Wastewater Services

Our catchment plan.

Providing safe and reliable wastewater services in Oxford.

Thames Water

2018

Wastewater Services

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Introduction.

About our plan

We want to tell you about our plan to improve our sewerage network in the Oxford catchment, so it can cope with current and future demands. We're doing this because some of our customers in Oxford have experienced flooding (with associated pollution), and restricted use of their bathrooms.

Both flooding and pollution are unacceptable, that's why we treat all instances with the highest priority. If one of our sewers causes a problem, we'll do everything we can to put this right as soon as possible. We're committed to addressing these issues across our region and we'll continueto work with our customers and other drainage stakeholders to do so.

Our plan explains:

- the sewer problems some of our customers are experiencing, and their causes
- what we're doing to address these issues, and who else is involved
- our recommendations for continuing to provide safe and reliable wastewater services in the catchment now, and in the future.

At the back of this document you'll also find definitions for some of the words and phrases we use in our plan.

The Oxford catchment

Every day, our sewerage network in Oxford manages the demands of over 250,000 customers. The catchment is served by Oxford Sewage Treatment Works (STW), located to the south of the city, and Littlemore Sewage Pumping Station (SPS), one of the largest pumping stations in our region.

Our sewerage network consists of:

- foul sewers - these take water from showers, toilets, sinks and appliances to our treatment works, where it's cleaned
- surface water sewers - these collect rainwater that falls on properties, roads and other paved areas, and drain it into local rivers.

Our network has been vastly improved and extended since it was constructed, yet it remains under increasing pressure.

The Oxford catchment*

* Source: Contains Ordnance Survey data © Crown copyright and database right (2015) https://www.ordnancesurvey.co.uk

Sewer flooding and pollution

Sewer flooding and pollution is caused by a number of factors including:

- more intense rainfall events
- population growth
- loss of green spaces that previously provided natural drainage
- pipework misconnections and blockages
- river and groundwater entering our sewers.

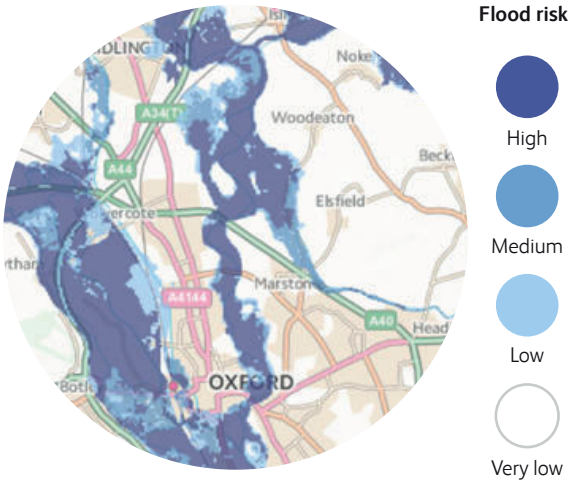
Combined, these can result in unwanted flow from the sewerage network into:

- customer homes and businesses, causing sewer flooding
- our neighbouring natural environments, causing pollution
- roads, causing congestion and closures.

Blockages within the sewer network often occur due to fats, oils and grease (FOG), being released into the sewers. These blockages can also cause flooding as they prevent water from draining away.

In the future, the catchment's population is estimated to continue to rise, and also we predict that rainfall events will continue to get more inten

Oxford sewer blocked by fat (2015)



Oxford catchment - flood risk from surface water map, source: Environment Agency

Groundwater and river flooding

Groundwater levels in Oxford are closely linked to, and affected by, river levels (and vice versa). As river levels rise and fall, so do groundwater levels. High river levels can sometimes cause groundwater levels to rise above the ground surface (or above the floor level of basements), resulting in localised groundwater flooding. Where property basements are not adequately protected, internal flooding can occur.

Oxford is located at the meeting point of the rivers Thames, Cherwell, Ray, Windrush and Bayswater Brook. This area has a long history of river flooding, there are written records of flooding which which date back to the 13th century. The catchment suffered major flood events in 1894 and 1947. The latter event resulted in internal flooding to more than 3,000 properties. Since then, there have been a number of smaller events, such as in December 2000, when 160 properties were flooded, and in January 2003, when 250 properties were affected by flooding.

Oxford catchment susceptibility to groundwater flooding [1]

1 https://www.bgs.ac.uk/research/groundwater/datainfo/GFSD.html

Our catchment plan.

What we're doing

We've already consulted with some of our customers and stakeholders, to support the creation of our plan. We'll continue to share it to make sure that the work we do is affordable for our customers, and meets their needs.

We've adopted the good practice Drainage Strategy Framework*, commissioned by the Environment Agency and Ofwat, the water industry regulators. We're also using this framework to make plans for other catchments, so that we're consistent in our approach to addressing issues across our region.

Our catchment plan has followed the 4-stage process shown in the diagram. We've summarised below the work undertaken at each stage of this process. We'll keep consulting with our customers and stakeholders as we complete Stage 3 and commence Stage 4.

* www.ofwat.gov.uk/publication/drainage-strategy-framework-for-water-and-sewerage-companies-to-prepare-drainage-strategies/.

** The estimated delivery timeline is dependent on factors including weather conditions, risks and costs, and is, therefore, open to change.

Drainage Strategy Framework stages and timescales

- **Stage 1 - Initialise / prepare**
  We gathered all the information that would help us to produce our plan. We surveyed the sewers and rivers, and collected data on pollution and flooding incidents. We also modelled the performance of the existing drainage systems in the catchment.
- **Stage 2 - Risk assessment**
  We investigated and analysed the information, to identify the risks in the catchment and to understand the causes of the problems we found.
- **Stage 3 - Option appraisal**
  We developed a number of options to address the catchment risks and tested them using our models. We assessed the costs and benefits of each option and chose the ones we want to implement.
- **Stage 4 - Intervention**
  This is when we implement our chosen options. We'll need to work with our customers and other stakeholders to gain their help and support, for the work we propose.

Our completed investigations

We've completed detailed research within the Oxford catchment to identify the root causes of sewer flooding and pollution. Our investigations have included:

- physical inspection and CCTV surveys of sewers and manholes
- using our survey findings to evaluate the health and capacity of the catchment's sewers and manholes
- analysis of over 350 customer questionnaires about sewer flooding
- surveys of rivers, obtaining cross-section measurements at over 200 locations
- integrated catchment modelling - combining our own models, with river model data from the Environment Agency. The combined model contains over 9,300 manholes, 465 kilometres of sewers, 70 kilometres of rivers and over 150 structures such as bridges and culverts. It's helped us to understand and test the causes of flooding and to develop ways to address them
- working with the Environment Agency to assess the impact the Oxford Flood Alleviation Scheme will have on the performance of our sewerage network
- flow and depth monitors to assess the performance of our network and test the accuracy of our modelling work
- surveys to identify the source of surface water flows into the foul system
- predicting the level of flooding and pollution risk present across the catchment
- significant engagement with Oxford City Council, the Environment Agency, Oxford Flood Alliance and local flooding action groups, and customers.

Our catchment findings

Current issues

There are a broad range of flooding and pollution issues within the Oxford catchment, and many root causes which include:

- heavier and more intense rainfall events happening more often
- population growth, high-density urban development and paving-over of gardens, creating a large combined watertight area
- property misconnections, leading to many homes and businesses discharging to the wrong sewer; as illustrated in the image on the next page
- deterioration within our sewerage network and blockages caused by fat, oil and grease deposits, resulting in flooding and operational issues. For example, within the trunk sewers, as captured in the photograph on Page 3
- loss of local river flood plains, increasing river flooding
- pollutants directly entering watercourses from urban areas.

What we've found

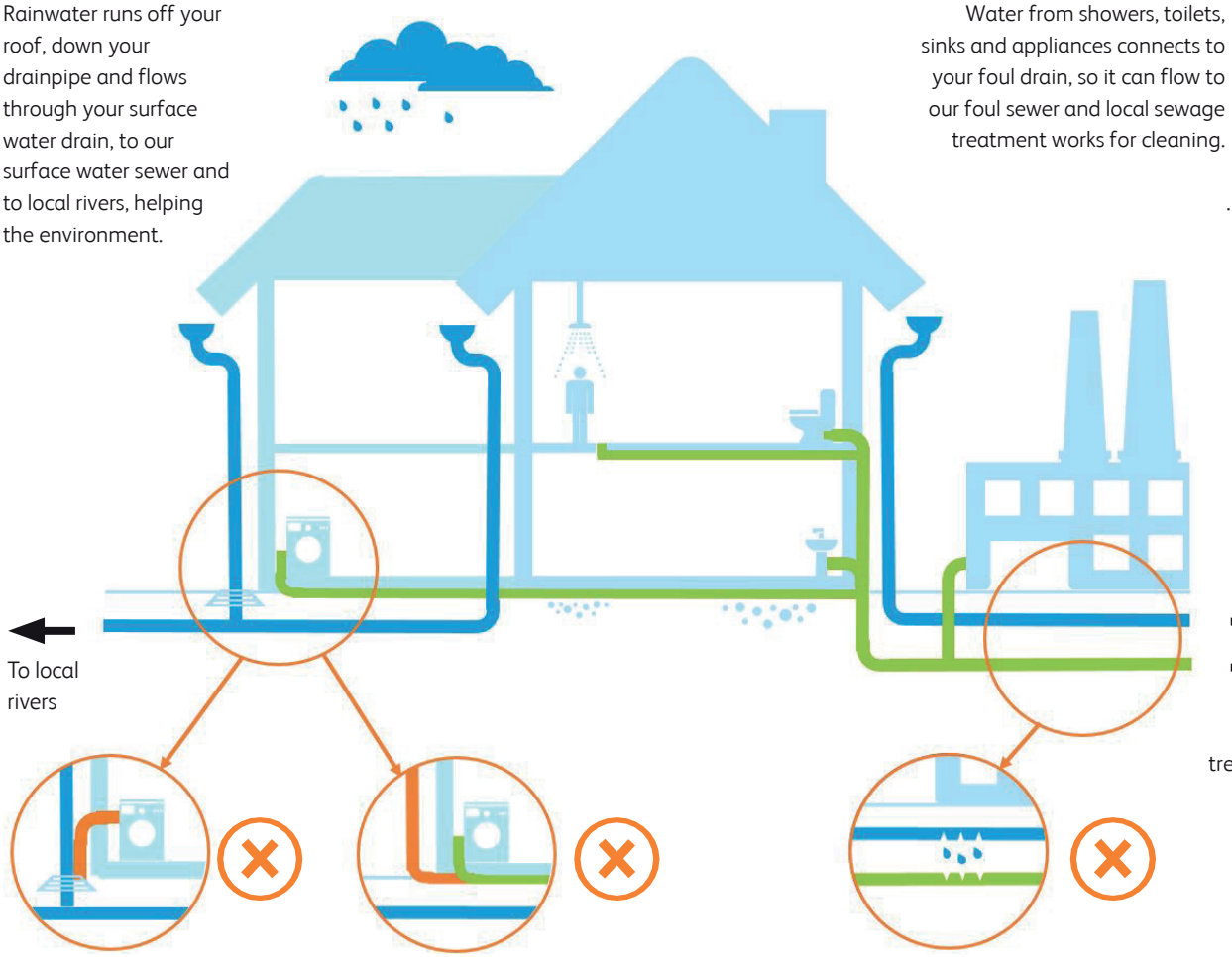
Overall our catchment findings tell us that:

- flooding has occured from our foul sewers, as property misconnections have allowed surface water to drain into them. Our foul sewers were not designed to cope with surface water
- deterioration of some of the sewers within our network has allowed groundwater into the foul sewers. For example, within the Grandpont area
- flooding from our surface water sewers has also occurred as a result of high river levels and / or restriction of the outfalls due to vegetation growth. For example at Abingdon Road
- in some areas, the sewers have been laid with relatively shallow gradients. This has increased the likelihood of debris and blockages forming during low flow conditions. For example, from Oxford Road to Ferry Road
- historically, flooding has occurred in South Hinksey due to backing-up from the main sewer. This has been casued by debris reducing the performance of Littlemore SPS. Improvements implemented at the SPS in 2016, have significantly reduced the flooding risk in South Hinksey
- odour pollution has also been detected at Littlemore SPS. This may have been caused by foul sediment building up within the trunk sewers.

Property misconnection problems

Rainwater runs off your roof, down your drainpipe and flows through your surface water drain, to our surface water sewer and to local rivers, helping the environment.

Water from showers, toilets, sinks and appliances connects to your foul drain, so it can flow to our foul sewer and local sewage treatment works for cleaning.



Appliances should never be plumbed into your drainpipe. This sends waste into the local river killing wildlife.

Drainpipes should never be connected to your foul drain. This sends rainwater to our foul sewer, overloading it and causing sewer flooding.

Poor condition sewers can sometimes let flows transfer between them, causing flooding or pollution. Where we find this happening, and it's our responsibility, we'll fix them.

Future risks

To make sure our work is effective and sustainable we're also addressing within our plan the future challenges facing the catchment, which include:

- urban creep - loss of green space increasing the strain on our sewerage network when it rains heavily. Our modelling suggests urban creep rates in Oxford are slightly higher than the regional average
- climate change - some recent analysis suggests rainfall could become 20% more intensive by the 2050s*, increasing the potential for flooding.
- wetter winters may also mean groundwater levels could be higher more often, with more flow getting into our sewers
- population growth - there are significant areas of new development to the north and east of the catchment, as well as brownfield redevelopment within its boundary
- changes in customer behaviour - property misconnections are substantial within the catchment and flushing or pouring the wrong items into sewers has led to blockage-related flooding and pollution.

Addressing the current issues and future risks will be complex. We'll also need to work in partnership with all stakeholders responsible for drainage in the catchment. We'll also need to gain customer support for the work we propose.

* UK Climate Change Risk Assessment 2017: Evidence Report: Flood Risk, Appendix C – Climate Change Projections October 2015.

Who can help?

There are a number of stakeholders who, like us, have important drainage responsibilities. They also play an essential role in addressing flooding and pollution in our catchment, and include:

Local Authorities: In some locations flooding occurs from multiple sources. We need Oxford City Council (with Environment Agency funding), to address fluvial and surface water flooding. This will complement the work we're doing to help our network perform efficiently.

- We'll work with Oxford City Council (OCC), by sharing information on our main surface water outlets and by ensuring these are kept clear, especially during the summer months. OCC can support our work by encouraging customers to report any sewer flooding directly to us. We'll also work the Council to encourage the use of sustainable drainage systems (SuDS), in new developments and redevelopment sites, and in preventiong property misconnections.

Customers: Our customers have an important role to play in ensuring that their properties, including any future improvements, are correctly connected. They can also ease the pressure on our sewerage network by reducing the runoff from the roofs and driveways of their properties, and through supporting our campaign to 'Bin it, don't block it!'. Our customers can also help us by reporting any internal flooding or overflow from manholes.

- We'll continue to work with community action groups formed by customers across our region, and the Oxford Flood Alliance, to share flooding information and news.

Charities: A number of charities are important stakeholders due to their impartial nature and specialist skills. Charities are important to our catchment plan for facilitating customer engagement, accessing additional funding streams and sharing their experience in delivering SuDS schemes across London.

Environment Agency: Is the principal flood risk management operating authority in England. It has operational responsibility for managing the risk of flooding from main rivers, reservoirs, estuaries and the sea. The Environment Agency is an important stakeholder as it provides partnership working support and funding to other flood risk management authorities, through their local regional flood and coastal committees.

- Recognising that fluvial flooding has a big impact on our sewers in this catchment, we've contributed to the Oxford Flood Alleviation Scheme (OFAS).

We're seeking to work in partnership with all stakeholders to make sure that together, we deliver and maintain the most sustainable sewer flooding and pollution interventions.

Stakeholders with drainage responsibilities

Just as our drainage responsibilities are focussed on removing and treating wastewater, and draining the surface water from our customers' properties, other stakeholders' responsibilities include:

- managing local flood risk on riverbanks
- groundwater
- land and highways
- maintaining private drains.

We take full responsibility for addressing the drainage and sewer flooding issues in our control. Outside of this, we'll fully support other stakeholders to deliver their responsibilities, including working in partnership with them to tackle issues that need a joint approach.

Our current actions

As we work to address sewer flooding and pollution across our region, we'll continue to:

- regularly talk to our customers and make contact with them through meetings, other communications and surveys
- collaborate with regional drainage stakeholders to agree ongoing activities and joint working, for example continued attendance at meetings with the Oxford Area Flood Partnership (OAFP)
- publish our catchment plans as they develop, and ask for feedback from our customers and stakeholders to shape our ongoing activities
- refurbish our assets if required, to improve performance. For example, in September 2016, we completed a significant refurbishment of Littlemore SPS.

This work has improved performance and involved:

- installation of pumps more resilient to debris
- improved control and monitoring
- installation of odour control.

Our recommendations

Our Oxford catchment plan is currently at Stage 3, the Options Appraisal stage, of the Drainage Strategy Framework. We've used industry best practice, and our latest work on drainage innovation, to develop a number of options to address the sewer flooding and pollution happening in this area, and to prevent them in the future.

We've tested these options using our models and have selected those that have the greatest benefit to our customers, for the lowest cost to implement. We're recommending an intervention that has three phases:

1 Short-term activities

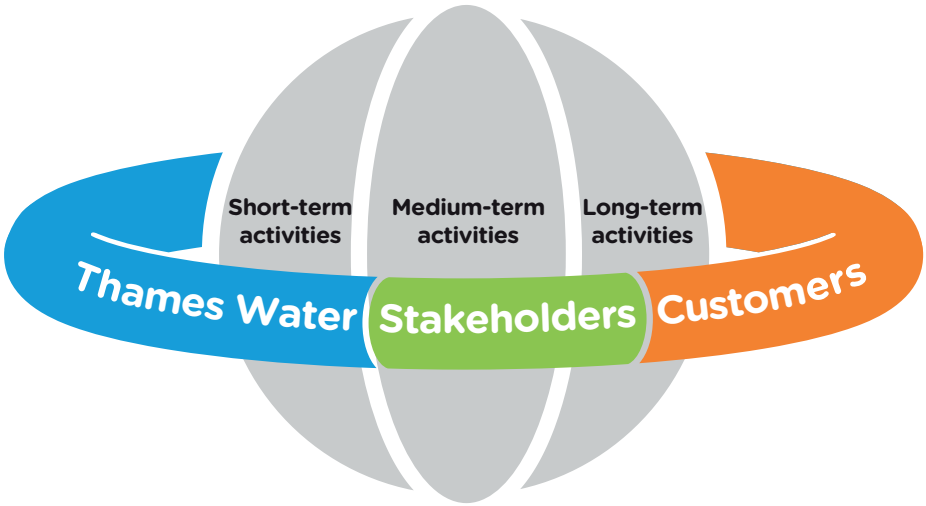
This will include all of our ongoing work to improve the operation of our network and our response to problems as they occur. We'll implement solutions at critical locations across the catchment to reduce pollution and flooding. We'll also provide advice to customers on how to avoid property misconnections and flushing or pouring the wrong items into sewers.

2 Medium-term activities

This will include the refurbishment of our local sewerage network to reduce pollution and foul sewer flooding. We'll work with catchment stakeholders to undertake the widespread management and reduction of runoff from roads, roofs and parking areas at commercial, street and property level. This will reduce surface water flooding in this area.

3 Long-term activities

We'll review and refine our catchment approach based on the experience gained, and outcomes achieved, from our medium and short-term interventions. We'll continue to refurbish our sewerage network and work with catchment stakeholders to manage surface water and flooding.



Oxford catchment recommended option

Next steps

Our next step is to move our catchment plan to the final stage of the good practice Drainage Strategy Framework, Stage 4, Intervention. This is when we'll implement the recommended interventions for the Oxford catchment.

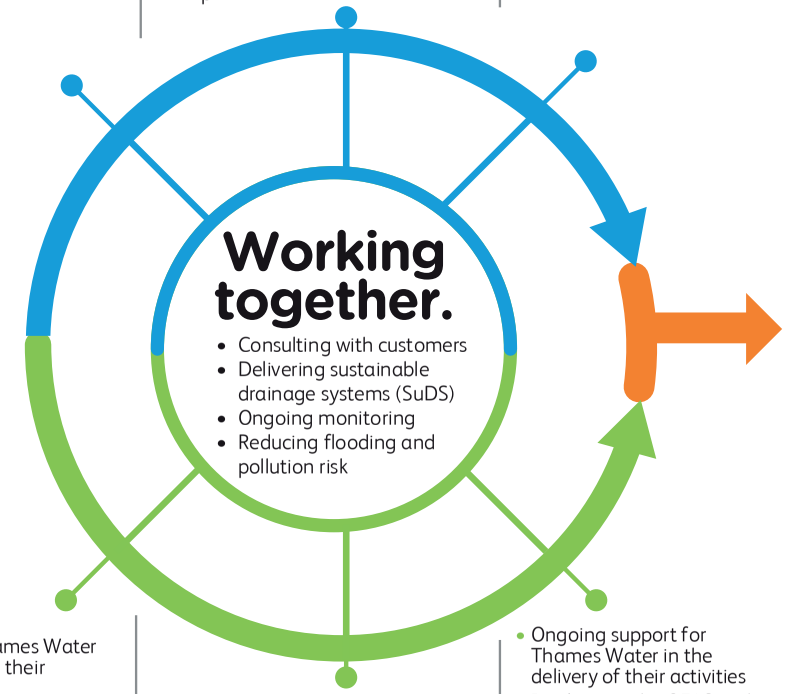
Implementing our plan successfully and sustainably requires us to:

- deliver all of the activities within our control
- gain agreement from stakeholders outside of our organisation, and our customers, to deliver the activities within their control
- work in partnership with stakeholders on activities that need a joint approach.

We understand that each stakeholder has different drivers, funding criteria and approaches. So, we'll be supportive, and work in partnership with them, to make sure agreed interventions are implemented and their benefits delivered for our customers.

Stage 4 Intervention* >>> 2018 onwards**

Activities	Short-term	Medium-term	Long-term	Potential benefits
What we need to do	• Regular maintenance of tanks and blockage hot spots including Marston tanks, Ferry Road tanks and key locations on Botley Road • Develop interventions that address problems occurring at the inlet to our STW • Funding for the Oxford Flood Alleviation Scheme (OFAS)	• Work with customers to reduce property-level runoff • Continue to identify and rectify property misconnections • Extend FOG campaign to other affected areas • Implement interventions that address problems occurring at the inlet to our STW • Undertake sewer rehabilitation where infiltration occurs • Work with stakeholders to implement street-level SuDS	• Surface water management to offset flows from new developments • Continue to monitor the effects of growth and climate change, and their impacts on our STW • Targeted implementation of SuDS • Ongoing monitoring and customer consultation, leading to refinement and enhancement of our activities • Live monitoring of weather conditions and sewer flows to maximise storage	• Integrated and efficient partnership working with stakeholders • Reduction in private property misconnections and associated flooding and pollution • Reduction in flooding across the catchment • Increased customer awareness resulting in avoidance of sewer abuse • Reduced restricted bathroom use, flooding and odour pollution • Reduced odours from Littlemore SPS • Catchment wide benefits including: o enhanced natural environment o increased natural habitats for local wildlife • Sustainable long-term strategy
What other stakeholders need to do	• Support Thames Water in delivering their activities • Work with property developers to support Thames Water's services • Trial and monitor SuDS, working with Thames Water • Ongoing support for the OFAS	• Continue to work with customers to resolve and avoid property misconnections • Work to maximise opportunities for SuDs installations on greenfield developments and brownfield redevelopments	• Ongoing support for Thames Water in the delivery of their activities • Implement the OFAS and schemes to address flooding from local rivers • Implement catchment-wide SuDS • Ongoing monitoring and customer consultation, leading to refinement and enhancement of activities	



* www.ofwat.gov.uk/publication/drainage-strategy-framework-for-water-and-sewerage-companies-to-prepare-drainage-strategies/.
** The estimated delivery timeline is dependent on factors including weather conditions, risks and costs, and is, therefore, open to change.

Frequently asked questions.

Your questions answered

We're committed to listening to, consulting and collaborating with our customer and stakeholders on our sewerage network activities and plans. We've addressed key feedback and questions raised by customers and stakeholders in the Oxford catchment, and by customers affected by flooding throughout our region, in this section. We've also included customer and stakeholder feedback into our detailed catchment plan, as far as possible, and is relevant to the Drainage Strategy Framework.

General questions

Q1
Will following the 4-stage drainage strategy process delay essential work in our area?

Answer

Essential work will continue in the Oxford area throughout our catchment plan investigations. We'll also continue to carry out repair works on our sewerage network if, through our investigations, we identify issues that increase the risk of flooding or pollution.

The 4-stage drainage strategy process has been commissioned and recommended as good practice by the Environment Agency and Ofwat, our industry regulators. It's allowed us to better understand the root causes of the sewer flooding and pollution in the catchment, and to predict future issues. It's very important for us to complete the process, to help us to focus our work and investments. Following this process is important to make sure we're implementing the most effective and sustainable drainage intervention for the Oxford catchment.

Q2
Why are costs a consideration when making plans to address sewer flooding and pollution?

Answer

Every day we serve 15 million customers across London and the Thames Valley. Providing the essential service, and getting it right, is our focus every day and we never forget it's paid for by our customers.

We prioritise investment across our sewerage network to meet our customers' needs. Every five years we agree with Ofwat, our economic regulator, the amount we can charge all of our customers to deliver service improvements, including reducing the risk of sewer flooding and pollution. We calculate this amount by talking to our customers to find out how much they would be willing to pay for service improvements, and how they feel they should be prioritised.

We also estimate the customer benefits from these improvements, and those from other major projects, before we start anywork, to make sure they always outweigh the costs to our customers.

Drainage work questions

Q1 What drainage-related work are you carrying out in our area, and when is it happening?

Answer

We've developed our catchment plan for Oxford and have outlined our next steps. The following actions have already been undertaken, or are underway, in the catchment:

- physical inspection and CCTV surveys of sewers and manholes
- using our survey findings to evaluate the health and capacity of the catchment's sewers and manholes
- analysis of over 350 customer questionnaires about sewer flooding
- surveys of rivers, obtaining cross-section measurements at over 200 locations
- integrated catchment modelling - combining our own models, with river model data from the Environment Agency. The combined model contains over 9,300 manholes, 465 kilometres of sewers, 70 kilometres of rivers and over 150 structures such as bridges and culverts. It's helped us to understand and test the causes of flooding and to develop ways to address them
- flow and depth monitors to assess the performance of our network and test the accuracy of our modelling work
- surveys to identify the source of surface water flows into the foul system
- predicting the level of flooding and pollution risk present across the catchment
- innovative solution analysis, including sustainable drainage systems (SuDS), and approaches to maximise the capacity of our sewerage network.

Q2 Are you renovating the sewers in our area?

Answer

We'll renovate catchment sewers which we find to have been damaged through age, or as a result of other activities. We'll continue to target and repair these problems over the coming months, prioritising those that have the greatest impact on the service provided to our customers.

Q3 What are you doing about defective private drainage and surface water connections?

Answer

Our investigations have identified misconnected private property drainage within the Oxford catchment. This means that a number of homes and businesses are discharging to the wrong sewer. By connecting a surface water drain to a foul sewer, these properties are contributing to the current sewer flooding issues. To address this problem we'll target misconnected private properties and raise repair requirements with the responsible stakeholder.

Drainage work questions

Q4
Are you working with the Highway Authority to resolve blocked gullies, drains and ditches, and with landowners to reduce field runoff, as both affect drainage and our sewers?

Answer

There are other stakeholders who, like us, have important drainage responsibilities and therefore, play an essential role in resolving sewer flooding issues in this catchment area. Highways maintenance activities and land maintenance practices sit outside of our responsibilities.
We'll continue to work with the responsible stakeholders to highlight these issues, where there is a major impact on our sewerage network.

We'll also maintain our ongoing work with Oxford City Council and the Highway Authority to understand the extent to which flood waters may be escaping from highway or land drainage systems; and impacting the sewerage network.

Q5
What are the improvement plans for Oxford Sewage Treatment Works to manage capacity?

Answer

The Oxford Sewage Treatment Works (STW), operates a fully-compliant permanent storm overflow, which stores additional flow in tanks during heavy rainfall.

We've recently assessed the growth requirements for the works and identified that the volume of debris, which needs screening out at the start of the process, is causing blockages. We're currently working on a solution to reduce the impact caused by this debris, and to increase capacity. We regularly use the growth forecasts to assess the performance of the Oxford STW, and we'll continue to ensure that it can cope with any future increases in the catchment's population.

River question

Q1
Are you contributing to the Oxford Flood Alleviation Scheme?

Answer

We recognise that river flooding, and associated high groundwater levels, has an impact on our sewerage network. Flood water can enter the sewers causing them to fill faster than normal, which can result in flooding from the sewers.
River flooding can also introduce sediment that can lead to blockages and a reduction in sewer capacity.

The Oxford Flood Alleviation Scheme will reduce the impact of fluvial flooding in Oxford and, therefore, on our sewers.
To support this important work, we're contributing to the funding of the scheme.

Future risk questions

Q1 Does urban creep affect this catchment?

Answer

Our definition of urban creep is the transformation of a catchment by the paving-over or development of previously absorbent areas. When absorbent areas such as grass, are replaced with properties, extensions and driveways, this prevents surface water from soaking into the ground when it rains heavily. Instead, this water flows into our sewerage network, causing it to surcharge and flood in some instances.

The historical urban creep rate for the Oxford catchment is slightly above the average rate across our Thames area. However, urban creep is linked to misconnected pipework and changes in land use, which are having a significant impact on sewer flooding locally. Implementing our long-term activities across the catchment will increase the capacity of our network, addressing the problems caused by urban creep.

We're also monitoring planning and development applications in and around the catchment to support our drainage activities and plans.

Q2 How are you planning for population growth and future development in the catchment?

Answer

We define a catchment's growth as the increase in the number of new properties developed, and the rise in the number of individuals living there. The population growth rate for the Oxford catchment is fairly average across our Thames region, yet relatively small increases in population and new developments, can be influential on our operations and sewer flows.

As part of our drainage work in the catchment we're:

- closely monitoring development applications and assessing their likely impact on the capacity of our operations in the future
- working with property developers to make sure we can serve their new developments and avoid any problems for our existing customers.

We'll continue to work with all involved stakeholders to monitor local plans and planning applications. We'll incorporate current and projected developments into our business planning cycle. This way we'll be able to make sure our service is maintained for customers throughout the catchment's development.

Q3 Why are you collecting climate change data rather than 'climate proofing' assets?

Answer

Our business is sensitive to weather. Every day we manage the challenges that changing weather conditions has on the services we provide to our customers, including those problems created by severe weather.

We're concerned about the future impact of changing weather on our business, commonly referred to as climate change, and are responding to it by:

- understanding and assessing where we can respond to these unavoidable potential impacts on our services to customers
- lowering our greenhouse gas emissions.

Since 2010 we've been improving our understanding of how climate change could impact our ability to deliver services to our customers. In 2015/16 we published a detailed review of the potential risks and impacts on our business, and how we could manage them to protect our services to our customers.

We're lowering our greenhouse gas emissions in support of the Climate Change Act 2008. We've set ourselves a voluntary and challenging goal of achieving a 34% reduction in emissions, compared to 1990, for our scope 1 and 2 emissions* by 2020.

* Scope 1 emissions refer to greenhouse gas emissions associated with the operation of our assets. Scope 2 emissions are emissions associated with the use of grid electricity.

Words we use.

Definitions

Foul sewers
These take water from showers, toilets, sinks and appliances to treatment works, where it's cleaned.

Misconnection
This occurs when pipework is connected to the wrong sewer.

Pollution
This occurs when wastewater flows from the sewerage network and contaminates neighbouring natural environments.

Sewer flooding
This occurs when water flows from the sewerage network into customers homes and gardens, businesses, highways and open areas.

Sewerage network
This consists of all of our foul and surface water sewers and manholes.

Stakeholders
These are individuals, organisations or groups that are affected by our catchment plan.

Surface water sewers
These collect rainwater that falls on properties, roads and other paved areas, and then drain the water into local rivers.

Urban creep
This is the transformation of a catchment by the paving-over or development of previously absorbent areas.

Wastewater
This is water that is drained by both foul and surface water sewers.