

# Drainage and Wastewater Management Plan (DWMP)

## Overview of the Arun and Western Streams River Basin Catchment

October 2022  
Version 2

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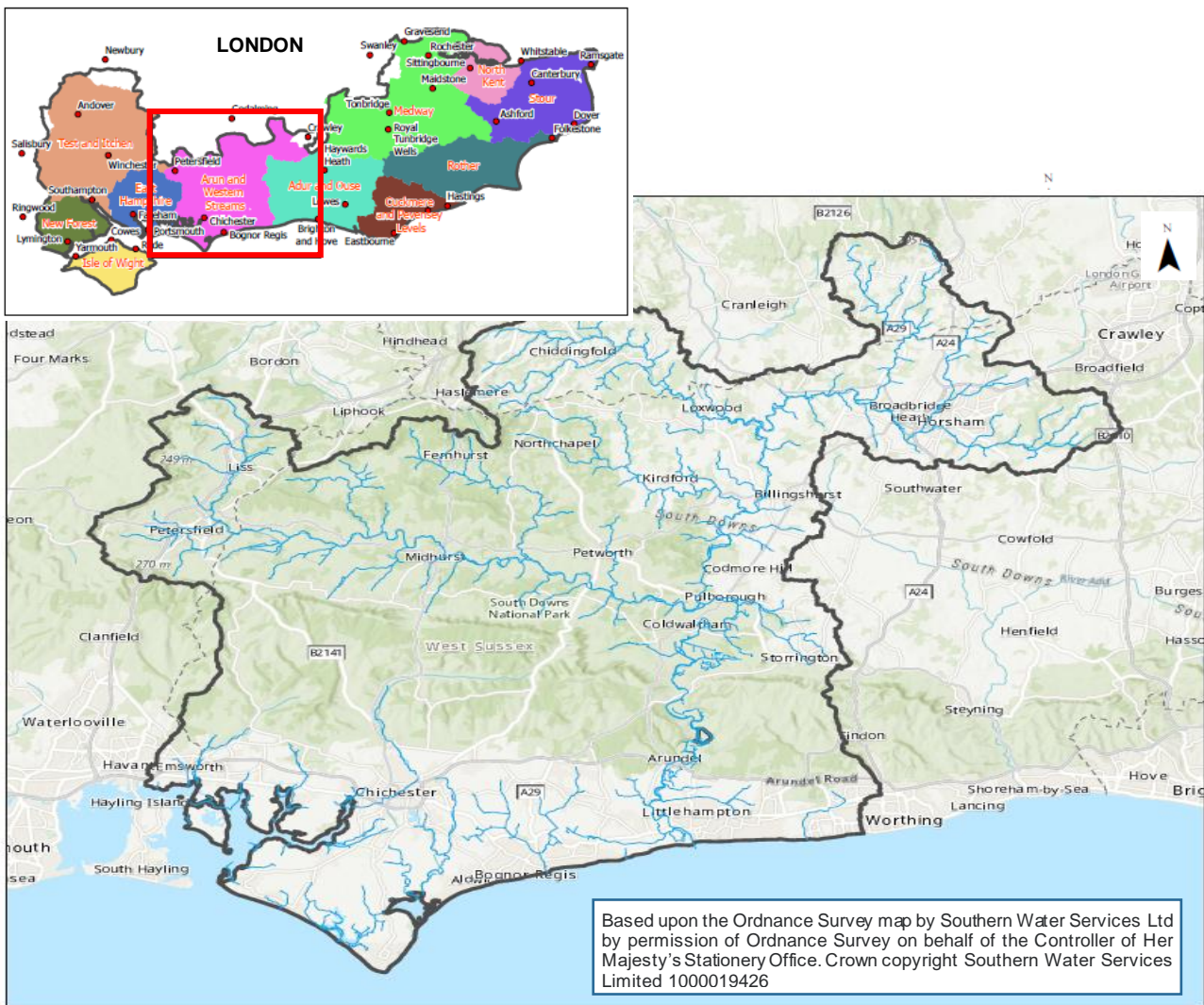


from  
**Southern  
Water** 

# Overview of the River Arun and Western Streams Catchment

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 Arun and Western Streams river basin catchment is shown in figure 1.

Figure 1: The Arun and Western Streams river basin catchment



The Arun and Western Streams river basin catchment includes the River Arun, the Western Rother, and several small coastal streams which feed into Pagham and Chichester Harbours.

The River Arun rises from the chalk ridge of the South Downs National Park near Horsham, a historic market town in West Sussex. It flows south to Pulborough where it is joined by its major tributary, the Western Rother. At this point, the river becomes the tidal Arun and it continues to flow south until it enters the sea at Littlehampton. The basin also includes the catchments of several smaller streams to the west of the River Arun that discharge directly into Chichester Harbour. These include the Aldingbourne Rife; the Rifles surrounding Selsey and East Wittering; the River Lavant, the Bosham Stream and the River Ems.

The catchment has some major towns such as Petersfield, Midhurst, Pulborough and Horsham to the north of the South Downs, and Littlehampton, Bognor Regis and Arundel on the coastal plain. The only city is Chichester, the county town of West Sussex.

Most of the watercourses have been heavily modified over the years. For example, the land beside the middle reaches of the Arun and Western Rother was drained to provide fertile agricultural land from the original marshes and the lower reaches of the Arun were drained and dredged for navigation. In Roman times the River Lavant was diverted through Chichester to provide water.

The geology of the catchment varies from the hills and steep scarp slopes of the South Downs, to the gently rolling hills of the Low Weald and the wide Arun valley floodplain south of Pulborough. Flow characteristics of the rivers vary correspondingly, with fast flowing streams emerging from the High Weald area to the north, flowing into the low-lying coastal plain where the gradient is less and the river flows are much slower. From Pulborough, the lower parts of the River Arun are tidal.

Much of the area is recognised for its environmental and cultural value and includes the South Downs National Park and Chichester Harbour Area of Outstanding Natural Beauty. There are many valuable natural habitats in the area, such as the spring fed floodplain marshes and wetlands of the Arun Valley south of Pulborough, designated as a Special Area of Conservation (SAC) and Special Protection Area (SPA) under national, international and European law. Chichester Harbour is part of the Solent Maritime SAC and is of particular importance for over-wintering wildfowl and waders. Pagham and Langstone Harbours, internationally recognised for their flora and fauna, are designated SPAs and Ramsar Sites. Chichester is also a Site of Special Scientific Interest (SSSI). There are also numerous other SAC designations along the Western Streams.

The catchment is also vital for business and recreation. The majority of land is used for agriculture. During the summer, farmers graze their livestock on the floodplains and use the grasslands to produce hay and silage for the winter. The catchment's valleys and the Chichester Plain are important for salad crops, potatoes, glasshouse production and horticulture.

Chichester Harbour with its historic villages and yachting marinas is a major tourist attraction as are the catchment's country homes and castles. There are numerous angling clubs and associations and anglers are probably the main recreational users. Bird watchers, walkers and ramblers are attracted to the area so access to the rivers is essential as well as having safe launching places for small boats and canoes.

## 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.

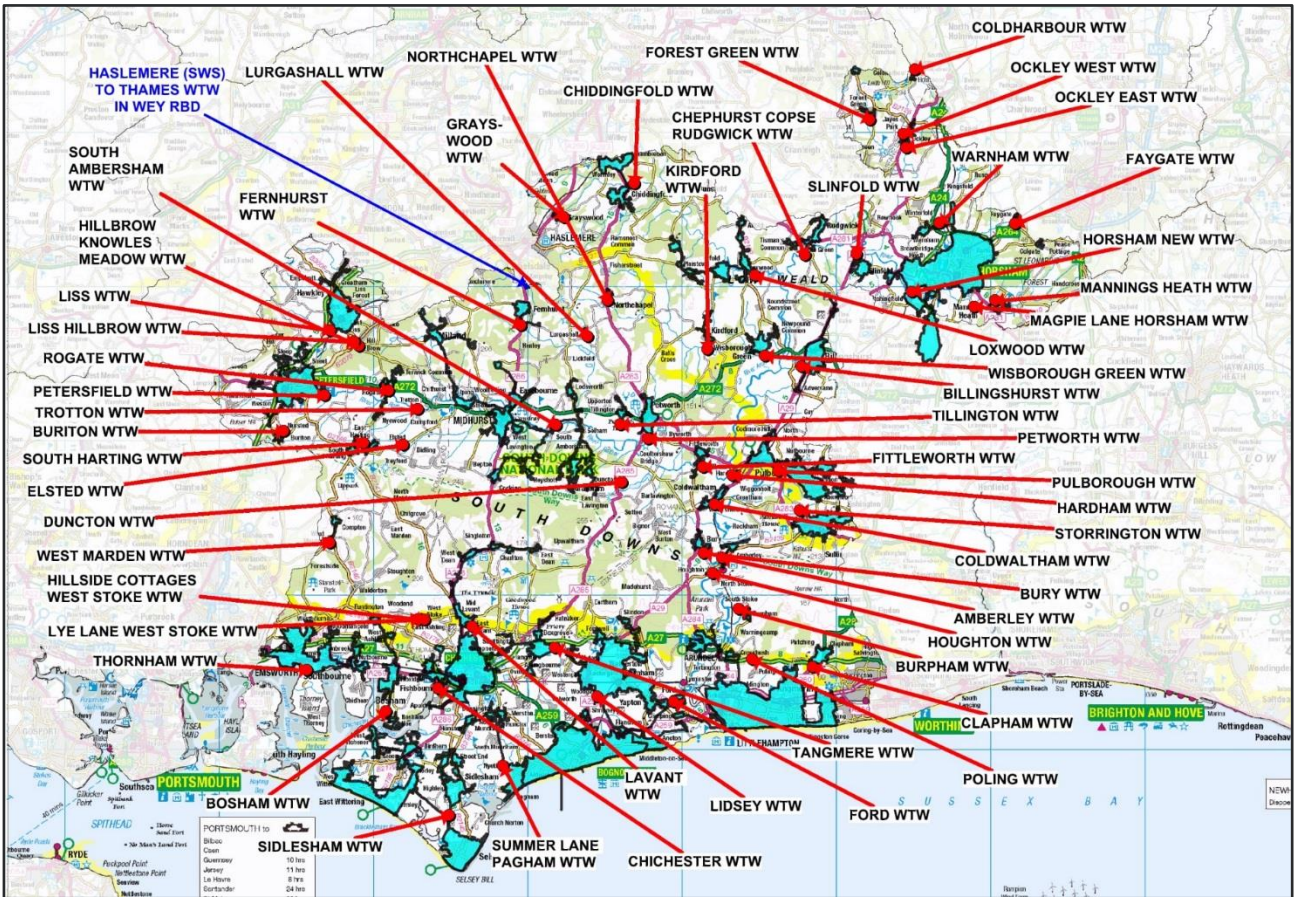
All these systems provide essential services to protect the economy and environment, and ensure public health, safety and hygiene. The links between water use and the management of wastewater is important to protect the wider environment. This excellent independent short film, called "[The Drip](#)",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

In the Arun and Western Streams river basin catchment, we own and operate 59 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 treatment 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 1,433km<sup>2</sup> of land only 169km<sup>2</sup> (approximately 12%) is covered by our sewer catchments. However, of the 205,238 residential properties and 10,407 businesses within the Arun and Western Streams catchment, 93% of the homes and 83% 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 Arun and Western Streams Catchment showing the sewer catchment areas (in blue) and locations of the WTWs



There are 56 WTWs within the Arun and Western Streams river basin catchment with 59 sewer catchments, one of which, Colgate, is a private WTWs, and the remaining two catchments, Colgate Thames and Guildford, drain to Thames Water. More than 4,019km of wastewater pipes serve the catchment with 527 pumping stations within the network to pump sewage to the 56 WTWs for recycling the water back into the rivers or the sea. Table 1 provides a summary of the 59 sewer catchments within the Arun and Western Streams 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 water recycling centre needs to process, 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: Sewerage Catchments in the Arun and Western Streams River Basin**

Sewer Catchment Ref	Sewer Catchment Name	Communities Served	Population Equivalent	Length of sewers (km)
FORW	FORD	Arundel, Amberley, Crossbush, Houghton, Slindon, Walberton, Yapton, Bognor Regis, Felton, Middleton on Sea, North Bearsted, Pagham, Rose Green, South Bearsted, Littlehampton, Angmering, Climping, East Preston, Wick, Rustington, Ferring, Middleton on Sea, Lyminster.	130,053	1,131.729
HONE	HORSHAM NEW	Horsham, Broadebridge Heath, Christs Hospital, Colgate, Coolham, Cowfold, Dial Post, Itchingfield, Kingsfold, Lower Beeding, Partridge Green, Rudgwick, Rusper, Slinfold Southwater, Faygate	77,717	617.831
CHIC	CHICHESTER	Chichester, Aldingbourne, Apuldram, Birdham, Bosham, Boxgrove, Bracklesham Bay, Chilgrove, Compton, Earmley, East Ashling, East Wittering, Eastergate, Fishbourne, Goodwood, Hambrook, Hunston, Lavant, Norton, Nutbourne, Oakwood, Oving, Runcton, Sidlesham Common, Sidelsham, South Mundham, Tangmere, Walderton, West Stroke, West Wittering, Stockbridge, Westhampnett, Bosham, West Broyle	36,364	221.286
SIDL	SIDLESHAM	Chichester, Birdham, Bracklesham Bay, Earmley, West Wittering, Itchenor, Selsey, Sidelsham Common, Almodington, Highleigh	28,121	272.693
LIDS	LIDSEY	Arundel, Slindon, Walberton, Yapton, Bognor Regis, Chichester, Eastergate, Norton, Westergate, Woodgate, Aldingbourne, Barnham, Fontwell, Middleton on Sea, Flansham, Ford, Climping, Slindon Common, Elmer	25,323	199.746
THOR	THORNHAM	Emsworth, Prinsted, Southbourne, Thorney Island, Woodmancote, Nutbourne, Hambrook, Westbourne, Chidham, Bosham, Chichester, Havent	20,918	215.890
PETE	PETERSFIELD	Liss, Empshott, Greatham, Hill Brow, Langley, Petersfield, Buriton, Ditcham, East Meon, Foxfield, Langrish, South Harting, Steep Marsh, Steep, Stroud, Trotton, Weston, Buriton, Steep Marsh	20,540	214.081
SOAM	SOUTH AMBERSHAM	Midhurst, Bepton, Easebourne, Heyshott, Ping, Penedean, Redford, Stedham, Wwest Lavington, Graffham, Lavington Park, Lodsworth, Selham, Tillington, Ambersham, Milland, Lodsworth, Stedham	13,225	180.859
PULB	PULBOROUGH	Pulborough, Bignor, Bury, Fittleworth, North Heath, Sutton, Watersfield, West Chilington, Pulborough, Thakeham, Codmore Hill, Storrington	8,693	101.341

PAGM	PAGHAM	Hunston, Chichester, North Mundham, Runcton, Bognor Regis, Pagham, Rose Green	8,253	112.015
STOR	STORRINGTON	Pulborough, Ashington, Storrington, Thakeham, Washington, Cootham	7,607	63.561
BILL	BILLINGSHURST	Billingshurst, Five Oaks, Ifold Loxwood, Loxwood, Parbrook, The Haven, Wisborough Green, Adversane	7,434	79.575
LISS	LISS	Liss, Greatham, Hawkley, Hill Brow	6,127	83.151
TANG	TANGMERE	Halnaker, Maudlin, Oving, Tangmere, Boxgrove, Westhampnett, Chichester.	4,512	44.986
BOSH	BOSHAM	Bohsam, Funtington, West Ashling, Chichester	3,587	53.203
LOXW	LOXWOOD	Billingshurst, Loxwood, Plaistow, Ifold Loxwood, Alford, Dunsfold, Wisborough Green	3,448	59.619
CHID	CHIDDINGFOLD	Goldalming, Hambledon, Chiddingfold, Hambledon	3,032	40.225
PETW	PETWORTH	Petworth, Balls Cross, Graffham, Lodsworth, North Chapel	2,690	26.982
LAVA	LAVANT	Charlton, Chichester, East Dean, Lavant, Singleton, West Dean Park, Binderton	2,421	42.410
RUDG	CHEPHURST COPSE RUDGWICK	The Haven, Billingshurst, Rudgwick, Horsham	2,249	24.929
FERN	FERNHURST	Fernhurst, Haslemere	1,871	15.378
WAAM	WARNHAM	Warnham, Horsham, Rowhook	1,192	12.902
HAND	HANDCROSS	Slaugham, Handcross, Haywards Heath	1,129	7.614
WISB	WISBOROUGH GREEN	Wisborough Green, Billingshurst, Ifold Loxwood	1,120	22.031
MANN	MANNINGS HEATH	Mannings Heath, Horsham	1,008	14.456
ROGA	ROGATE	Nyewood, Rogate, Petersfield	933	13.433
HATG	SOUTH HARTING	East Harting, South Hartng, Petersfield	911	12.043
COLW	COLDWALTHAM	Coldwaltham, Watersfield, Pulborough	805	10.345
FITT	FITTLEWORTH	Fittleworth	698	11.574
KIRD	KIRDFORD	Kirdford	688	11.142
NORT	NORTHCHAPEL	Northchapel	597	5.402
BURI	BURITON	Buriton	504	7.176
AMBE	AMBERLEY	Houghton, Amberley	501	10.966
CLAP	CLAPHAM	Patching, Clapham	458	9.604
GRAY	GRAYSWOOD	Graywood, Haslemere	457	2.945
BURY	BURY	Bury	455	9.313
TILL	TILLINGTON	Tillington, Upperton	348	7.065
OCKW	OCKLEY WEST	Ockley	287	4.343
WESM	WEST MARDEN	Compton, Walkderton, West Marden	275	5.674
FAYG	FAYGATE	Faygate	265	1.311
FOGR	FOREST GREEN	Foirest Green	250	3.877
OCKE	OCKLEY EAST	Ockley	180	2.839



LURG	LURGASHALL	Lurgashall	174	1.966
BURP	BURPHAM	Burpham, Wepham	141	5.987
COLH	COLDHARBOUR	Coldharbour	135	3.423
TWCG	COLGATE THAMES	Colgate	132	0.817
TWGU	GUILDFORD WTW	Holmbury St Mary	102	1.111
TROT	TROTTON	Trotten	90	0.673
HOUG	HOUGHTON	Houghton	87	1.773
DUNC	DUNCTON	Duncton	74	0.385
POLI	POLING	Poling	54	0.026
WESS	WEST STOKE	West Stoke	53	0.279
HBKM	HILLBROW KNOWLES MEADOW	Hill Brow	52	0
LIHB	LISS HILLBROW	Hill Brow	49	0.850
HOML	MAGPIE LANE HORSHAM	Horsham	35	0.473
TWCP	COLGATE PRIVATE	Colgate	28	0
ELST	ELSTED	Elsted	25	0.447
HARD	HARDHAM	Hardham	23	0.017
WSHC	HILLSIDE COTTAGES WEST STOKE	West Stoke	14	0.063

Of the 56 WTWs in the catchment, seven systems serve more than 30,000 population equivalent per day.

Ford WTW serves just under 130,053 people living in the area. The sewerage systems includes 96 wastewater pumping stations in the network to transport the water through the sewers from homes and businesses to the treatment works. The works is permitted to discharge just over 37764m<sup>3</sup> per day of recycled water.

Horsham New WTW serves more than 77,717 people within Horsham catchment. The sewerage systems includes a large gravity sewer networks and 28 pumping stations in the network to transport the water through the sewers from homes and businesses to the treatment works. There are four Pumping station are followed by a rising main longer than 1km. The works is permitted to discharge just over 16500m<sup>3</sup> per day of recycled water.

Chichester WTW serves a population equivalent of 39,634 for the city of Chichester and surrounding villages. The sewerage networks are mixed gravity and rising mains with 19 wastewater pumping stations. The works is permitted to discharge just over 13524m<sup>3</sup> per day of recycled water.

Sidlesham WTW is wide rural area dotted with coastal and inland villages serves a population equivalent of 26,121 people within Selsey, Bracklesham, Wittering, West Itchenor, Birdham, Somerley and Sidlesham areas. The sewerage networks are gravity sewers and rising mains. There are 42 wastewater pumping stations in the catchment. Sewage is from some parts of the catchment is relayed by several pumping stations sometimes up to 5 times. The total length of



rising mains are in excess of 32 km. The works is permitted to discharge just over 58m<sup>3</sup> per day of recycled water.

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 56 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.

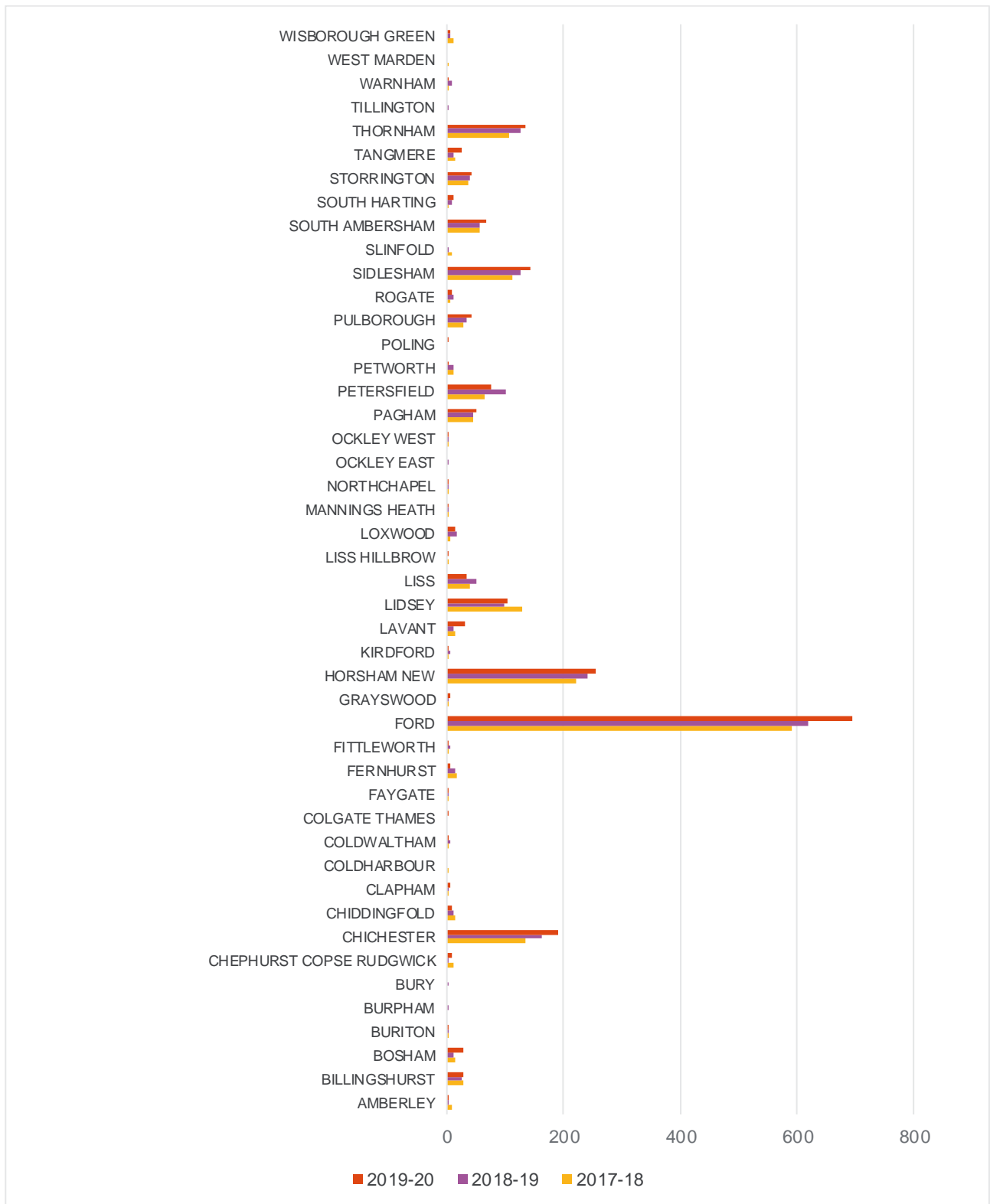
### Sewer Blockages

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 Arun and Western Streams river basin catchment. 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. Ford, followed by Horsham New and Chichester, had the highest number of blockages.

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 Arun and Western Streams river basin catchment**



## Sewer collapses and rising main bursts

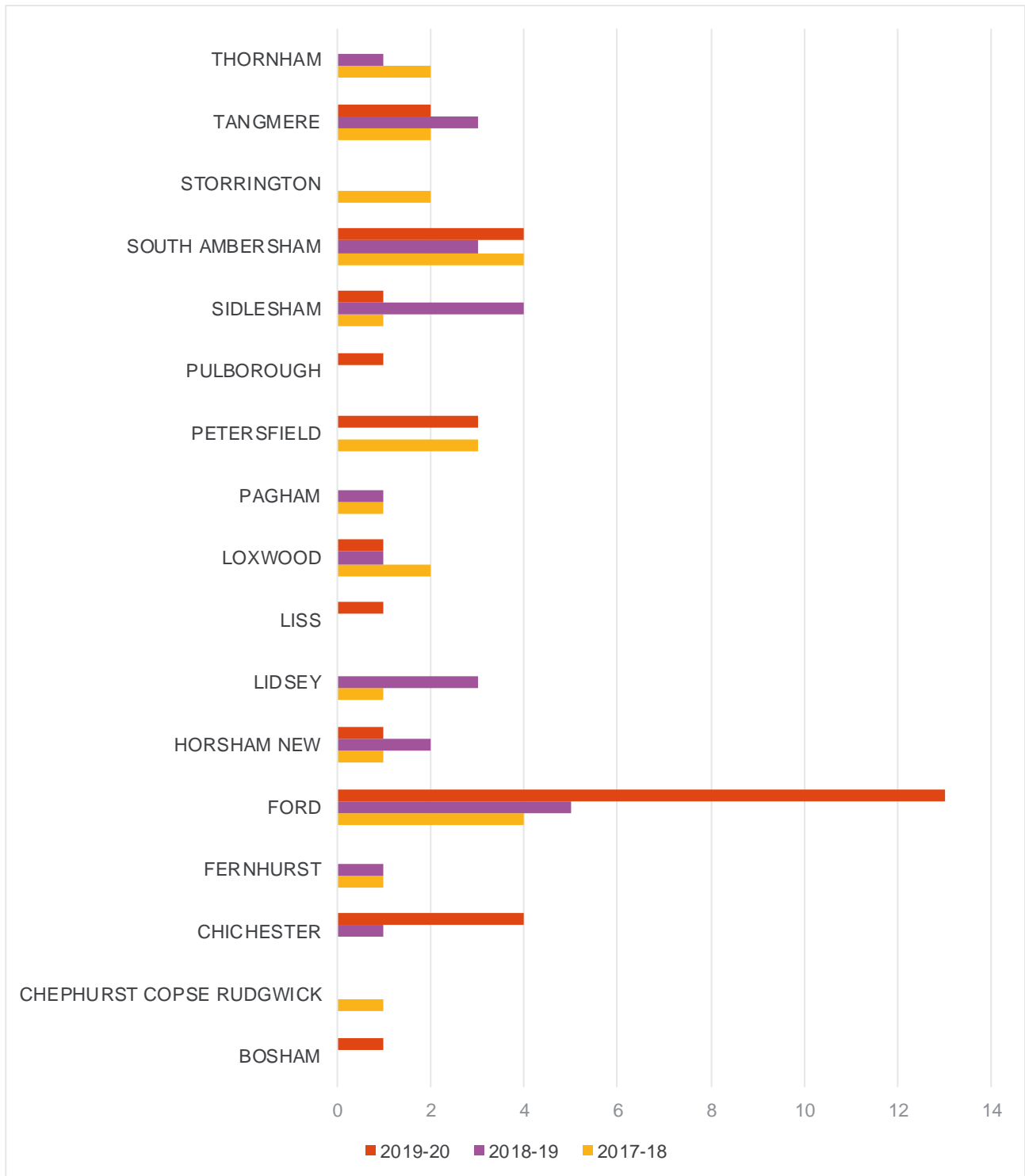




Figure 4 shows the number of sewer collapses and rising main bursts recorded by our Sewer Incident Reporting for public sewers in the Arun and Western Streams river basin catchment over the last three years. (Note: catchments with no incidents are not shown in the graph). Rising mains contain wastewater that is pumped under pressure from our wastewater pumping stations towards the treatment works.

The majority of these collapses and bursts were in Ford, South Ambersham and Chichester. 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 Arun and Western Streams 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.

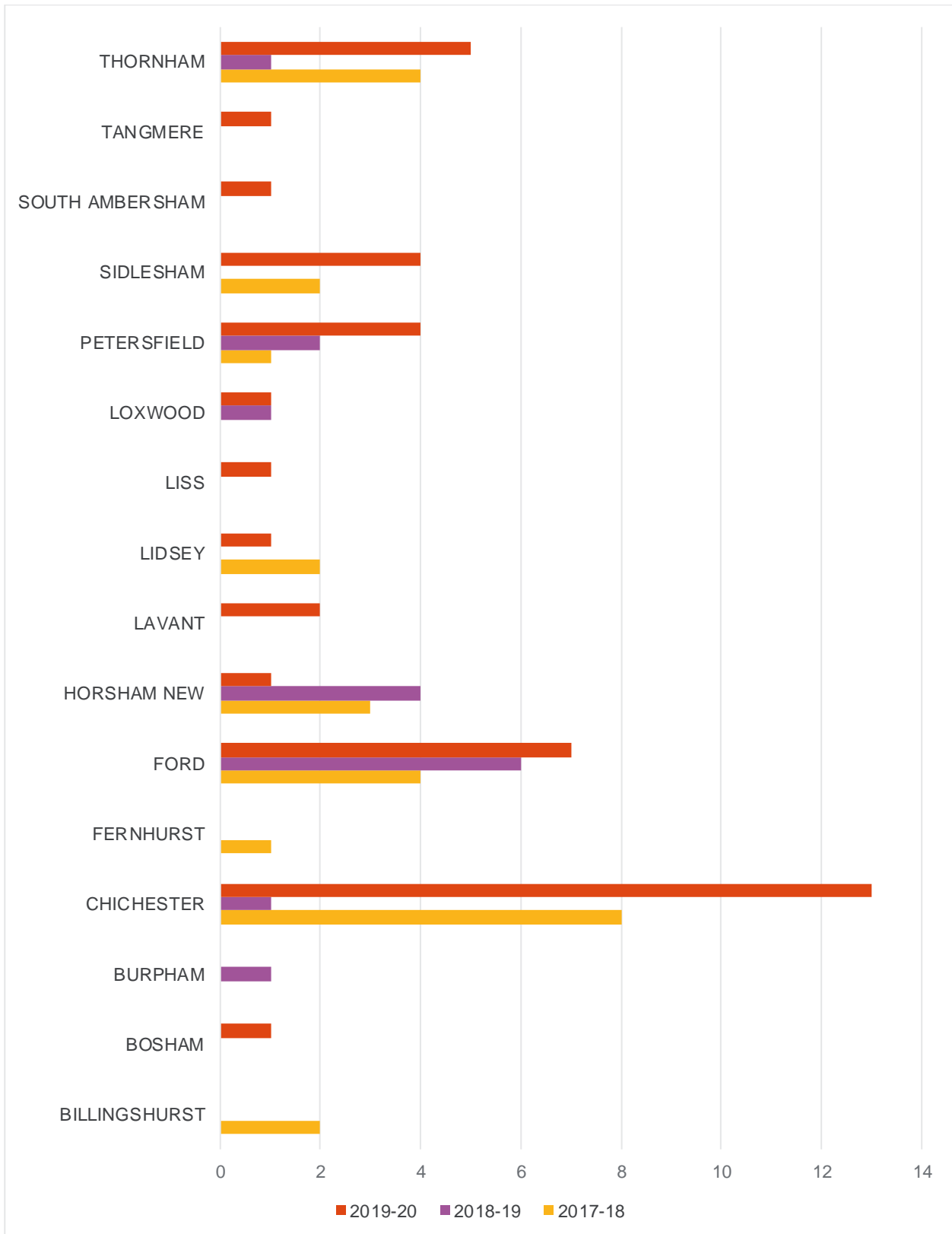
Within the Arun and Western Streams river basin catchment, several of our sewer catchment have both separate and combined sewer systems to carry wastewater. Combined systems convey both sewage from homes and businesses as well as rain and storm water collected from roofs and hard paved areas. During 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 86 combined sewer overflows in service in the Arun and Western Streams catchment.

Figures 5 and 6 show the number of internal and external flooding incidents respectively over the last 3 years in the Arun and Western Streams 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.

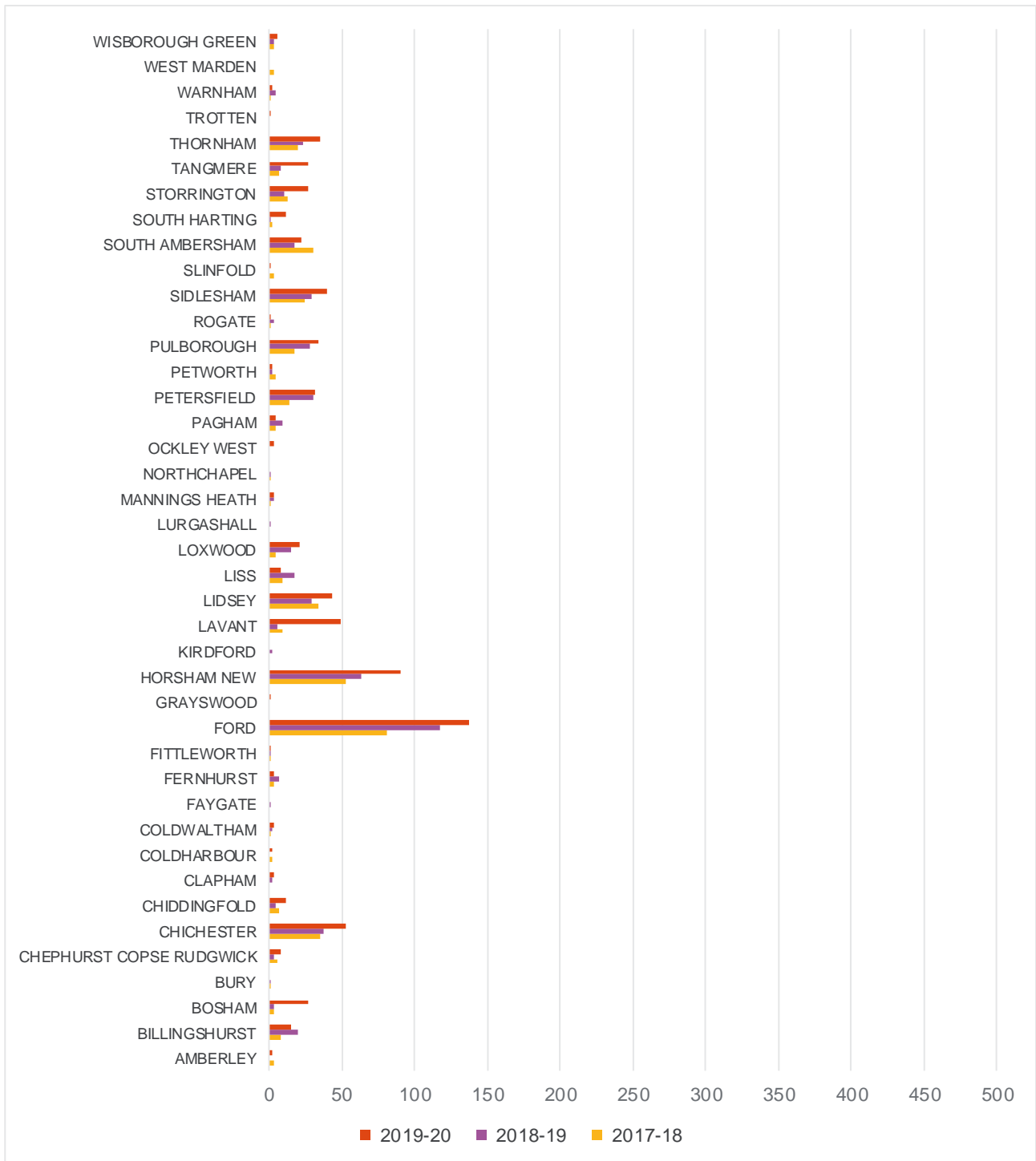
Of the 205,238 homes connected to the 69 sewer systems within the Arun and Western Streams river basin, 59 properties experienced some form of internal flooding (including sewage backing up into a bath or shower tray) during the financial year 2019-20. This figure has increased from 27 properties that experienced flooding in 2017-18. The data shows there have been an increase in the number of floods from the sewer network in the Bury, Guildford WTW, Mannings Heath and Pagham 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 Arun and Western Streams river basin (number of incidents)**



## 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 Arun and Western Streams catchment, there have been no water quality compliance failures over the last three years.

**Southern Water**  
October 2022

Version 2

