Drainage and Wastewater Management Plan (DWMP)

Overview of the North Kent River Basin Catchment

October 2022
Version 2

from Southern Water

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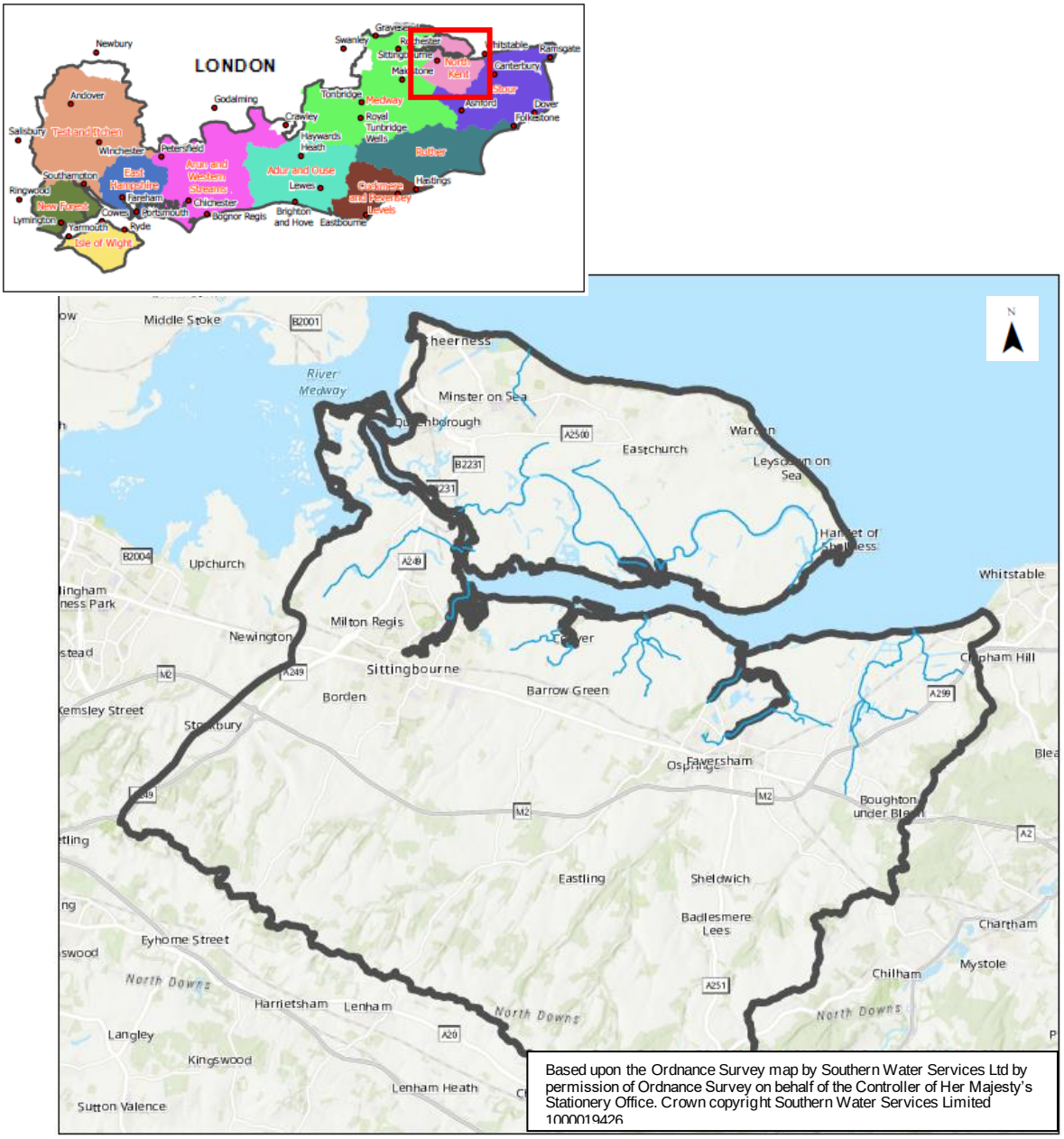
The Environment Agency has previously defined the River Basin District catchments in their River Basin Management Plans prepared in response to the European Union's Water Framework Directive. These river basin catchments are based on the natural configuration of bodies of water (rivers, estuaries, lakes etc.) within a geographical area, and relate to the natural watershed of the main rivers. We are using the same catchment boundaries for our Level 2 DWMPs. A map of the North Kent river basin catchment is shown in figure 1.

Figure 1: The North Kent river basin catchment in North Kent, England



The North Kent catchment lies to the east of the Medway estuary and covers 416km^2 of land along the Kent coast and the Isle of Sheppey. It is formed from many smaller river catchments whose watercourses flow from the North Downs to the Swale Channel before reaching the Thames Estuary.

Around 154,198 people live in the river basin catchment. It is predominately a rural area but there are a number of important urban centres, including Sittingbourne, Faversham, Sheerness and Minster. These towns, the locally designated areas of high landscape value, as well as many smaller towns and villages attract many visitors to the region every year.

The catchment is characterised by what is known as the North Kent Plain, a generally open and gently rolling rural landscape, that lies between extensive marshland to the north and the North Downs escarpment to the south. Traditionally the area was part of what was known as the North Kent fruit belt, known for its apple and cherry orchards. Whilst fruit production still plays an important role, many of these orchards have been lost, giving way to soft fruit (increasingly grown within polytunnels) and arable crops. South of the M2 motorway, the catchment sits within the Kent Downs Area of Outstanding Natural Beauty (AONB), the eighth largest of the UK's 46 ANOBs, and is characterised by steep-sided dry valleys and extensive areas of coppiced woodland.

To the north of the catchment lies the Isle of Sheppey. Linked to the mainland by road and rail, the Island is surrounded to the east and north by the Medway and Thames estuaries and the Swale Channel to the south. The island is formed primarily of a ridge of London Clay overlain to the south by alluvium of the Medway estuary and the Swale marshes. Included within the area of London Clay are the Sheppey Cliffs and foreshore SSSI (Site of Special Scientific Interest).

The tidal Swale Channel comprises brackish/freshwater grazing marsh, saltmarsh and mudflats. These habitats have ensured that area remains of both national and international importance for wildlife, especially waterfowl. The area is protected by a number of designations - The Swale Special Protection Area, The Swale SSSI, and The Swale Ramsar. The Swale Channel is also a Marine Conservation Zone, designated for its important seabed habitats and use as spawning and breeding ground for various fish. The area also includes two National Nature Reserves at Elmley and Shellness, along with two Kent Wildlife Trust reserves at Oare and Seasalter.

Historically, the area around Faversham was important for the manufacture of explosives at the Oare Gunpowder Works, Chart Gunpowder Mills and Uplees Explosive Factory. Much of the area surrounding the Medway and Swale was also important for the manufacture of cement and bricks. Today, the catchment continues to be economically important, including for energy and transport infrastructure.

The North Kent Catchment Partnership has identified priority issues in the catchment as:

- water quality, in particular point source pollution from the water industry, rural diffuse pollution and urban diffuse pollution
- physical modifications to the river - changes to the shape and position of the rivers have dramatically altered the river habitat and have introduced barriers to fish movement
- invasive non-native species (INNS) - these have an adverse impact on plants, invertebrates and fish communities within the fresh water bodies and the estuary.

Drainage and Wastewater Systems

Drainage and wastewater systems are designed to convey water. There are several different drainage systems, including:

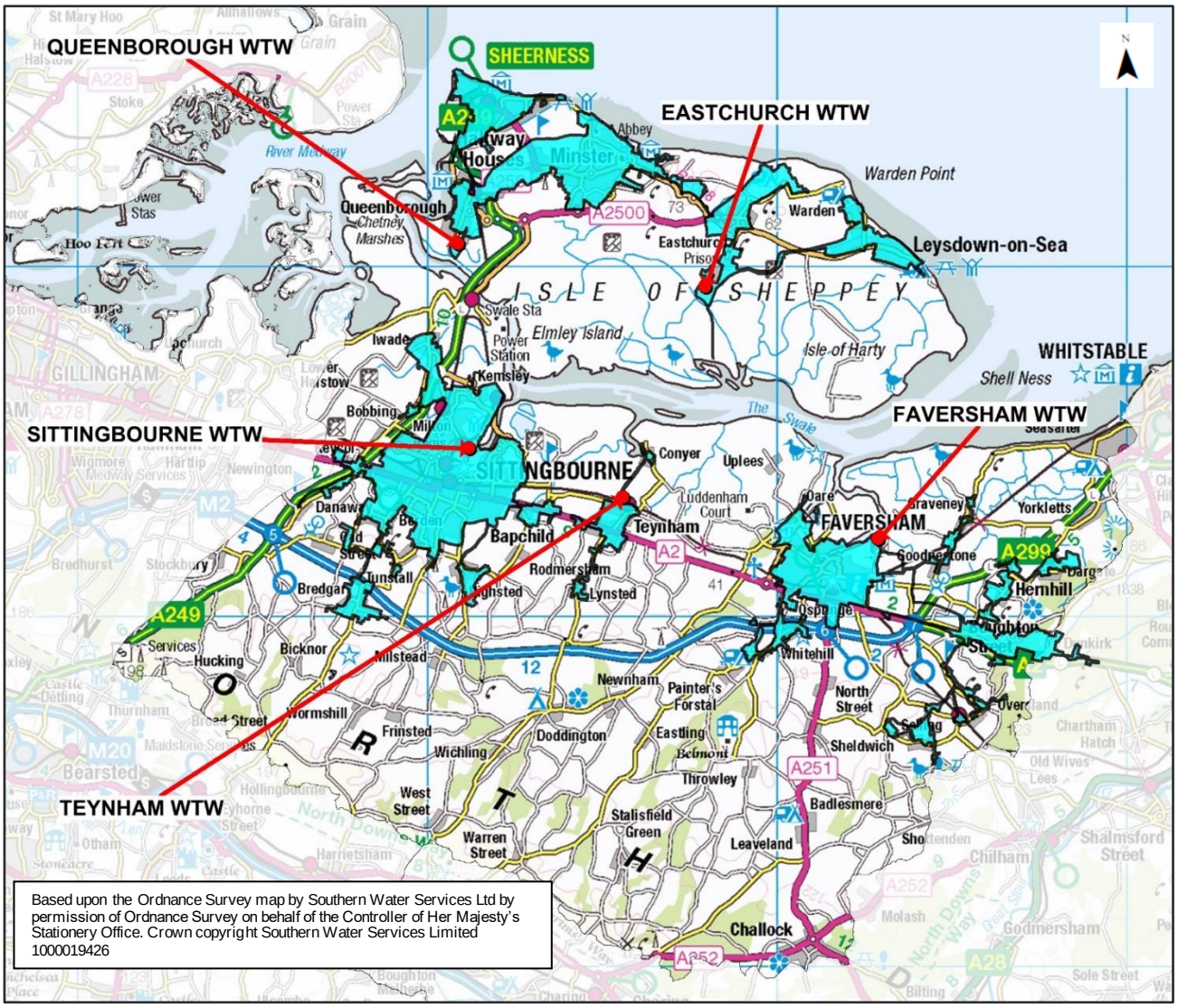
- land drains in fields to drain the land to enable it to be used for agricultural purposes
- highway drainage systems to ensure that roads and car parks remain safe and useable during rainfall
- rivers and streams to transport water running off the land to the sea
- surface water drainage systems that take water from roofs and paved areas to local rivers, and
- sewerage systems that take wastewater away from people's homes and businesses so it can be recycled at the Wastewater Treatment Works (WTW) and released safely back into the environment.

All these systems provide essential services to protect the economy and environment, and ensure public health, safety and hygiene. The links between water use and the management of wastewater is important to protect the wider environment. This excellent independent short film, called "The Drip", shows how the water cycle links everything together.

In the North Kent river basin catchment, we own and operate 5 separate sewerage systems that collect wastewater over a geographical area known as a sewer catchment. These are the areas shaded blue on the map, see figure 2 below. Each sewer catchment is drained by a complex sewerage system comprising a network of pipes, pumps and wastewater treatments works (WTWs) that combine to remove wastewater from homes and businesses and re-cycle the water so it can be safely discharged back into the environment.

Our sewer catchments generally cover the urban centres and communities. Of the 416km^2 of land in the river basin catchment, only 47km^2, or 11%, is covered by our sewer catchments. However, of the 60,962 residential properties and 2,814 businesses within the North Kent catchment, 93% of the homes and 82% of the businesses are connected to our sewerage system. Remote rural properties are often not connected to sewerage systems and therefore rely upon a septic tank within their property to collect wastewater before it is periodically emptied by tankers and the wastewater is taken to a WTWs to be recycled.

Figure 2: Map of the North Kent Catchment showing the sewer catchment areas (in blue) and locations of the WTWs



More than 581.20 km of wastewater pipes serve the North Kent catchment with 104 pumping stations within the network to pump sewage to the 5 WTWs for recycling the water back into the rivers or the sea. Table 1 provides a summary of the 5 sewer catchments within the North Kent river basin catchment, including the equivalent population that each sewerage system serves and the approximate length of sewers within the sewer catchment. The Population Equivalent is a measure of the quantity of sewage that the WTW needs to process and recycle, and consists of the calculated equivalent number of people who would contribute the amount of sewage from within the sewer catchment from residential and commercial properties.

Table 1: Sewer Catchments in the North Kent River Basin Catchment

Sewer Catchment Ref	Sewer Catchment Name	Communities Served	Equivalent population served	Length of sewers (km)
SITT	SITTINGBOURNE	Sittingbourne, Bapchild, Borden, Bredgar, Conyer, Doddington, Hartlip, Wade, Kemsley, Lower Halstow, Milton Regis, Murston, Newington, Newnham, Rodmersham, South Green, Stockbury, Teynham, Tunstall, Upchurch	73,383	398.856
QUEE	QUEENBOROUGH	Queenborough, Rushenden, Sherness, Bluetown, Eastchurch, Leysdown on Sea, Minster on Sea, Warden	36,596	313.872
FAVE	FAVERSHAM	Faversham, Baldersmere, Boughton-Under-Blean, Durgate, Eastling, Goodnestone, Graveney, Hernhill, Luddenham, Norton, Ospringe, Oterden, Painters Forstal, Selling, Sheldwich, Stalisfield, Dunkirk	34,149	210.411
ECHU	EASTCHURCH	Leysdown on Sea, Eastchurch, Warden, Mister On Sea	6,381	90.541
TEYN	TEYNHAM	Bapchild, Conyer, Lynsted, Teynham	3,689	23.980

Of the 5 WTWs in the catchment, three systems serve more than 30,000 population equivalent per day.

Sittingbourne WTW serves just under 73,383 people living in the Sittingbourne area and the surrounding villages. The sewerage systems includes 21 wastewater pumping stations in the network to transport the water through the sewers from homes and businesses to the treatment works. The permitted discharge of recycled water is 11,800m3 per day.

Queenborough WTW serves just under 36,596 people living within Isle of Sheppey catchment. The sewerage network is a mixture of gravity sewer and rising mains. There are 21 wastewater pumping stations in the network to transport the water through the sewers from homes and businesses to the treatment works. The permitted discharge of recycled water is 11225m3 per day.

Faversham WTW serves 34,149 people living within Faversham and the surrounding areas. There are 24 wastewater pumping stations. In some parts of the catchment sewage is pumped several times by different wastewater pumping stations in the network to transport the water through the sewers from homes and businesses to the treatment works. The permitted discharge of recycled water is 7,000 per day.

Eastchurch WTW serves just 6,381 people living within Eastchurch, Leysdown on Sea, Kingsborough, Warden and HM Prisons. The catchment is served by a gravity sewers and rising mains with 6 wastewater pumping stations in the network to transport the water through the sewers from homes and businesses to the treatment works. The treatment works is a remote and isolated site on the Isle of Sheppey. The permitted discharge of recycled water is 4500 per day.

Teynham WTW serves just 3,689 people living within Teynham area. There are only 2 wastewater pumping stations in the network to transport the water through the sewers from homes and businesses to the treatment works. The permitted discharge of recycled water is 848 per day.

The Environment Agency (EA) sets limits on the quality and quantity of recycled water (known as effluent) that can be discharged from WTWs. The EA issues discharge permits to ensure the recycled water released from WTWs complies with three main legal provisions

(i) The Water Resources Act (WRA) 1991;
(ii) The Environmental Permitting (England and Wales) Regulations 2010 and
(iii) The Urban Wastewater Treatment Regulations (UWWTR) 1994.

The permits ensure that the quality of the receiving water (i.e. the river or the sea) is protected and that the discharges do not cause an unacceptable impact on the environment. The flow that may be discharged (released) in dry weather is one of the limits set by permits. Our 5 WTWs operate in accordance with their permits and recycle the wastewater to the specifications set out by the EA to ensure it is safe and clean to be released back into the rivers and streams or directly to the sea.

Under heavy storm conditions, rainfall can enter the sewerage systems and significantly increase the flow in the system. The flow of water arriving at the WTWs can exceed the recycling capacity of the works, so any excess water is temporarily stored in large storm tanks. If these tanks ever fill to capacity, then they would discharge water into the rivers or sea through storm overflows. Our aim is to prevent any discharge of water that has not been fully recycled to the required standards. Any water released from storm tanks is screened to remove items such as wet wipes and solids. These discharges are permitted by our regulator and monitored carefully. This control mechanism is required to prevent the backing up of water within the sewers and putting homes at risk of flooding.

Wastewater System Performance

We routinely monitor, analyse and report the performance of our wastewater sewerage systems to enable us and our regulators to assess the service provided to our customers and the impact of our activities on the environment.

The current performance on the sewerage systems is a good starting point for the DWMP, and enables current issues to be highlighted so the planning objectives can be identified and defined for use throughout the DWMP. These planning objectives will determine the metrics that we used in the next stage of the DWMP, which is to determine the current and future risks to people, property and the environment of changes in the river basin catchment and in the performance of our sewerage systems.

The current performance, based on the last three years of date, is summarised below.

Sewer Blockages

Every year there are thousands of avoidable blockages in our sewers caused by the flushing of wet wipes, cotton buds and other inappropriate items down the toilet, or by pouring fat, oil and grease down the sink. These items cause blockages within the sewer systems, and these blockages can result in flooding to customers' properties or impact upon watercourses or coastal waters.

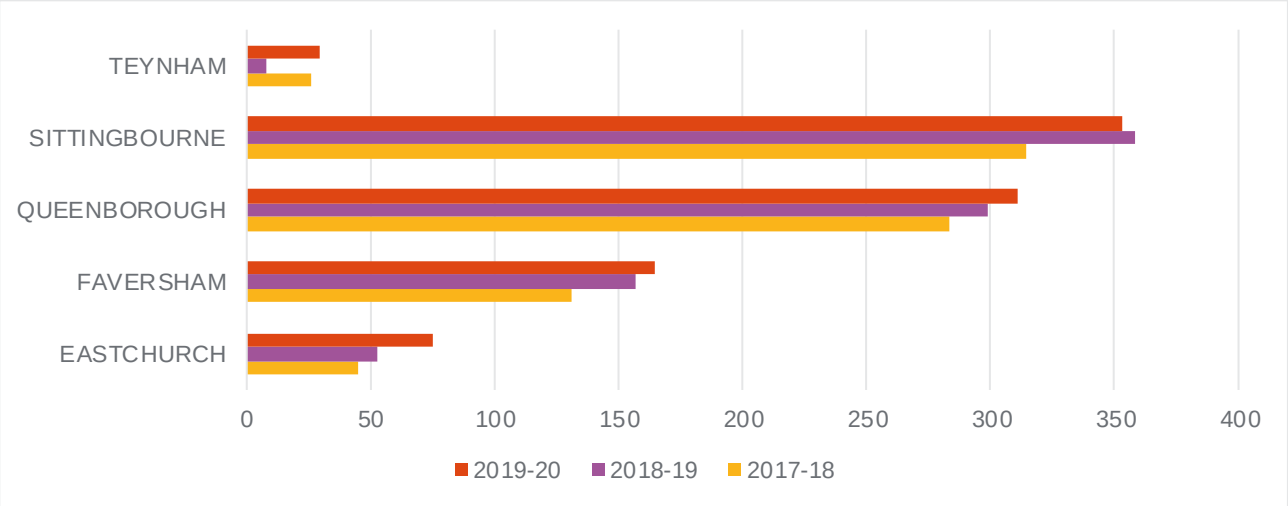
Figure 3 shows the number of blockages recorded in the North Kent river basin catchment by sewer catchment over the last three years. We have noticed an increasing trend in the number of

blockages over the last three years, which we are tackling through our pollution and flooding reduction programmes.

Of the five sewer catchments in the North Kent river basin, Sittingbourne had the highest number of blockages, closely followed by Queenborough and Faversham.

We use high-powered water jets to clear blockages and ensure our sewers are running freely. In 2015, we launched our 'Keep it Clear' campaign which involves teams visiting 'blockage hotspot' areas to educate customers on how to safely dispose of items rather than putting them down their sinks or toilets. We visit almost 20,000 customers a year across the region to promote correct disposal of 'unflushable' items.

Figure 3: Number of blockages in each of the sewer catchments in the North Kent river basin catchment

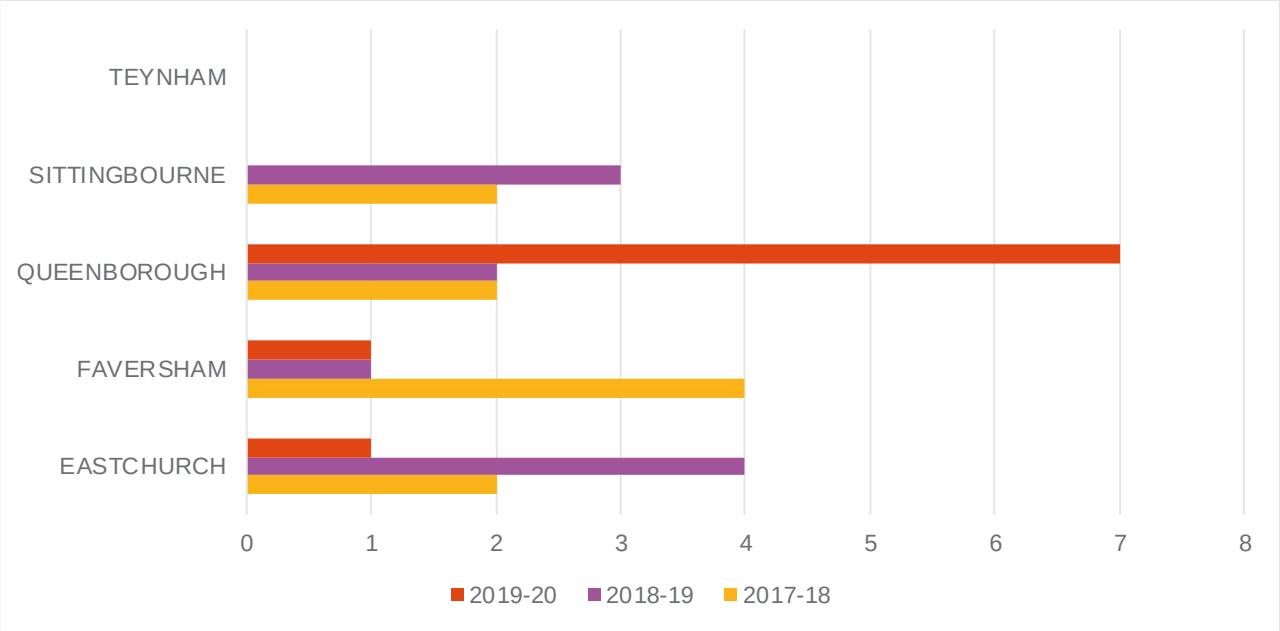


Sewer collapses and rising main bursts

Figure 4 shows the number of sewer collapses and rising main bursts recorded by our Sewer Incident Reporting for public sewers in the North Kent river basin catchment over the last three years. Rising mains contain wastewater that is pumped under pressure from our wastewater pumping stations towards the treatment works.

The majority of these collapses and bursts were in Queenboroough, Eastchurch and Faversham. A collapse or burst can result in a discharge to the environment or flooding. We have an ongoing programme to inspect (by CCTV), replace or refurbish ageing sewers at high risk of collapse or where bursts are likely.

Figure 4: Number of incidents of sewer collapses and rising main bursts in the North Kent River Basin by sewer catchment



Flooding Incidents

The most common cause of flooding is from blockages of debris such as wet wipes. However, flooding can also occur in wet weather when the sewerage system becomes overloaded due to rainwater entering the sewer system.

Within the North Kent river basin catchment, several of our sewer catchment have both separate and combined sewer systems to carry wastewater. Combined systems convey both sewage from homes and businesses as well as rain and storm water collected from roofs and hard paved areas. During heavy rainfall, the capacity of combined sewers can be exceeded and lead to localised flooding as a result of the water backing up the system to the closest available escape route: manhole, toilet, sink, basement etc. In some combined sewer systems where flooding of properties could occur in heavy rainfall, there are built in overspill weirs, called storm overflows, which release excess water into rivers to prevent flooding of homes or businesses. Storm overflows (also known as Combined Sewer Overflows) are permitted by the Environment Agency to operate in certain conditions. The majority of storm overflows have equipment installed to record the number of times that water passes through the storm overflow. We monitor these carefully and report this information to the Environment Agency. There are 38 combined sewer overflows in the North Kent catchment.

Figures 5 and 6 show the number of internal and external flooding incidents respectively over the last 3 years in the North Kent catchment. For the purpose of the DWMP, sewer flooding is defined as incidents caused by an escape of water and sewage from a public sewer due to a blockage, sewer collapse, rising main burst, equipment failure or from too much water entering the system (known as hydraulic overload). Importantly, the definition of sewer flooding excludes extreme storms with a probability of occurring of less than once in 20 years (i.e. less likely than a 5%

chance in any given year). Internal flooding occurs inside a building or cellar, whilst external flooding occurs within a curtilage (garden) or on a highway or public space.

Of the 60,962 homes connected to the 5 sewer systems within the North Kent river basin, 1 properties experienced some form of internal flooding (including sewage backing up into a bath or shower tray) during the financial year 2019-20. This figure is down from 17 properties that experienced flooding in 2017-18. The data shows there have been an increase in the number of floods from the sewer network in the Queenborough catchments which we are targeting in our flooding reduction programme.

Figure 5: Internal Sewer Flooding within properties by sewer catchment (number of incidents)

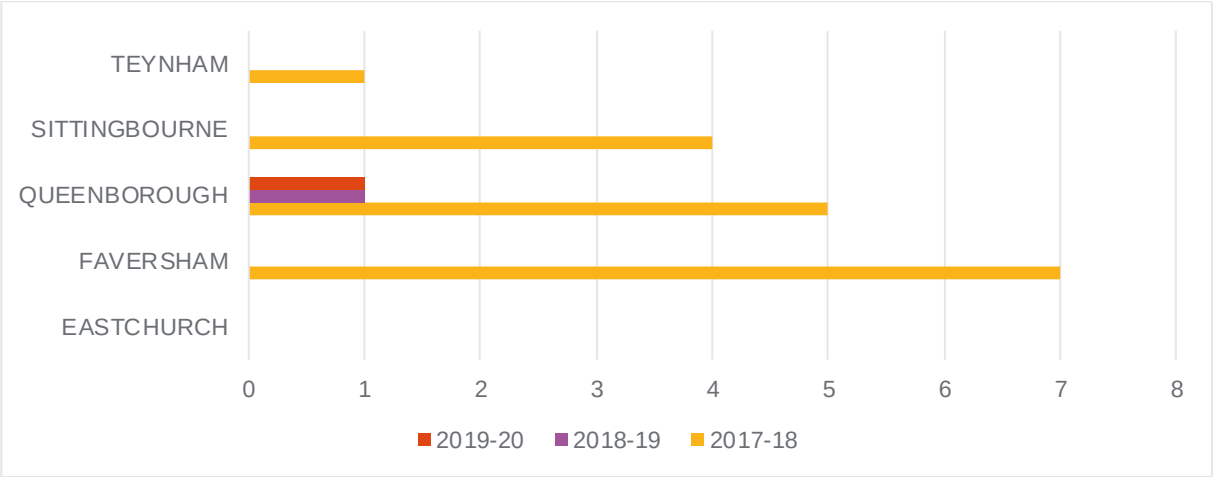
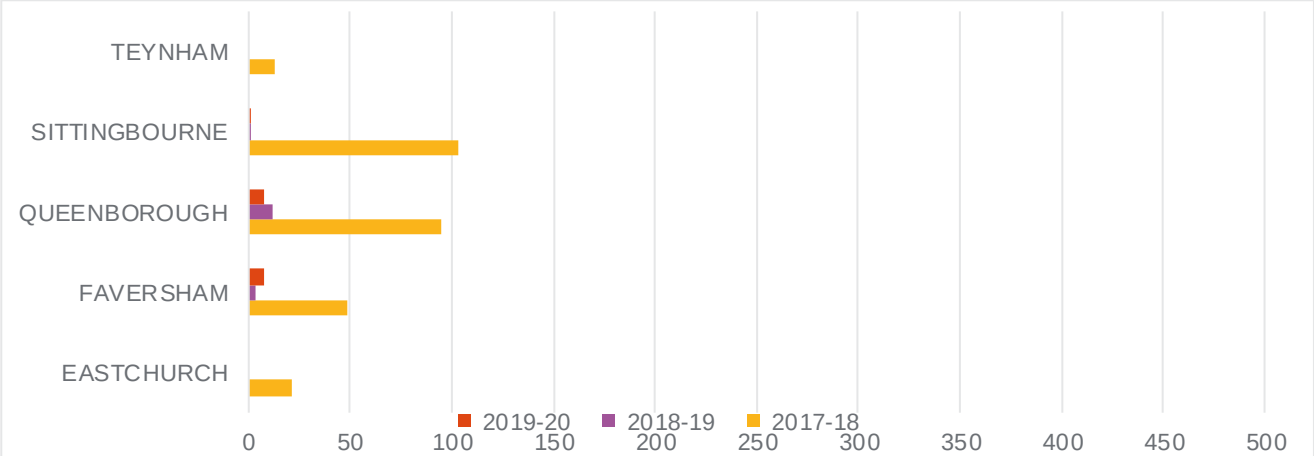


Figure 6: External Flooding within the curtilage of a property (not inside) by sewer catchment in the North Kent river basin (number of incidents)



Within the North Kent catchment, we estimate that there are approximately 16 properties currently at risk of internal sewer flooding in any given year due to overloading of the sewers by rainwater in a storm.

Pollution Incidents

Reducing the number of pollution incidents is a priority for us, our customers and our stakeholders. We have set the target to reduce the number of pollution incidents across the whole of our operating region to 79 incidents by 2024-25, and our aim by 2040 is to have zero pollution incidents. To achieve this we have created an extensive pollution incident reduction plan with the Environment Agency to significantly reduce pollution over the next five years in line with industry targets.

Pollution incidents connected with our wastewater assets (e.g. blocked sewers, pump failures) are reported to the Environment Agency.

The impact an incident has on the environment is categorised into one of four categories using the Common Incident Classification System (CICS). More information on the classification system can be found on the Ofwat website here. There are four categories for pollution incidents: 1 (major), 2 (significant), 3 (minor) or 4 (no pollution). Only category 1, 2 and 3 pollutions are reportable.

We continue to investigate the root causes of pollution incidents. Our improvements in monitoring of assets and data collection are informing our Pollution Reduction Programme and resulting in more pollutions being prevented. We have also strengthened our incident response team and arrangements to improve our response and reporting of a potential pollution incident.

In addition, our new Environment+ programme looks at all aspects of environmental compliance and performance. Our focus on wastewater treatment works compliance will bring about improved river quality, reduced pollution incidents and flooding, and enhance bathing water quality.

We publish pollution data in our Annual Report and on our website. However, we are not yet at the stage where we can publish that data in greater detail or make further detail publically available. To do so would also require the agreement of the Environment Agency as they provide some of the information. We are currently being investigated by the Environment Agency in relation to pollution events, and the management of some of our wastewater treatment works, so what we can say about these at this time is limited.

Wastewater Treatment Works Compliance with Permits

The Environment Agency sets limits on the quality and quantity of recycled water from WTWs entering rivers or the sea so the water does not cause an unacceptable impact on the environment. The flow that may be discharged in dry weather (known as Dry Weather Flow) is one of these limits. Dry weather flow (DWF) is the average daily flow to a wastewater treatment works during a period without rain. Exceedances of the DWF can be caused by a number of factors, but it can be due to the additional flow from new development in the sewer catchment. To enable further development, we work with planning authorities to understand where future development is planned and include growth schemes in our investment programme so we can increase the capacity of WTWs and continue to comply with our permits in the future.

We must comply with permits issued by the EA. Where we do not meet the permit requirement, we call this a compliance failure.

We are investing in improved operational resilience to maintain wastewater treatment compliance at a high standard by achieving 99.0% as a minimum, but continuing to aim for 100% compliance.

In the North Kent catchment, there have been no water quality compliance failures over the last three years.

Southern Water
October 2022

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