thames Water appealed the case to the House of Lords. If upheld, the Court's decision could have had major implications for companies in relation to sewer flooding, increasing the incentive on companies to make redress and to tackle sewer flooding. However, on 4 December 2003 the House of Lords issued its judgement and upheld Thames' appeal. The Lords concluded that the appropriate route for dealing with such cases was that set out in the Water Industry Act which provided for the regulator to balance the interests of individual flooded customers and customers generally, who bear the cost of avoiding sewer flooding. There was no cause for compensation under the Human Rights Act or the general law of nuisance. The Lords also highlighted the issue of compensation for customers subject to flooding.³⁴

The statistics on the incidence and risks of sewer flooding may not indicate the true scale of the problem

The quality of data on sewer flooding has improved since the early 1990s

2.6 The quality of information on the scale of the sewer flooding problem has improved in the last ten years. Ofwat requires companies to report "confidence grades" for the information submitted to Ofwat in their annual returns, and asks company reporters to verify these confidence grades. Ofwat sets out in its annual "Levels of Service" report summary confidence grades for each service performance category, including sewer flooding. The grades for sewer flooding have improved for all ten companies over the period 1992-2002.

²⁸ Welsh Water has published its "Code of Practice for Sewage Flooding from Public Sewers" on its website, www.dwrcymru.com.

²⁹ The average sewerage charge for the year 2003-04 is £125, ranging from £95 for Thames Water to £221 for South West Water. The victim receives the same level of payment for each further flooding incident they suffer, up to a maximum of £1,000 per incident.

³⁰ Severn Trent Water offers such payments as part of its "Floodcare" scheme.

³¹ Some of these payments relate to aspects of service other than sewer flooding.

³² Ofwat, *Flooding from Sewers - A Way Forward: Consultation, March 2002*, paragraph 2.6.

³³ The Court of Appeal gave its judgement in *Peter Marcic v Thames Water Utilities Limited* [2002 EWCACiv 65] on 7 February 2002.

³⁴ House of Lords, *Marcic (Respondent) v Thames Water Utilities Limited (Appellants)* [2003] UKHL 66.

The scale of the problem may be under-reported

2.7 For public concerns about sewer flooding to be met and the number of cases reduced in a cost-effective manner, there needs to be reliable information on the scale of the problem. Some companies, however, consider that the reported number of properties affected by sewer flooding incidents may be an underestimate. This view was borne out by our engineering consultants.³⁵ Some customers may not wish to report incidents where their properties have been internally flooded by sewage, because it causes distress or may reduce the value of the property. Ofwat believes however that the level of under-reporting of sewer flooding incidents is likely to be limited.

2.8 The reported number of properties at risk of flooding is also likely to be an underestimate of the scale of the problem, since Ofwat:

- has focused on the generally more serious problem of internal flooding, and therefore does not currently require companies to report properties at risk of external flooding (Ofwat will collect information on external flooding from 2004);
- allows companies to omit from "at risk" registers properties flooded as a result of extreme weather, but problems in defining extreme weather may mean some properties are excluded when they should be reported;
- requires companies to report properties at risk of flooding due to hydraulic overload (paragraph 1.11), but not at risk of flooding due to other causes, because Ofwat regards flooding due to other causes as a day-to-day management issue; and

- customers are also likely to be interested in whether their property has a risk of flooding less than once in 10 years, say once in 15 years. Companies have some information on such properties, and from 2004 Ofwat plans to collect information on properties at risk of flooding once every 15 or 20 years.

There are inconsistencies in the data reported by companies to Ofwat

2.9 There are inconsistencies in the way that companies record and report to Ofwat the number of properties at risk (Figure 9). Some companies are concerned that the system of independent company reporters does not secure consistency of reporting between companies. They considered that reporters did not share experience enough and that the meetings between Ofwat and reporters (three or four times a year) do not get into the detail of differences in recording. Companies consider that reporters need to discuss their findings in more depth with each other on issues where there is a known risk of inconsistency. Ofwat considers that, while there are some inconsistencies in reporting between companies, it is also important to achieve consistency in reporting within each company over time, and that changes in reporting must be planned and introduced with care.

The term "properties at risk" may not be an accurate description of the data collected

2.10 It is not clear how meaningful "at risk" measures are to customers. Most companies base measures of "at risk" on the properties known to have flooded in the past, but the term "at risk" implies that it covers properties that are at risk of flooding in the future. The measures may mislead customers who do not appreciate the meaning

9 Range of methods used to estimate the number of properties at risk

Methodology	Differences in approaches
Use of modelling	Some companies only report properties if they have experienced a flooding incident, but others include properties not flooded but identified as being at risk through a range of modelling techniques
Cause of flooding underlying the risk	Some companies record only properties at risk of hydraulic overload, but one company reporter suspected some properties at risk of flooding due to other causes had been included.
Properties not flooded in last ten years	At least one company removes properties from the "more than one in ten years" category if they have not been flooded in the last ten years, while others retain them.
Extreme weather	Some companies do not report properties if the flooding incident is due to extreme weather, while others do.
Removal of properties (or transfers from) "2 in 10" to "1 in 10"	At least one company removes properties from an at risk category solely on the basis of a statistical assessment, while other companies require additional reasons.

Sources: June Returns commentaries by reporters and National Audit Office meetings with companies

35 Our consultants, Ewan Associates, reported that canvassing of householders during flooding model verification (where the sewer model predicts flooding) revealed cases of flooding where the company had no record of the flooding event.

of a statistic such as 'once in ten years', believing it to mean that, if the event happened last year, it cannot happen again for ten years. The actual risk of flooding of properties in the "1 in 10" category is likely to vary considerably, while some properties with that level of risk are excluded altogether, for example properties flooded due to periodic blockages at bottlenecks in the network. In essence, historic data may not be a useful predictor of future sewer flooding.

Companies can reduce the sewer flooding problem, but cannot eliminate incidents

Companies undertake work to solve known sewer flooding problems

2.11 Companies are able to take action to reduce the number of known properties at risk, and to deal with new problems as they become known. Solutions to known problems can be temporary, such as the installation of non-return valves, or more permanent, such as construction of larger pipes or overflow tanks.

It is impossible to prevent incidents from arising

2.12 While companies can predict where some problems may occur in future and undertake work programmes to address these problems, there is also a random element to sewer flooding, which makes it impossible to eliminate the problem altogether. Almost half of all sewer flooding incidents are caused by overloaded sewers due to heavy water flows, particularly associated with heavy rainfall. While it is possible to predict weather with some accuracy, the effect of rainfall on any given area of the sewer network is less predictable.

2.13 Sewerage companies have a duty to provide drainage in their areas, but they have limited control over flows into their sewers which may increase the likelihood of sewer overload and of sewer flooding to downstream properties. Companies are not always aware when connections to the sewer system are made, whether legally or illegally. New property developments place additional burdens on sewer networks and require careful planning, but such planning can cut across the responsibilities of several authorities - the company, the Environment Agency, the Highways Agency and the local authority. Furthermore, companies are not statutory consultees in the planning process.³⁶ Appendix 2 gives more detail on the causes of sewer flooding.

Ofwat has regulatory tools available to influence company behaviour

Ofwat provides incentives and resources for companies to tackle known sewer flooding problems

2.14 There are a number of methods available to Ofwat for influencing the performance of sewerage companies in relation to their sewer networks and the problem of sewer flooding (**Figure 10**). To date, Ofwat has not found it necessary to take statutory enforcement action against any company in relation to its performance in sewerage service, having found informal discussions with individual companies leading to agreed action plans sufficient to deal with potential emerging problems.

2.15 At the 1999 Price Review, Ofwat set the companies output expectations for eliminating known sewer flooding problems. Ofwat made provision in each company's price limit for the period 2000-05 to address a specified number of known sewer flooding problems, and to tackle new problems as they arose. This provision allowed for the removal from the at risk register of 4,500 properties (about 30 per cent of the total) between 2000 and 2005 at a cost to customers of £140 million.³⁷

10 Methods available to Ofwat for influencing company behaviour

- Enforcement action through each company's licence
- Less formal action including discussions with companies on recovery action
- Use of publicity, including guidance to companies and publicity of good or bad performance
- Financial rewards at price reviews for good levels of service performance (and penalties for bad performance) through the "Overall Performance Assessment" (see paragraph 2.16)
- Financial penalties at price reviews for under-delivery during the most recent price control period (see paragraph 2.16)
- Ofwat will be able to impose fines on companies under powers in the Water Act

Source: Ofwat

³⁶ Policy on planning matters is the responsibility of the Office of the Deputy Prime Minister and other Government Departments.

³⁷ This means companies must address problems affecting more than 4,500 properties by 2005, as new problems become known during the five-year period.

2.16 Since 1999 Ofwat has provided a further financial incentive for companies to improve levels of customer service, including reductions in sewer flooding, and environmental performance. The Overall Performance Assessment (OPA) assesses the overall level of service provided to customers by each company, and links the levels of service companies provide to customers to the prices they charge. Ofwat makes an upward adjustment to price limits at price reviews for those companies which perform relatively well under the OPA, and a downward adjustment to the price limits for those which perform less well. Companies consider that the OPA gives them a strong incentive to maintain and improve levels of service, including sewer flooding performance.

2.17 In 2002, in view of public concerns about sewer flooding, Ofwat indicated that it was willing to allow companies to increase expenditure to address specific sewer flooding problems. Ofwat has two mechanisms by which companies can obtain retrospective funding for additional work. Firstly, to allow for changes in circumstances between price reviews, Ofwat provides for "interim determinations", which subject to its consent, allow companies to increase prices between price reviews. Secondly companies can, subject to Ofwat's consent, "log up" the expenditure incurred so that Ofwat takes this expenditure into account at the next price review. During the 2000-05 price control period, three companies have successfully applied for interim determinations, and a further seven companies have logged up expenditure, to fund accelerated action on sewer flooding. Ofwat has discussed proposals for additional work from all ten companies which would address nearly 2,000 more internally flooded properties and 800 external flooding problems by March 2005.

Companies have reduced the number of properties at risk

2.18 Although each company must at a minimum deliver the target specified by Ofwat over the price control period, companies can tackle more problems if they consider sewer flooding to be a priority, and Ofwat does not dictate how much each company should spend. Most sewerage companies have announced enhanced programmes to tackle sewer flooding by 2005. For example, Thames Water are spending an additional £32 million (above the amounts allowed for in the 1999 review) to tackle an extra 250 properties at risk of internal flooding and 250 of the most severe external flooding problems. Ofwat has discussed proposals for additional work from all ten companies which would address nearly 2,000 more internally flooded properties and 800 external flooding problems by March 2005.

Companies are using cost-benefit analysis to prioritise sewer flooding problems

It can be very expensive to tackle sewer flooding problems

2.19 The cost of tackling sewer flooding problems varies widely, depending on factors such as the location of the problem, and the types of solution available. Some schemes are expensive, but may remove the risk of flooding from substantial numbers of properties. In their draft submissions to Ofwat for the 2004 price review companies estimated average costs for dealing with internal flooding of up to £110,000. Estimated costs for individual schemes may be significantly higher.

2.20 On the basis of companies' draft business plans estimates, it could cost some £1.1 billion for companies to address the most severe problems in the existing backlog of properties at risk of internal flooding. As an illustration, this would be equivalent to £50 per household, against an average annual sewerage bill of £125. It would cost a further £0.5 billion to address the most severe external problems. Companies therefore need to prioritise schemes to alleviate known sewer flooding problems.

Ofwat has encouraged companies to prioritise sewer flooding schemes

2.21 Ofwat's method of providing an allowance within the overall price control gives companies an incentive to undertake work to alleviate sewer flooding efficiently. The Pipes and Wires report described how the RPI-X form of price control provides companies with incentives to operate efficiently since, provided they deliver the outputs required, companies can keep any efficiency savings they make. However, in terms of sewer flooding, Ofwat acknowledges that there may be an incentive to tackle first the problems that are cheapest to address. These may not be the most serious problems.

2.22 Ofwat has therefore encouraged companies and the relevant WaterVoice committees to work together to develop the criteria to be used when prioritising work to alleviate sewer flooding. Ofwat and WaterVoice suggest parameters in addition to severity and frequency, such as the potential impact on vulnerable properties like hospitals, schools and nursing homes. All companies have produced lists of schemes to alleviate sewer flooding. WaterVoice do not consider it is their role to identify which individual properties the company should target, but to challenge companies to deliver on their prioritised lists.

2.23 Since work to address sewer flooding problems could be very expensive, cost-benefit analysis should enable companies to identify which schemes are worthwhile from society's point of view. Such analysis needs to take into account the costs incurred in undertaking schemes to alleviate sewer flooding, and the benefits that accrue to customers and to society as a whole if such schemes are successful. Ofwat commissioned research from the Water Research Centre (WRC) on the costs of sewer flooding control, with the report published in April 2002. This work was extended across the industry by Babcie Group during 2003. Estimating the benefits of alleviating sewer flooding is, however, more difficult than estimating the costs, and companies recognise that their analyses could be improved.

2.24 Customer research indicates that most customers are willing to pay higher prices to allow companies to tackle sewer flooding problems.³⁸ In some cases, the justification for tackling many sewer flooding problems is clear-cut. For other less severe sewer flooding problems, the costs of undertaking work to alleviate sewer flooding problems, which must be met from water customers' bills, would exceed the benefits of undertaking that work, as measured by willingness to pay. In such cases, some properties would remain at risk of sewer flooding, because it would be inefficient from society's viewpoint for the work to be undertaken. Robust cost-benefit analysis would allow companies to make better-informed decisions about which sewer flooding problems should be alleviated.

Companies' cost-benefit analysis could be made more robust

2.25 We commissioned a report from Professor David Pearce, of University College London, on estimating the benefits of sewer flooding control.³⁹ His report:

- outlines the issues arising in estimating the benefits from sewer flooding control;
- outlines the methodologies for estimating the benefits;
- summarises the available studies which are either directly relevant, or which may be indirectly relevant; and
- suggests how to secure a better idea of the benefits of sewer flooding control.

2.26 The report analyses the use of customers' willingness to pay as a means of estimating the benefits of sewer flooding control, and finds very few existing studies of direct or indirect relevance to attempts to produce robust estimates. He concludes that it would be inappropriate for companies to "transfer" the estimates of willingness to pay resulting from existing studies because they provide insufficient, relevant information. Nor would it be appropriate to transfer the results of recent work by Yorkshire Water, the only study to be conducted using a "state of the art" technique. Instead, new studies (ideally three to five) specifically addressing sewer flooding would need to be commissioned, with a single methodology generated from the best expertise currently available, applied to all studies.

2.27 For some known problems, the costs of schemes to tackle the problem will outweigh the benefits for the foreseeable future. A small number of customers will therefore remain at risk of repeated sewer flooding, with little prospect of relief from the problem. The problem may be exacerbated for any customers who may be unable to obtain insurance after repeat flooding incidents.



³⁸ Joint industry research into customers' views by MORI, published 15 November 2002, indicated that a majority of customers were willing to pay more for reductions in the risk of sewer flooding and environmental improvements. Research published in December 2003 showed that customers supported sewer flooding elements of companies' draft business plans ("Customer Research 2003", MVA, December 2003).

³⁹ Professor Pearce's report is available on the National Audit Office website, www.nao.gov.uk.

Part 3

The scope for Ofwat to develop the way it regulates sewerage companies

SEWERAGE companies have a duty to maintain networks so as to deliver services to customers.

Ofwat has to check that they fulfil their duty and, in setting price limits, make judgements about what expenditure on maintenance an efficient company might incur. This Part explains how Ofwat has been developing its approach.

It is difficult to assess maintenance needs

The relationship between performance, condition and expenditure is complex

- 3.1 As with most network industries, sewer networks' current performance, condition and expenditure is not necessarily a good guide to future performance, and the relationships between maintenance expenditure and the performance and condition of sewer networks are inherently complex. The age of a pipe may be a poor guide to its condition and performance. Since sewerage networks are located underground, they are relatively inaccessible. Inspection of the condition of underground assets can only be carried out by specialised programmes (most commonly using CCTV cameras) which can be costly. Sewer assets, such as pipes, can have very long lives and can be serviceable for at least 100 years before they may need renewing or replacing. They deteriorate at different rates for many reasons such as environmental factors, construction standards of pipes when installed and the materials used.
- 3.2 A company's decisions about how it manages and operates its sewer network and when it should replace or renew a particular sewer are complex. These decisions need to be informed by a robust risk analysis based on a detailed understanding of the assets concerned, how they perform and how the requirements placed on the system will change.

Companies are working to improve their understanding of the relationship between performance, condition and expenditure

- 3.3 Building on a diverse and patchy knowledge base at privatisation, companies are developing a variety of systems to enable them to obtain a better understanding of this complex relationship. Yorkshire Water has developed a risk-based model covering all of its water and sewerage activities. This allows the company to assess the optimal level of capital maintenance, based on an understanding of the level of service that customers want, the risk of asset failure and the effect on service of such failures. Anglian Water has developed its own suite of lower level serviceability indicators in addition to those required by Ofwat, which allow the company to assess network performance across individual catchments within its area of operations.
- 3.4 The companies, together with regulators, have begun work on implementing a common framework to achieve a better understanding of the capital maintenance needs of networks. This is discussed further in paragraph 3.22.

Ofwat monitors how companies maintain their sewer networks

- 3.5 Ofwat's approach to monitoring how companies maintain their sewer networks is based on the serviceability of company assets. Ofwat seeks to ensure that companies operate their networks in such a way that they are able to maintain serviceability to customers. It also requires companies to report annually a range of non-financial and financial information on company activity in renewing or replacing sewers, and expenditure incurred in maintaining networks. And as part of its five-yearly price reviews, Ofwat asks each company to provide an Asset Inventory with information on the condition of sewers. Ofwat's company reporters validate the accuracy of information submitted by companies.

- 3.6 In forming its serviceability assessments (paragraph 1.16), Ofwat analyses the trends in the data collected for each company against each serviceability indicator (Figure 4) over a number of years (because there can be variations from one year to the next). It examines these overall trends together with commentaries from companies and the views of independent reporters, to build up a picture of the company's performance. Ofwat's assessments are reviewed by an expert consultant, Dr. Colin Sinnott, on both statistical and judgemental aspects. The trends help Ofwat make judgements as to whether each company has achieved "stable", "improving", "marginal" or "deteriorating" serviceability to customers. Companies are required by Ofwat to achieve a "stable" or "improving" serviceability assessment over the whole five year price control period.
- 3.7 In the most recent assessments serviceability, Ofwat assessed eight companies' sewer infrastructure assets for 2002-03 as "stable" and two as "deteriorating".⁴⁰ Consequently it classified sewer network serviceability as a whole as "stable". These assessments are provisional, and the final assessments for 2002-03 will be published early in 2004. Currently, Ofwat is reviewing its finding with the two companies and will then decide whether the action proposed by them is sufficient to rectify the performance shortfall.
- 3.8 The 1998 Asset Inventory provides the latest available published data on the condition of sewer networks. Condition is classified according to five grades, from grade 1 (no structural defects) to grade 5 (for example collapsed or severely deformed sewers, or extensive areas of missing fabric or bricks), although grade 5 sewers may continue to function effectively for some time. Ofwat aggregated information provided by companies to create an industry picture (Figure 11) and concluded that maintenance expenditure before the 1999 price review had been sufficient to maintain overall condition.⁴¹

11 Latest available (aggregate) data on condition of sewer assets

Type/Grade	1	2	3	4	5
Percentage of critical sewers	60	17	13	8	2

NOTE

Sewers in category '5' are those in the worst condition.

Source: Ofwat

Ofwat faces difficulties in making assessments about future needs

Ofwat makes assessments about networks when setting price controls

- 3.9 In its price review process, Ofwat has to form a judgement on the most likely future network maintenance needs of each company. It has to balance the requirement that sufficient allowance should be made for each company's future network needs, with its requirement to protect the interest of customers in respect of price. In assessing future needs, Ofwat uses:
 - company business plans, setting out each company's spending plans for the next five-year period, reflecting expectations about future needs, and
 - its own assessments of serviceability, asset condition, activity and expenditure, and the implications that these have for future needs.
- 3.10 As part of this process, it makes an assessment of the quality of the business plan submitted by each company. If it judges that a business plan is not sufficiently robust, it substitutes its own judgement in areas where plan is weak. Ofwat's judgements to date have been informed principally by its serviceability assessments, but also by the information it collects on condition, company activity and expenditure.

Ofwat has not been able to rely solely on company business plans

- 3.11 Since 1991 Ofwat has encouraged sewerage companies to develop their understanding of the business case for deciding on the right level of capital maintenance. In 1994 and 1999 Ofwat concluded that the business plans submitted by companies for price review purposes did not establish a robust linkage between the condition of the network and expenditure. Hence Ofwat concluded that they could not rely on the information on future sewer maintenance needs to determine how much these were likely to cost an efficient company. In a report to Ofwat, consultants Mott MacDonald said that "while Ofwat was criticised (in the 1999 review) for being too backward-looking in its analysis of companies' capital maintenance needs few companies... provided a forward-looking analysis with any robust evidence that the future would be different".⁴²

⁴⁰ Ofwat recognises that in one case the company (South West Water) is addressing the decline with some success but is pressing the company to make more progress in turning it around. In the case of the second company (Anglian Water) there are data capture issues and Ofwat is looking to the company to provide better historical information to inform their final assessment.

⁴¹ Ofwat Information Note 35A, Serviceability of Water Main and Sewer Networks up to March 1999.

⁴² Mott MacDonald, "Review of Capital Maintenance - Severn Trent Water" (Draft Report), May 2003, page 6.

3.12 Companies have more information about their networks than regulators, and may therefore be better placed to make assessments about future needs. The link between the business plan and the price limit, however, creates a financial incentive for companies to overstate future network needs in the business plan, for example by providing an unfavourable picture of the performance and condition of assets. There is some evidence to suggest that companies in regulated industries use business plans to "bid" for larger allowances than needed. In several industries, including water and sewerage, outturn expenditure has been generally lower than company forecasts in business plans. It may therefore be difficult for Ofwat to distinguish "bidding" from a fair assessment of future needs.

3.13 Because Ofwat knows that companies have an incentive to bid for more resources than they need, there is also a risk Ofwat treats business plans with too much scepticism and does not believe a company when it says genuine problems have arisen. Unless Ofwat has a means of ensuring that business plans are robust, therefore, sewerage maintenance may be inadequate or prices may either be too high. The common framework (paragraph 3.22) and Ofwat's four-stage approach for the price review in 2004 are designed to address this risk.

There are limitations inherent in Ofwat substituting its own judgement

3.14 Ofwat generates a check on company data by performing its own analysis of company performance, asset condition, activity and expenditure. This mitigates some of the risks arising from reliance on company business plans. If the quality of data underpinning company business plans is inadequate, Ofwat currently has little alternative but to substitute its own judgement for that of the company in assessing future needs.

3.15 Ofwat's use of serviceability assessments in monitoring network performance is generally supported by the companies. There are however some concerns:

- It is hard to identify genuine underlying trends and distinguish between a change in a company's performance and improved data quality. Ofwat's advisor said "data returns for sewer collapses (in earlier years) are ...suspect", as "in the early years of data collection returns from sewerage agents were inaccurate and tended to understate the scale of the problem".⁴³ The quality of information reported by companies has improved over the last ten years, but the improvement makes it more difficult for Ofwat to compare performance in earlier and later years.⁴⁴

- Companies consider that Ofwat should not place too much reliance on serviceability assessments in assessing future capital maintenance needs. They consider that assessments based on mostly backward-looking serviceability indicators are a weak guide to future maintenance needs. In 2000, the Environmental Audit Committee of the House of Commons doubted whether Ofwat's serviceability assessments "were sufficiently robust, and even where they are robust the indicators are often poor measures of the effectiveness or need for capital maintenance".⁴⁵

3.16 Some companies consider that Ofwat should give more weighting to trends in condition data. However, assets in relatively poor condition can continue to perform well for some time before problems arise. Ofwat also considers that there can be difficulties in comparing asset condition over time, in particular:

- Interpretations of condition grades may differ over time and between companies. Industry guidance on grading derives from Sewer Rehabilitation Manuals. There have been five versions of these and companies use different versions.
- Companies report on a sample basis, and tend to target surveys on areas that represent a risk of failure. This approach has merit because it allows companies to focus on sewers known to represent a risk of service failure to customers. However, it means that it is rare for the same sewer to be surveyed from one Asset Inventory to the next. Companies have therefore been unable to establish an assessment of the deterioration of individual assets over time. A national study into deterioration rates and methods of characterising the effect on behaviour of sewerage networks would strengthen information on the condition of networks and would provide Ofwat with an additional source of evidence to complement its serviceability assessments.

These difficulties may have affected the maintenance of networks since the 1999 review

3.17 Ofwat does not believe that there is sufficient evidence available to say whether there is a future problem with sewer networks. It considers that problems would come to light before there are any serious consequences for customers, and that there has been no evidence of major problems to date. In response to concerns about the use of serviceability assessments, Ofwat pointed out that it was "working with companies and regulators to improve the robustness of the indicators and their ability to predict future needs for capital maintenance",

⁴³ *Notes of guidance on the application of the historical perspective of serviceability and capital maintenance expenditure, Colin Sinnott, August 2001, page 9.*

⁴⁴ *As noted earlier, district councils undertook the sewerage function for water and sewerage companies until the companies brought these functions in-house during the 1990s. These changes brought to light anomalies in data capture and reporting.*

⁴⁵ *Ofwat, Managing water and sewerage systems in England and Wales, April 2002, RD14/02, page 13.*

although it recognised that "some uncertainty will always remain, and that overall assessments will need to take account of other evidence."⁴⁶

3.18 However, the Environment Agency considers that the absence of problems to date does not mean that the risks to customers and the environment are small, and "the industry may need to commit more resources in some areas to maintaining and improving its sewers and pipelines".⁴⁷ And companies consider that the price caps for 2000-2005 made insufficient provision for maintaining the sewerage network, although in practice six of the ten sewerage companies are keeping their sewerage infrastructure maintenance expenditure within the levels Ofwat assumed in 1999.

3.19 In 2002, Ofwat appointed consultants Mott MacDonald to review company capital maintenance submissions, past determinations and trends in capital maintenance expenditure and serviceability, in particular to:

- undertake a further independent review of the robustness of past company analysis and proposals regarding capital maintenance;
- search for any evidence of a potential decline in serviceability;
- review Ofwat procedures and decisions in the light of current best practice; and
- highlight any aspects that are particularly informative that could be taken forward for the price review 2004.

3.20 The consultants reviewed Ofwat's assessments of serviceability for the water and sewer networks at the Periodic Review in 1999, and concluded that for at least one company "the serviceability trends for the sewerage infrastructure assets ... were less clear and might have been adjudged to be 'uncertain'. According to Ofwat's own rules, uncertain serviceability trends justified a 10 per cent increase on average expenditure levels, before adjustment". Ofwat, however, decided that serviceability was stable and made no expenditure adjustment. Overall the consultants considered Ofwat's decisions were not unreasonable, given all of the evidence put before it.⁴⁸

If implemented, the common framework will improve assessments of needs

The industry and its regulators are developing the common framework to improve assessments of maintenance needs

3.21 Although the quality of information held by companies on their networks has improved since privatisation, Ofwat concluded at the 1999 review that no company knew enough about its network to provide reliable forward plans for maintaining their asset systems. In 2000, Ofwat set out its requirements for maintaining serviceability to customers and developing a better understanding of the economic case for capital maintenance levels.⁴⁹

3.22 Since 2000, the industry and its regulators have worked together to develop a "common framework" allowing companies to obtain a better understanding of network capital maintenance needs. The project involved wide consultation within the water industry, and the active involvement and contribution of Ofwat, the Environment Agency and the DWI. The common framework is founded on risk-based principles, so that in most cases capital maintenance will be justified on the current and future probability of asset failure and the resultant consequences for customers and the environment.⁵⁰ In August 2002 Ofwat confirmed that when implemented fully and effectively by a company, the common framework will provide a robust basis for assessing future needs, and will provide assurance that the company has a robust understanding of its networks.

3.23 If companies fully implement the common framework, the quality of company assessments of future needs should increase. Companies should be able to produce more robust business plans, and Ofwat should be able to place more reliance on these in setting price limits. This would also address some of the limitations of Ofwat substituting its own judgement in place of company plans. Companies are using the common framework in part for their business plans for the 2004 price review, using judgement where there are data gaps.

⁴⁶ Ofwat, *Maintaining water and sewerage systems in England and Wales: Our proposed approach for the 2004 periodic review* May 2002, page 13.

⁴⁷ Environment Agency, *A good deal for water*, September 2003, page 9.

⁴⁸ Mott MacDonald, "Review of Capital Maintenance - Severn Trent Water" (Draft Report), May 2003, page 7.

⁴⁹ Ofwat, *Maintaining serviceability to customers*, MD161, April 2000.

⁵⁰ UKWIR, *A Common Framework for Capital Maintenance Planning*, abstract.

Ofwat has taken other steps to improve assessments of future needs

3.24 Ofwat has also modified its approach to setting price caps for the 2004 price review which will set price caps for 2005-10. It will now include consideration of whether future network needs will be different from those in the past, using information from the common framework. The approach is therefore more forward-looking than at the 1999 price review. In particular, Ofwat has sought to make improvements in relation to capital maintenance:

- In previous reviews, the level of capital maintenance expenditure tended to decrease in the first year after prices were set (Figure 2 in Part 1). This may have been because companies waited for price caps to be set before planning capital expenditure. Ofwat's Early Start programme will allow companies to agree a limited programme of work during the first two years of the review (2005-06 and 2006-07) before final determinations in November 2004. This should allow some schemes to be introduced earlier, bringing forward benefits to customers.
- In 2000 Ofwat and the Environment Agency commissioned a review of serviceability indicators, including sewerage indicators, from consultants Ewan Associates with Mott McDonald. Following the review, new indicators were introduced in 2002. These should improve the serviceability assessments by giving a broader picture, once sufficient historical data has accumulated to enable Ofwat to identify trends. Both regulators plan to keep the suite of indicators under review.

It is important that companies maintain confidence in the common framework

Companies have concerns about Ofwat's assessment of their plans

3.25 Ofwat will assess whether each company has fully implemented the common framework at the 2004 price review. It expects that most companies will face difficulties in implementing the common framework fully in time for the 2004 price review, partly because there is insufficient historic data on some aspects of network condition.⁵¹ Ofwat expects full implementation of the common framework by companies for the 2009 review, and considers that even partial use of the common framework in the 2004 review will be an improvement on the plans submitted at earlier reviews.

Ofwat has developed its own model against which company plans will be checked, and will seek explanations for differences.

- If Ofwat decides that a company has a robust case, it will incorporate the company's assessments of future needs when setting price caps.
- If Ofwat decides that a company has not produced a robust case compatible with the common framework, Ofwat will form its own judgement in deciding how much to allow for future network needs. This will take account of serviceability trends and comparisons of asset inventories between the 1994, 1999 and 2004 reviews, to assess whether this higher spending on capital maintenance is justified.

3.26 Companies are concerned about Ofwat's plans for deciding whether they have robust data, and in particular that Ofwat may start from a presumption that data is not robust, unless companies are able to convince them otherwise. They consider that Ofwat substituting its own judgements would reduce the credibility of the common framework, and discourage companies from doing more to improve their information. Ofwat recognises that there is a risk that the development of the common framework may be hindered if its assessments are not conducted in a robust and transparent manner.

Ofwat can play a role in maintaining companies' confidence in the common framework

3.27 Through effective guidance on good practice and feedback to companies, Ofwat may be able to assist more companies achieve full implementation earlier than would otherwise be the case. Ofwat has committed itself to providing increased transparency in its decisions, drawing insofar as it is appropriate on the information provided by companies.

3.28 Companies have highlighted the importance to them of clear feedback from Ofwat on areas of weakness in their business plans and how these can be improved. Ofwat could play a role in advancing the implementation of the common framework by identifying the areas of weakness in business plans and communicating these clearly to companies. This process has begun with the detailed feedback provided by Ofwat on the draft business plans submitted in August 2003. Ofwat could then initiate an iterative process giving each company opportunities to demonstrate that it has resolved the identified individual areas of weakness, between the end of the 2004 review and the beginning of the 2009

review. Ofwat's method of evaluation could also be subjected to quality control, similar to its review of its 1999 price review process.

- 3.29 Unless implemented sensitively, the common framework could increase the amount of information that companies must provide. In 2002 the National Audit Office highlighted the information burden that the process for setting price limits imposes on companies.⁵² Ofwat has said it does not intend to increase the overall information burden on companies.

Regulators and the industry should work together in planning for long-term changes

Changing circumstances will have an impact on the sewer networks in future

- 3.30 Company licence conditions require them to keep a 25 year underground asset management plan up to date. Companies currently produce longer term plans, including Underground Asset Management plans as required by company licences, Drainage Area Plans, and Ofwat monitors companies' progress in developing these plans. Companies also submit assessments of supply and demand over the longer-term for the purposes of business plans, as part of Ofwat's five yearly price reviews.
- 3.31 Developments such as the effects of climate change, new housing development and the requirement to implement the Water Framework Directive, will place new demands on the sewer networks. The common framework will provide more robust assessments of capital maintenance needs, but may need to be supplemented by reviews of the need to increase network capacity in some areas, for example climate change may have an effect on the capacity of sewers to provide existing service levels. The Water Framework Directive may require companies to reduce sewage overflows into watercourses, necessitating changes to the sewerage network.⁵³ Other improvements to the networks may be needed to reduce the number of sewer flooding incidents substantially, at a time when external pressures on the sewerage network are increasing.

The industry and its regulators can work together to plan for the long term future

- 3.32 In order to discharge its statutory duty in the longer term, each company will need to take into account the full impact on network capacity of external factors, and to draw up a strategy with an appropriate timescale for implementation. There may be a need for more robust assessments of future demands on the networks, as currently happens on the water side with water resource plans produced by each company and assessed by the Environment Agency. The Agency considers that it could play a role in assisting companies to develop forward looking assessments of their networks.

- 3.33 It is also important that the industry, Ofwat, the Environment Agency, WaterVoice, the Department, local authorities and other interested parties work together to establish a framework for the development of sewer networks, within which each company can develop assessments of the most likely longer-term requirements of its networks, and how these will be met over time. This framework could help to set out the respective roles of the various parties. In recent years the industry, Ofwat, the Department, the Environment Agency and companies have worked together successfully, including on the development of the common framework and a study on water leakage.



⁵² National Audit Office, *Pipes and Wires*, (HC 723, 2001-02), executive summary paragraph 17.

⁵³ The Water Framework Directive came into force in December 2000, and aims to establish by 2015 a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater.

Appendix 1

Methodology

Scope

In the course of our examination of sewer networks and sewer flooding, we sought to examine three issues:

- the performance of the sewer networks over the last ten years;
- the challenges for sewerage companies and Ofwat from sewer flooding;
- the scope for Ofwat to develop the way it regulates sewerage companies

Consulting stakeholders

We had discussions with relevant staff at all ten of the sewerage companies in England and Wales, and had meetings with:

- WaterVoice,
- the Department,
- the Environment Agency,
- the Drinking Water Inspectorate, and
- Water UK (who represent the interests of the water and sewerage companies).

Collection and analysis of Ofwat published information

We analysed annual company data submissions collected by Ofwat and reviewed Ofwat documents on their assessments of company performance on serviceability and on the condition of the sewer networks. We also held discussions with Ofwat staff.

Specialist advice

- We engaged Dr Tony Ballance of Stone and Webster Consultants to advise on regulatory matters in the water and sewerage industry.
- We commissioned a report on estimating the benefits of sewer flooding control from Professor David Pearce, University College, London and this report was published on the NAO and Ofwat websites.
- We commissioned Martin Hall of engineering consultants, Ewan Associates to undertake a review of our draft report from an engineering and network perspective.
- We commissioned Frontier Economics to advise on the incentives for companies to alleviate sewer flooding problems and to maintain their networks.

Sewer capital project

We visited a sewer capital project that was in the course of construction for Thames Water.

Website review

We reviewed the websites of the water and sewerage companies for customer information on sewer flooding, and reviewed the WaterVoice best practice register.

Case examples

We reviewed sewer flooding case histories that had been reported to WaterVoice in the Thames region.

Appendix 2

The causes of sewer flooding

Water can drain into the sewer network from various sources. It can find its way into the sewerage network from groundwater and from overflowing highway drains. Sewerage companies have limited control over drainage into their sewers which may increase the likelihood of sewer overload and of sewer flooding to downstream properties.

Legislation gives people the right to connect into a sewer, even if it does not have the necessary capacity. There is a similar right to discharge surface water into a sewer.⁵⁴ While those connecting into the network have a duty to report such connections to the local authorities, they do not always do so, and companies find it impossible to monitor the number of connections taking place so as to assess the effect that such connections will have on the local network. Companies have also reported problems with illegal connections, such as when foul water is connected to a surface water pipe.

New property developments may place additional demands on the sewer network. Where homes are built in clusters and connected to the network, an increase in the demand placed on the network without a commensurate increase in capacity poses a particular problem. Other developments such as out-of-town shopping centres, car-parks and roads can place further strains on the network as rainwater that once would have fallen on and soaked into the ground prior to such developments, is discharged instead into the sewer network. Householders can also unwittingly raise the likelihood of sewer flooding, if for example they build conservatories without due regard to drainage and the effect on the public sewer network.

Increases in connections for new homes require careful management and planning to avoid overloading sewerage systems. However, such planning can cut across the responsibilities of several authorities - the company, the Environment Agency, the Highways Agency and the local authority. Furthermore, companies are not statutory consultees in the planning process.⁵⁵

Households may behave in ways that increase the risk of sewer flooding. When there is flooding from rivers or other watercourses it is common for people to lift manholes in an attempt to alleviate the immediate problem, causing sewers to become overloaded. Householders and businesses can reduce the risk of sewer flooding due to blockages by refraining from placing cooking fat, nappies and other materials into sewers.

⁵⁴ *Learning to Live with Rivers, Final Report of the Institution of Civil Engineers' Presidential Commission to review the technical aspects of flood risk management in England and Wales, November 2001, page 33.*

⁵⁵ *Policy on planning matters is the responsibility of the Office of the Deputy Prime Minister and other Government Departments.*