# Drainage Strategy – North East Kent


Southern Water

# Executive summary

**The Drainage Strategy for North East Kent focuses on the current pressures and future challenges that will impact on the sewerage network and wastewater treatment works serving Margate, Broadstairs, Ramsgate, Minster, Sandwich and Deal.**

It will enable us to take a more strategic approach to drainage planning across the area, providing a long-term (25-year) strategy to ensure we deliver a reliable and sustainable wastewater service for the region while accommodating population growth, new development, climate change and higher environmental quality standards.

## Long-term outcomes

Our five-year Business Plan 2015 to 2020 sets out details of the improved water and wastewater services we will provide in the future. It was developed as a result of the company's biggest ever consultation programme which included feedback from more than 34,000 customers and stakeholders.

The business plan is built around the delivery of six outcomes which our customers and stakeholders told us were their priorities. For each outcome, we have developed a clear set of promises that detail what we will achieve for our customers. Three of these outcomes are relevant to the Drainage Strategy for North East Kent and are shown in Figure 1 below alongside the relevant promises associated with them.

## Current issues and future challenges for North East Kent

Over the next 25 years, population growth in North East Kent is expected to result in a 15 per cent increase in domestic properties connecting to our sewers. Climate change and urban creep are expected to increase surface water flows in our sewers which means more domestic properties would be at risk from surface water flooding.

For 2016, the Thanet region was awarded seven 'Blue Flag' awards for its beaches. Maintaining and improving bathing water quality is essential for encouraging tourism and supporting economic prosperity in the region. Rivers and groundwater bodies in the catchment were classified as 'poor' to 'moderate' status in 2015 according to the Water Framework Directive (WFD) and require improvement to 'good' status by 2027. Partnership working will be key to achieving the higher environmental standards required under the WFD.

We are assessing a range of traditional engineering and alternative strategies to tackle the current drainage issues and future risks that have been identified for the area.

**Figure 1. Outcomes of relevance to the Drainage Strategy for North East Kent**

**Removing wastewater effectively**

- *Minimising flooding due to wastewater and surface water with a 25% reduction in internal sewer flooding incidents by 2020*

**Looking after the environment**

- *Minimising pollution from wastewater including zero serious (Cat. 1 & 2) pollution incidents by 2020 and a halving of minor (Cat. 3) incidents by 2017*
- *Maintaining wastewater treatment works compliance by ensuring that any releases to the environment comply with permit conditions*
- *Maintaining 'excellent' bathing water quality and improving other bathing waters*

**Better information and advice**

- *Improved advice on how to prevent blocked drains to help reduce blockages*

We are also investing in the development of innovative techniques that will bring a significant improvement to our capabilities and performance. Potential strategies are being assessed against whole life costs, constraints and benefits to both the environment and stakeholders.

Table 1 below describes the key outcomes at risk from some of these issues and challenges alongside the potential strategies which could be implemented to reduce the risk.

**Table 1. Key outcomes at risk and potential strategies for the North East Kent region**

| Key outcomes | Risk | Potential strategies |
|---|---|---|
| **Minimising flooding and pollution due to wastewater** | Insufficient network capacity to accommodate new wastewater connections due to population growth | • *Upsize sewers and pumps as required*<br>• *Provide additional capacity in combined sewers for wastewater by reducing surface water flows* |
| **Minimising flooding and pollution due to surface water** | Insufficient network capacity to accommodate additional surface water flows due to climate change and urban creep | • *Upsize surface water and combined sewers and pumps as required*<br>• *Delivery of Surface Water Management Plans*<br>• *Encourage the take-up of sustainable drainage systems (SuDS) by others and retrofitting of SuDS in urban areas*<br>• *Separation of surface water from foul water in combined sewers*<br>• *Provision of stormwater tanks in the network* |
| **Maintaining compliance with permits at our treatment works** | Insufficient treatment capacity to accommodate population growth | • *Provide additional treatment capacity at the works as required*<br>• *Transfer wastewater to other treatment works with spare capacity* |
| **Improving water bodies to 'good' status by 2021 or 2027 and improving bathing waters** | Diffuse urban and rural pollution | • *Implementation of Integrated Water Cycle Management (IWCM) and working with Local Authorities, Highways Authorities, Environment Agency and landowners to reduce pollution* |
| | Pollution due to insufficient network capacity to accommodate additional flows | • *Minimise pollution due to additional wastewater, surface water and groundwater flows using the potential strategies described above* |

## Next steps

We will update and revise this Drainage Strategy as we consult with our customers and stakeholders in the region. We will continue to consult with the local community to gain important feedback from our customers and local stakeholders which we will use to shape our preferred solutions.

We have already begun discussions with our regional drainage partners. We will work collaboratively to agree and implement a preferred strategy and to develop a joint implementation plan to ensure a reliable and effective wastewater service for the region in the long-term.

# Contents

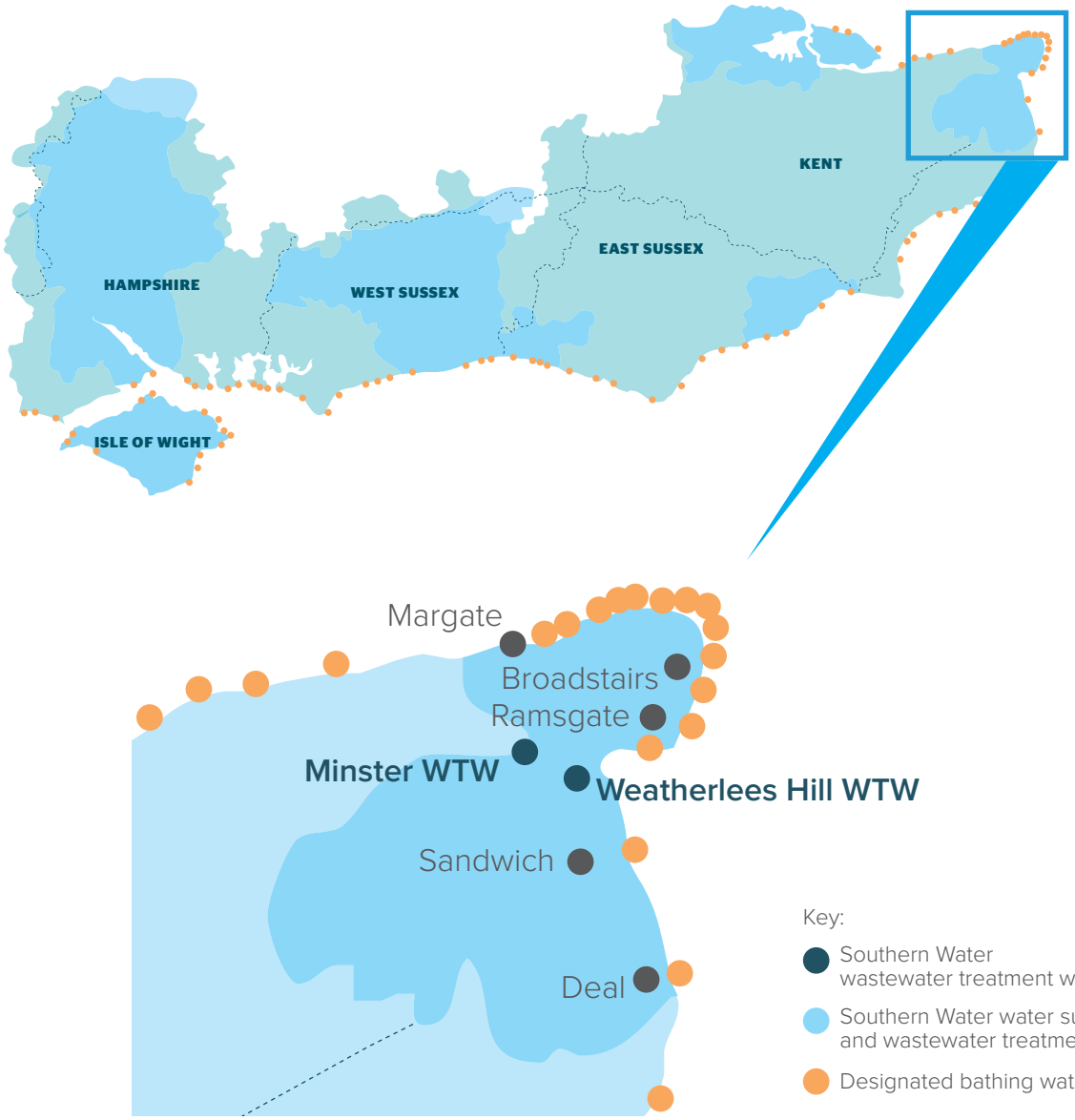
# 1. Introduction

**North East Kent benefits from a high quality environment which includes seaside towns, rural landscapes, 'excellent' bathing waters and rare habitats.**

We collect and treat wastewater from three catchments in the region which covers a total area of 54km$^2$. Figure 2 shows the location of the North East Kent area which includes the towns of Margate, Broadstairs, Ramsgate, Minster, Sandwich and Deal. The combined population of the region is approximately 180,000 which can increase by an additional 13,000 people during the peak holiday season. The majority of the region falls within the administrative boundary of Thanet District Council whilst Sandwich and Deal fall within the Dover District Council area. Kent County Council are the Lead Local Flood Authority and Highways Authority for the region.

Our customers expect us to remove and treat wastewater effectively now and for future generations whilst looking after the natural environment in which we operate. By developing this Drainage Strategy, the first in the Southern Water region, we will be better able to deliver sustainable solutions for our customers, stakeholders and the environment.

Figure 2. Location of the North East Kent area



# 2. What is a Drainage Strategy?

**The Drainage Strategy for North East Kent will enable us to take a more strategic approach to drainage planning across the area.**

It will provide a long-term (25 year) strategy to ensure a reliable and sustainable wastewater service for the region while accommodating population growth, new development, climate change and higher environmental quality standards.

To assist in the development of this strategy, we have adopted the Drainage Strategy Framework (Environment Agency et al., 2013), outlined in Figure 3. This framework recommends a four-stage planning process when preparing drainage strategies. This is a similar planning process to that used in the development of surface water management plans.

The North East Kent Drainage Strategy currently covers the first (initialise/prepare) and second (risk assessment) stages. Our current activities as part of stage three include an options appraisal of both traditional and alternative strategies which we will be undertaking in collaboration with our key local drainage partners.

A Drainage Area Plan (DAP) for Weatherlees Hill 'A' and 'B' Wastewater Treatment Works (WTW) is currently underway in 2016–17, the results of which will be incorporated into the Drainage Strategy once complete.

Figure 3. Four stage process for the development of Drainage Strategies

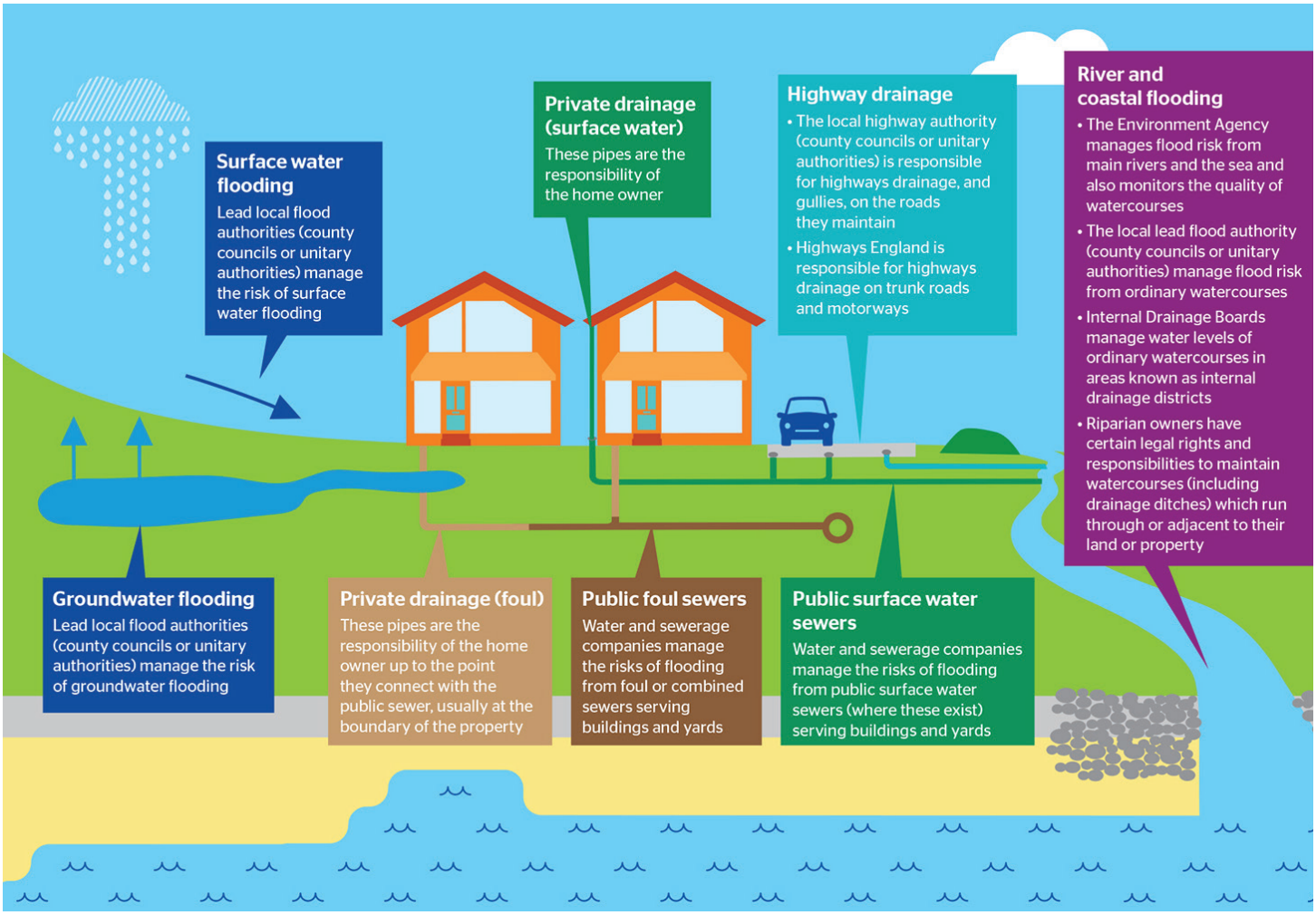
# 3. Working in partnership

**To ensure we develop and implement the most effective and sustainable strategies, we will need to work in partnership with other organisations who also have important drainage responsibilities.**

For North East Kent, this will include Thanet District Council, Dover District Council, the Environment Agency, Kent County Council and the River Stour Internal Drainage Board among others. We will also work with our key stakeholders to improve our knowledge and understanding of issues such as population growth, climate change and urbanisation of green spaces.

A high-level representation of key stakeholders who contribute to the development of an effective drainage strategy is shown in Figure 4.

Figure 4. Roles and responsibilities for drainage



# 4. Current drainage and flooding issues in North East Kent

## 4.1 Environmental quality

The North East Kent region benefits from a high-quality environment which includes a large number of designated sites where wildlife, habitats, landscapes and heritage are protected as detailed in Table 2.

**Table 2. Designated sites in North East Kent**

| Designated Site Description | Sites in North East Kent |
|---|---|
| Ramsar and Special Protection Areas (wetlands, rare and migratory birds) | Thanet Coast and Sandwich Bay |
| Special Areas of Conservation (habitats and non-bird species) | Thanet Coast, Sandwich Bay, Dover to Kingsdown Cliffs |
| Marine Conservation Zones | Thanet Coast, Dover to Deal |
| Sites of Special Scientific Interest | Thanet Coast, Sandwich Bay to Hacklinge Marshes, Dover to Kingsdown Cliffs |
| Local Nature Reserves | Prince's Beachlands |

Under the Water Framework Directive, the South-East River Basin Management Plan (Environment Agency, 2016) aims to achieve at least a 'good' status for all water bodies by 2021 or 2027. Table 3 shows the current and predicted status of the water bodies in the North East Kent region.

**Table 3. Water body status in December 2015**

| Water Body Name | Category | Status Type | Classification (2015) | Predicted Outcome (2021) | Predicted Outcome (2027) |
|---|---|---|---|---|---|
| Monkton and Minster Marshes | River | Ecological | Moderate | Moderate | Good |
| | | Chemical | Good | Good | Good |
| Sarre Penn and River Wantsum | River | Ecological | Moderate | Moderate | Good |
| | | Chemical | Good | Good | Good |
| North and South Streams at Eastry | River | Ecological | Moderate | Moderate | Good |
| | | Chemical | Good | Good | Good |
| North and South Streams at Northbourne | River | Ecological | Moderate | Moderate | Good |
| | | Chemical | Good | Good | Good |
| North and South Streams in the Lydden Valley | River | Ecological | Poor | Poor | Good |
| | | Chemical | Good | Good | Good |
| East Kent Chalk (Stour) | Groundwater | Quantitative | Poor | Poor | Poor |
| | | Chemical | Poor | Poor | Good |
| East Kent Tertiaries | Groundwater | Quantitative | Poor | Good | Good |
| | | Chemical | Good | Good | Good |
| Kent Isle of Thanet Chalk | Groundwater | Quantitative | Poor | Poor | Poor |
| | | Chemical | Poor | Poor | Good |
| Kent North | Coastal Water | Ecological | Moderate | Moderate | Moderate |
| | | Chemical | Good | Good | Good |
| Kent South | Coastal Water | Ecological | Moderate | Moderate | Good |
| | | Chemical | Good | Good | Good |
| Stour Kent | Transition Water | Ecological | Poor | Poor | Moderate |
| | | Chemical | Good | Good | Good |

The reasons for the 'poor' chemical status in 2015 of the groundwater bodies has been identified as pollution from towns, cities, transport and rural areas which includes sewage and industrial discharge. Groundwater abstraction is also a reason for the 'poor' quantitative status of the East Kent Chalk (Stour).

The North and South Streams in the Lydden Valley have a 'poor' ecological status due to physical modifications while the Stour Kent has 'poor' ecological status due to pollution from rural areas and continuous sewage discharge.

Partnership working is key to achieving the higher environmental standards required under the Water Framework Directive.

## 4.2 Protection of groundwater sources

North East Kent has a high number of groundwater sources which provide 77 per cent of the clean, healthy drinking water that we supply to our customers in the region. This groundwater is vulnerable to contamination from natural and man-made pollutants on the ground surface which pass down through thin soils and fissures into the chalk aquifers. Groundwater Source Protection Zones show the risk of contamination from any activities that might cause pollution in the area and can be seen on maps at the Environment Agency's 'What's in your backyard' website.

Under the Water Framework Directive, the Kent Isle of Thanet Chalk and the East Kent Chalk (Stour) water bodies have been defined as having 'poor' chemical status. This is primarily due to agricultural pollution from nitrates and pesticides, but pollution arising from wastewater activities is also considered to be an issue. The water bodies also have 'poor' quantitative status which is partially due to the impact of public water supply abstractions.

Substantial parts of the sewer systems which serve Ramsgate, Broadstairs and Margate were laid in hand-dug underground tunnels by miners over a century ago. Due to the possible risk of sewage escaping from the sewers, seeping through the unlined chalk tunnels, and polluting groundwater, we are investing £80 million over 10 years, on an extensive programme of 'sewer rehabilitation' in the Thanet region. This follows the completion in 2015 of a £20 million project covering the groundwater source protection zone in Ramsgate which included: the rehabilitation of 2km of sewers in tunnels and 10km of sewers not in tunnels; the lining of 5.5km of chalk tunnels to convey storm water; and the construction of 2km of new sewers and 15 new manholes.

## 4.3 Bathing waters

For 2016, the Thanet region was awarded seven 'Blue Flag' awards, the most for any district authority area in the country. Maintaining the quality of its beaches is essential for Thanet to encourage tourism which supports the local economy. Table 4 shows the historical and current classification for all the bathing waters in North East Kent.

Blue Flag award

Seaside award

**Table 4. Bathing waters classification in North East Kent (Based on EU Bathing Waters Directive 2006/7/EC)**

| Bathing Water | | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| Minnis Bay, Birchington | | Excellent | Excellent | Excellent | Excellent | Excellent |
| West Bay, Westgate | | Excellent | Excellent | Excellent | Excellent | Excellent |
| St Mildred's Bay, Westgate | | Excellent | Excellent | Excellent | Excellent | Excellent |
| Westbrook Bay, Margate | | Excellent | Excellent | Excellent | Good | Good |
| The Bay, Margate | | Good | Excellent | Good | Good | Good |
| Fulsam Rock, Margate | | Good | Good | Good | Excellent | Good |
| Walpole Bay, Margate | | Poor | Poor | Poor | Poor | Poor |
| Botany Bay, Broadstairs | | Excellent | Excellent | Excellent | Excellent | Excellent |
| Joss Bay, Broadstairs | | Excellent | Excellent | Excellent | Excellent | Excellent |
| Stone Bay, Broadstairs | | Excellent | Excellent | Excellent | Excellent | Excellent |
| Viking Bay, Broadstairs | | Sufficient | Sufficient | Sufficient | Sufficient | Sufficient |
| Ramsgate Sands | | Excellent | Good | Good | Excellent | Excellent |
| Western Undercliffe, Ramsgate | | Excellent | Excellent | Excellent | Excellent | Excellent |
| Sandwich Bay, Sandwich | | Excellent | Excellent | Excellent | Excellent | Excellent |
| Deal Castle, Deal | | Good | Good | Good | Excellent | Excellent |
| St Margaret's Bay, Dover | | Excellent | Excellent | Excellent | Excellent | Excellent |

Specific potential pollution risks for each of Thanet's bathing waters have been identified in a Water Cycle Topic Paper (Thanet District Council, 2013). These are summarised as follows:

- *Discharges containing urban pollutants in surface water after heavy rain*
- *Surface water from urban areas draining into underground culverts which then enter the sea near beaches*
- *Controlled discharges of treated wastewater from combined sewer overflows designed to prevent rainfall overwhelming the sewerage system and flooding homes*
- *Decaying seaweed and algae reaching nuisance levels*
- *Heavy rainfall run-off from agricultural land into the River Stour discharging into Pegwell Bay*
- *Animals and birds on or near beaches.*

Over the last 20 years, Southern Water has invested significantly in improvements to the quality of treated wastewater that we release into the sea. This work has included additional treatment at two new works in Weatherlees Hill to meet the requirements of the EU Urban Wastewater Treatment Directive (91/271/EEC).

Our business plan for 2015–2020 was developed through the biggest programme of customer research in our history. During this process, our customers indicated that clean bathing waters and beaches are a priority and they are willing to contribute more towards improvements where these are required. We have therefore committed to going beyond our statutory duties by increasing the number of our region's bathing waters with 'excellent' water quality – the level required for Blue Flag status. We are also committed to maintaining the number of our bathing waters with 'excellent' water quality at 54 beaches across Hampshire, Isle of Wight, Kent and Sussex. We will need to work closely with local councils and the Environment Agency, as well as others, to achieve this aim.

## 4.4 Shellfish waters

A shellfish water protected area at Margate covers the coastal waters north of Thanet. Shellfish water quality and hygiene standards are currently being updated at the time of writing and it is not yet clear which specific standards and classifications will apply in the future.

Currently, Weatherlees Hill 'B' treatment works provides additional ultra-violet treatment to kill potentially harmful bacteria in the treated wastewater, before it is released into the sea near Margate and Broadstairs.

## 4.5 Flooding

The North East Kent region is at risk of flooding from groundwater, surface water, river and tidal sources.

The Environment Agency's 'What's in your backyard' website provides maps showing the risk to the region of each of these types of flooding. Further information can also be found in the Strategic Flood Risk Assessments (Thanet District Council, 2009 and Dover District Council, 2007), Preliminary Flood Risk Assessment (Kent County Council, 2011) and Local Flood Risk Management Strategy (Kent County Council, 2013).

It is Southern Water's responsibility to ensure our customers can continue to use their wastewater services in the event of a flooding incident. We will work alongside local councils, the Environment Agency and others to help alleviate the effects of flooding on the community.

### Groundwater flooding

Although most of North East Kent is underlain by chalk aquifers, the water table is normally at a sufficient depth from the surface so that groundwater flooding is considered to be a low risk. The Environment Agency has recorded six incidents of groundwater flooding in the Thanet region with three being located near Minster. Basement flooding has also been recorded in Ramsgate and there have been a further two incidents in Deal.

### River and tidal flooding

The main flood risk for North East Kent is tidal flooding. In Thanet, tidal flooding is a particular risk in Birchington, Westgate on Sea, Margate Old Town, Margate Dreamland and the Wantsum Channel. Sandwich is at particular risk of tidal flooding from overtopping of the sea defences or storm surges moving up the River Stour.

The management of river and tidal flooding risk is primarily the responsibility of the Environment Agency, district and borough councils and internal drainage boards. Southern Water will co-operate with the other relevant authorities in the exercise of their flood and coastal erosion risk management functions.

Southern Water's main responsibility is to provide a resilient wastewater service in the event of river or tidal flooding. We assess the risk of flooding at our wastewater treatment works and pumping stations and whether flooding could affect critical assets. If potential loss of service is identified, we can provide flood reduction measures such as bunding (a protective wall), watertight doors, raising the height of equipment, temporary flood barriers and the provision of standby generators. Although Weatherlees Hill is close to areas of medium to high flood risk, the site is located in an area of low flood risk and is protected from flooding by bunding and raised defences.

## Surface water flooding

The Preliminary Flood Risk Assessment has identified that 7,000 domestic properties are currently at risk of surface water flooding in North East Kent. Surface Water Management Plans (SWMP) are used to identify and assess flood risks from surface water and also local flooding due to groundwater and ordinary watercourses as defined in the Flood and Water Management Act 2010. A SWMP will also include action plans to reduce local flooding that have been agreed by the drainage partners. Progress on the actions is reviewed periodically. These partners include the lead local flood authority (Kent County Council), local authorities, sewerage undertaker, highways authorities and others.

## Thanet and Margate SWMP

Surface water flooding in Thanet is described in the Thanet and Margate SWMP (Kent County Council, 2013 and 2014). The flooding has generally been due to heavy rainfall which overloads the highway drains and gullies or hydraulically overloads the sewers. In Margate, surface water flooding issues have been identified in areas such as Canterbury Road, Northdown Road and Dane Park. In Broadstairs and Ramsgate, the sewers are mainly combined which means they carry wastewater and surface water flows. In particular, Ramsgate Harbour is identified as an area where hydraulic overloading of sewers has resulted in flooding of properties in the past.

## Deal

In general, Deal is served by separate surface water and foul sewers but there are some combined sewers in the north of the town. The surface water drainage system is complex and relies on pumping stations to lift surface water so that it can gravitate to the sea. Surface water flooding issues have been recorded in the north of Deal.

Some of the key actions that Southern Water is supporting through SWMPs in the region include:

- *Full participation in the development and implementation of Surface Water Management Plans with our drainage partners*
- *Ongoing maintenance of the sewerage network, pumping stations and combined sewer overflows to ensure surface water flows without hindrance to treatment works, and/or controlled discharges*
- *Removal of properties on the DG5 Register where hydraulic overloading is due to excessive flows of surface water in the sewerage system*
- *Identification of misconnections of surface water sewers to foul sewers (and vice-versa)*
- *Promoting the use of sustainable drainage systems (SuDS) to reduce surface water entering the sewerage system.*

# 5. Wastewater services in North East Kent

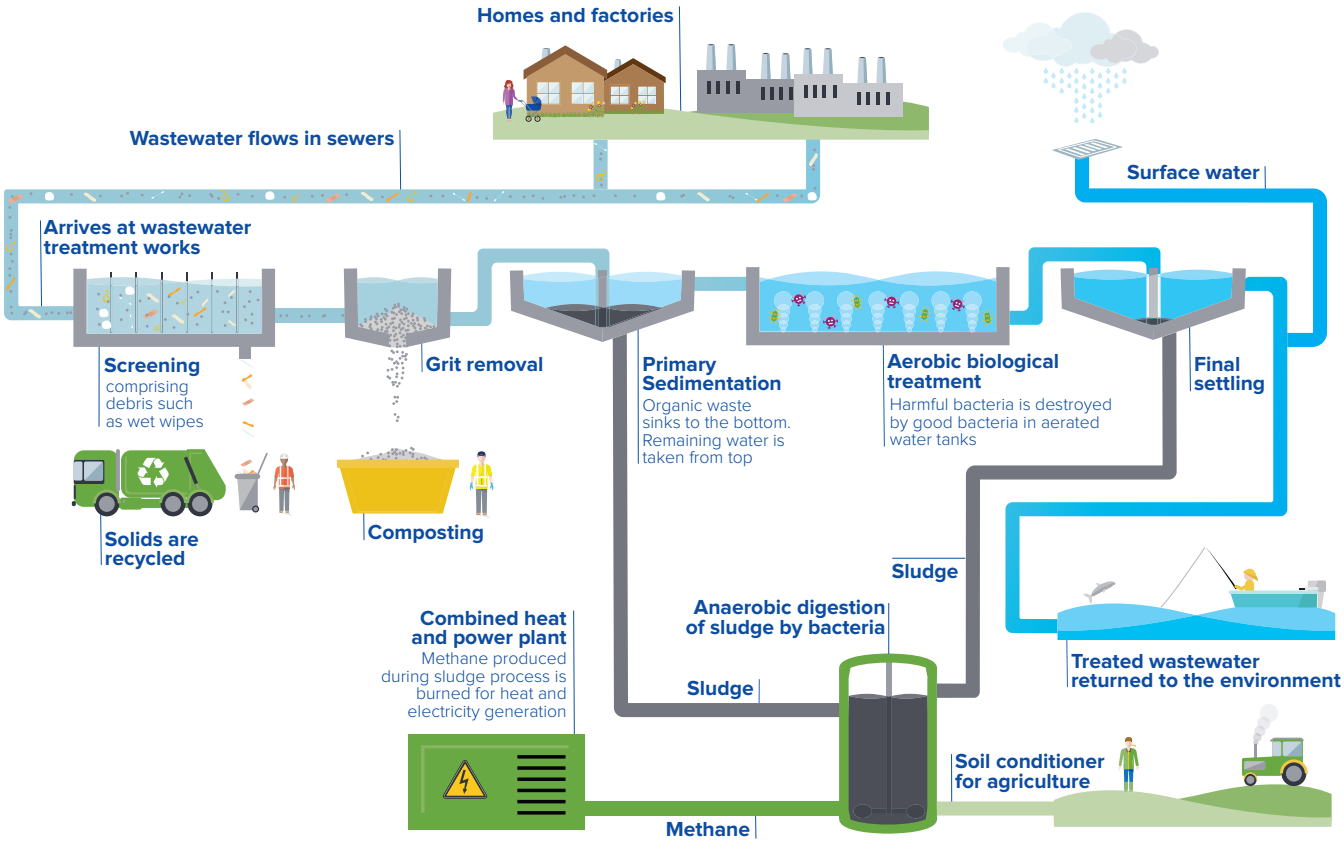
## 5.1 Wastewater collection and treatment process

Southern Water recycles wastewater from almost two million homes across Kent, Sussex, Hampshire and the Isle of Wight. Every day we treat and recycle 700 million litres of wastewater at our 368 treatment works after it has been pumped through a sewer network 39,600 kilometres long.

Wastewater comes from water used in the home, in businesses and factories and we also collect some of the surface water run-off from rain falling on roofs or roads which ends up in our sewer network.

The wastewater flows by gravity through smaller drains and sewers to large diameter trunk sewers that carry wastewater flows from whole villages or suburbs of towns. Where required, the wastewater is pumped from low level to a higher level using pumps at a Wastewater Pumping Station (WPS). Figure 5 below provides a simple diagram showing how the collected wastewater is screened and processed at a wastewater treatment works before the treated water is returned to rivers or the sea. Further information on the wastewater process can be found at, **www.southernwater.co.uk/the-wastewater-process**

**Figure 5. The wastewater treatment process**



## 5.2. Wastewater catchments in North East Kent

Southern Water collects and treats wastewater from three catchments in the North East Kent region which includes the Isle of Thanet, Sandwich and Deal. Figure 6 shows the location of the three catchments in North East Kent alongside neighbouring catchments which include Broomfield Bank (Folkestone and Dover), Herne Bay and Dambridge Wingham.

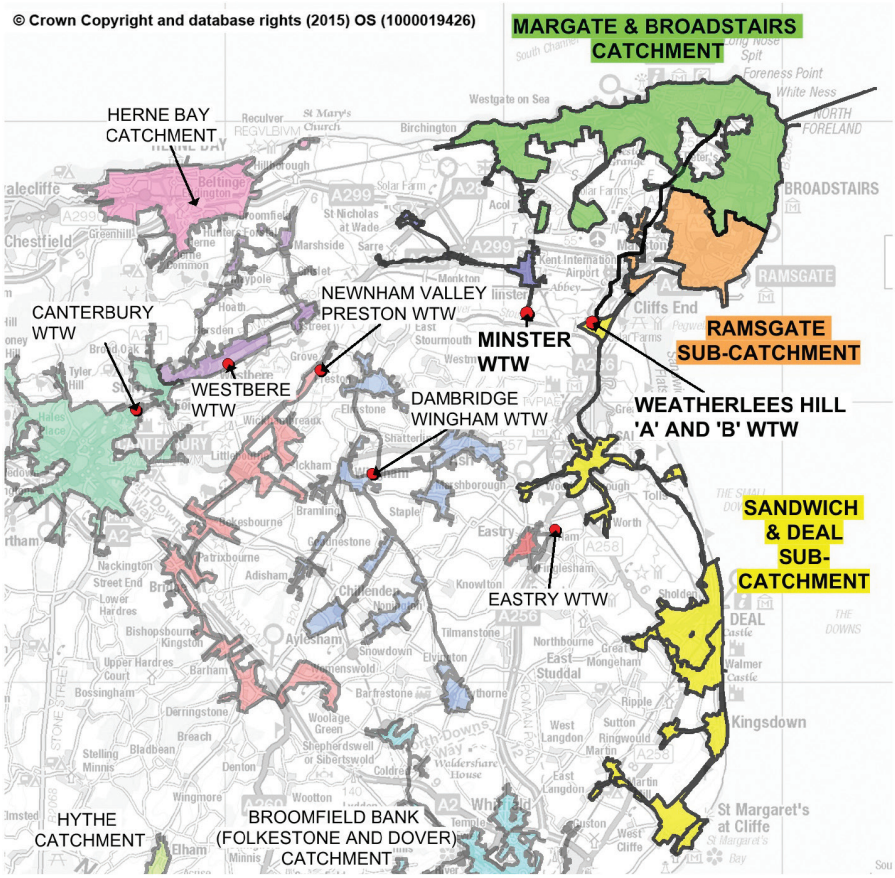
**Ramsgate, Sandwich** and **Deal** are served by **Weatherlees Hill 'A' WTW** which was constructed in 1996. The wastewater from the catchment is mixed with cess imported by tankers before it is screened to remove non-biological items such as wet wipes. The wastewater then passes through primary settlement tanks to remove small particles before undergoing biological treatment. Remaining particles are removed in final settlement tanks before the treated effluent is released to the tidal River Stour which flows into Pegwell Bay.

**Margate and Broadstairs** are served by **Weatherlees Hill 'B' WTW**. Constructed in 2006, the site is next to Weatherlees Hill 'A' WTW.

Flows from Margate undergo primary treatment of screening and grit removal at Foreness Point Wastewater Pumping Station (WPS) before being pumped on to Weatherlees Hill 'B' for full treatment. The wastewater receives biological treatment before remaining particles are removed in final settlement tanks. The treated effluent is disinfected by ultra-violet (UV) treatment to remove bacteria before being pumped back to Foreness Point WPS and released to sea via a long sea outfall.

**Minster, Isle of Thanet (IOT) Wastewater Treatment Works (WTW)** treats wastewater flows from Minster and other small rural villages in the south-west region of Thanet. The wastewater collected from the catchment is screened before primary settlement. The flow passes through biological filters before remaining particles are removed by humus tanks. The treated effluent is then released into the River Stour.

**Figure 6. Location of wastewater catchments in North East Kent**



## 5.3. Wastewater catchment maps and schematics

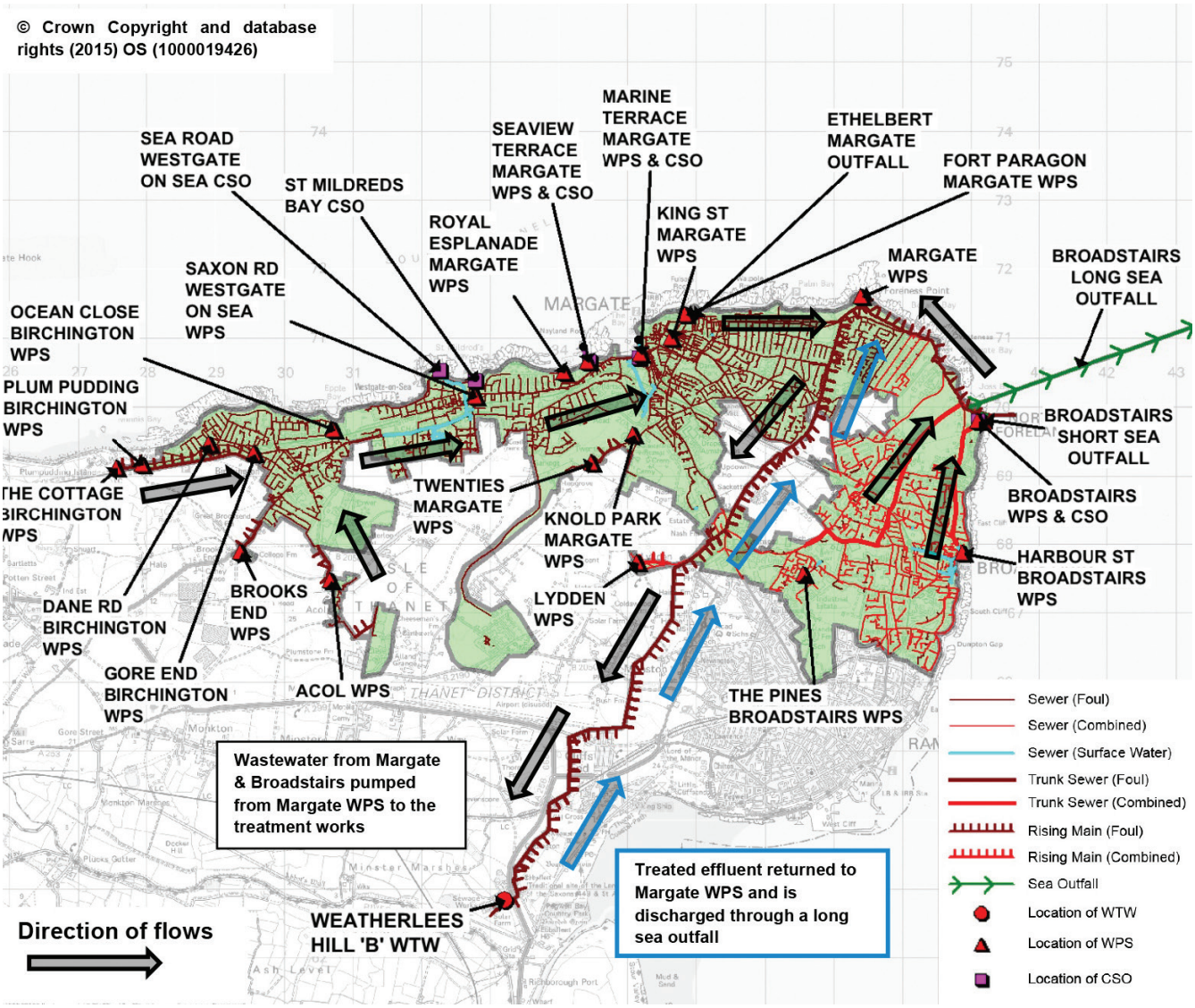
The sewers in North East Kent were, on average, laid in the 1940s. This means that they will be approaching 100 years old by 2040. This compares to the 1950s as the average laying date across the entire Southern Water region. However, North East Kent has an above average (65 - 86 per cent) number of vitrified clay sewers which are considered to have excellent integrity for 100 years or more.

The following maps and schematics show how wastewater flows to treatment works from each of the wastewater catchments in North East Kent.

### Margate and Broadstairs sub-catchment

Figure 7 shows that the Margate sub-catchment is comprised primarily of foul sewers which transfer waste flows only. Broadstairs contains mainly combined sewers that transfer wastewater and surface water in the same pipe. Southern Water also manages small networks of separate surface water sewers in Broadstairs, Westgate-on-Sea and Margate.

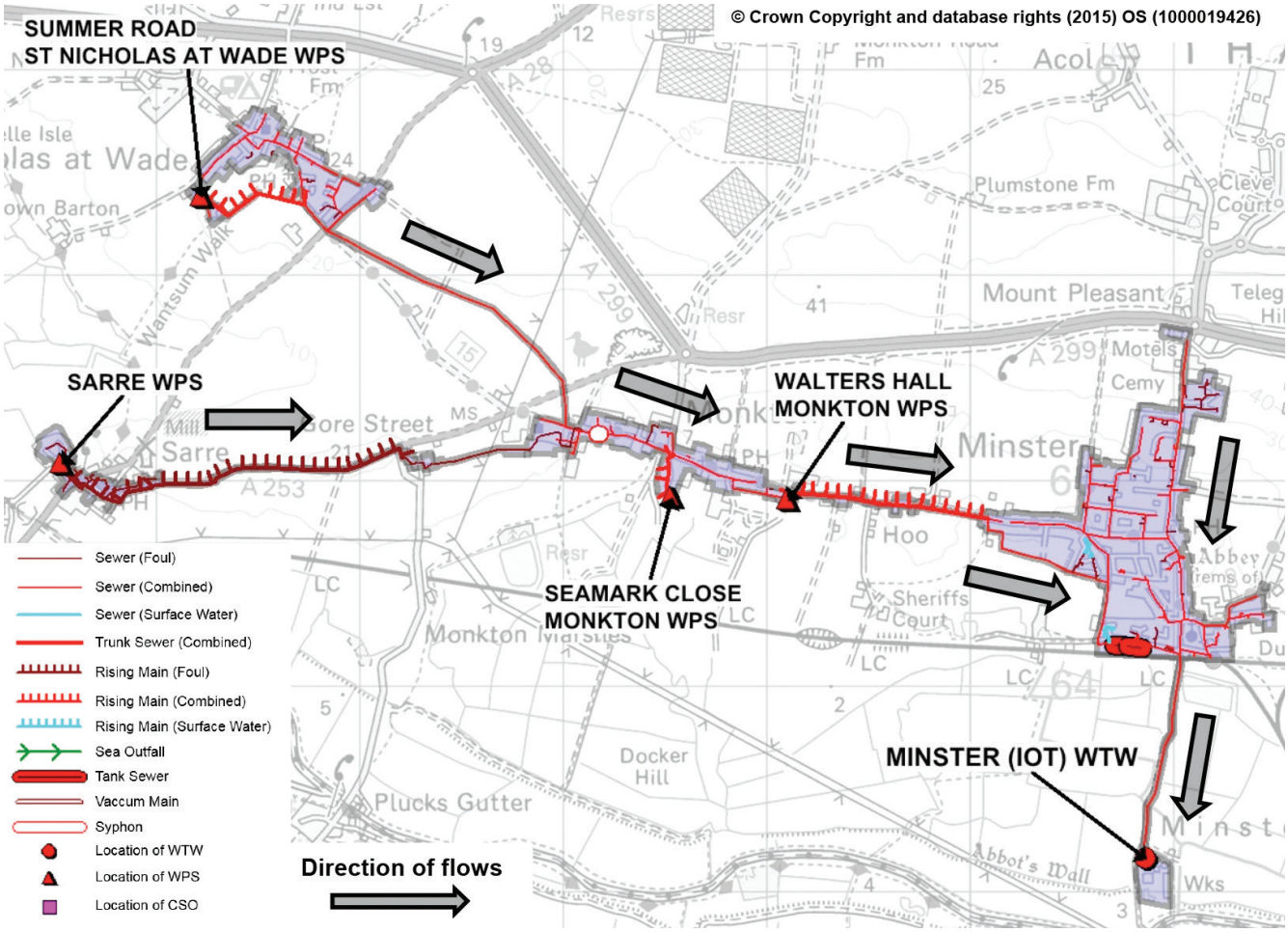
**Figure 7. Margate and Broadstairs sub-catchment**



## Minster catchment

Figure 8 shows that the Minster catchment primarily contains combined sewers.

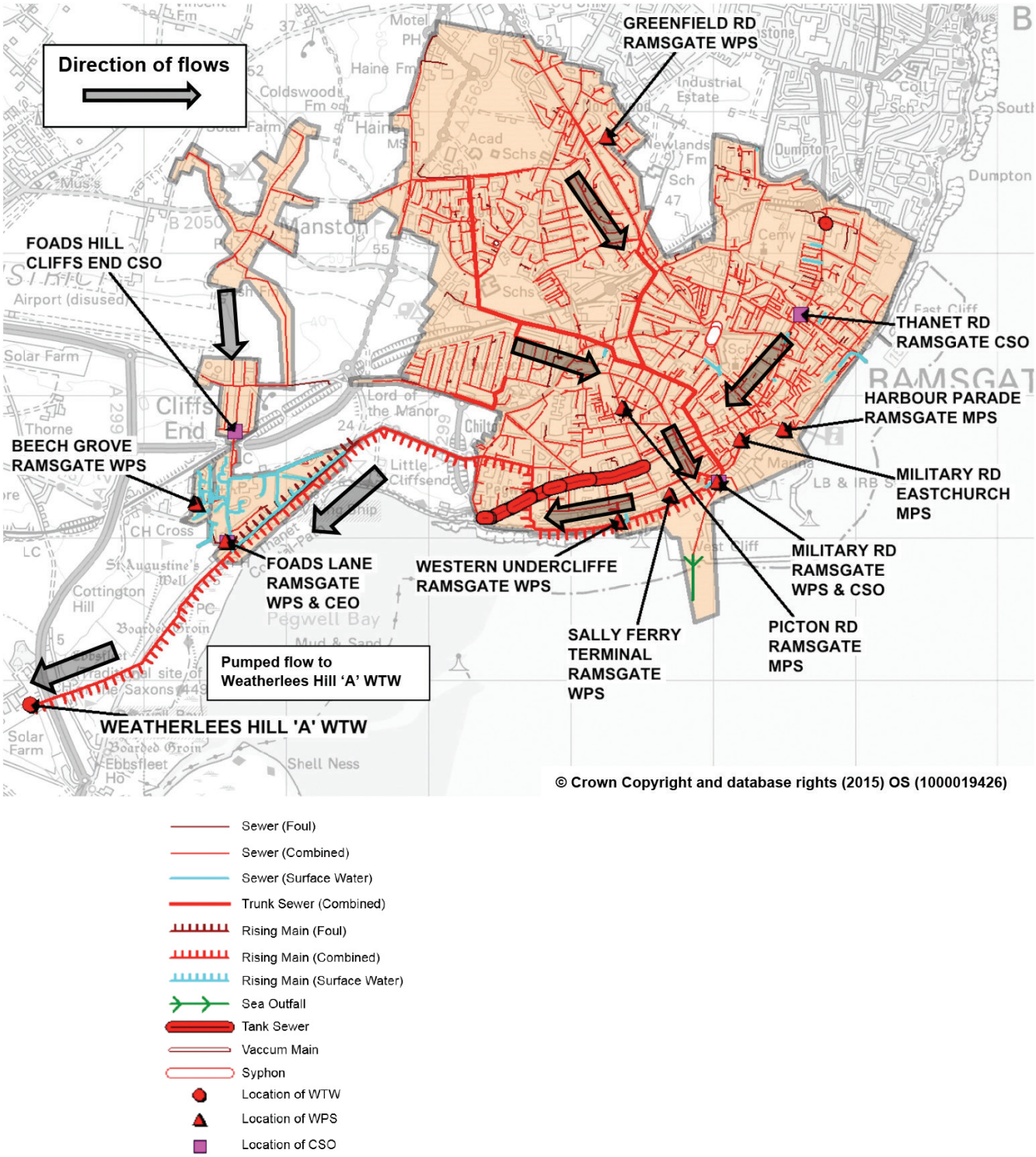
**Figure 8. Minster catchment**



## Ramsgate sub-catchment

Figure 9 shows that the Ramsgate sub-catchment is comprised primarily of combined sewers.

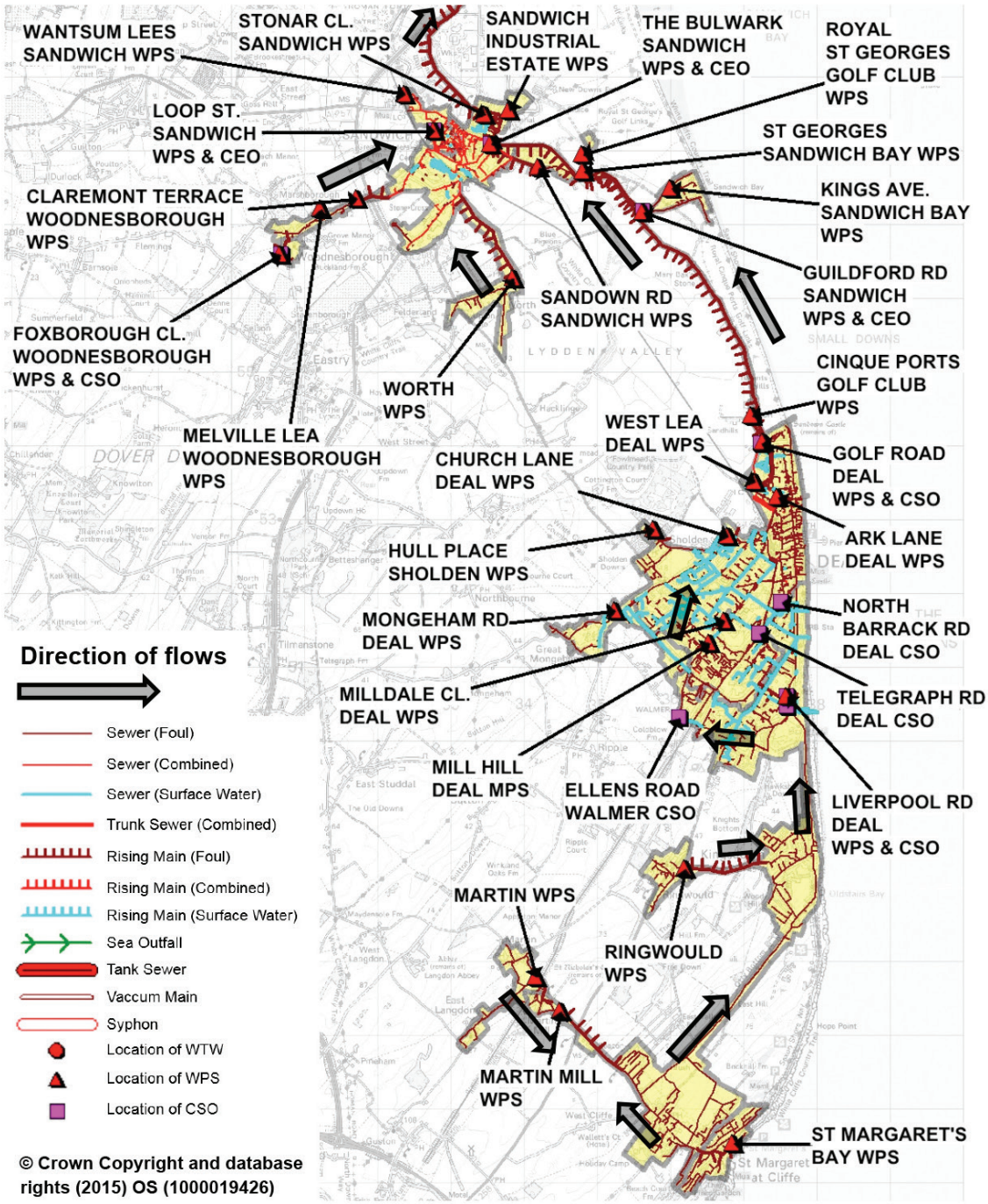
**Figure 9. Ramsgate sub-catchment**



## Sandwich and Deal sub-catchment

Figure 10 shows that the sewers in Sandwich are mainly combined while Deal and St Margaret's at Cliffe are served mainly by foul-only sewers. Southern Water also operates an extensive separate surface water network in Deal and some parts of Sandwich.

Figure 10. Sandwich and Deal sub-catchment



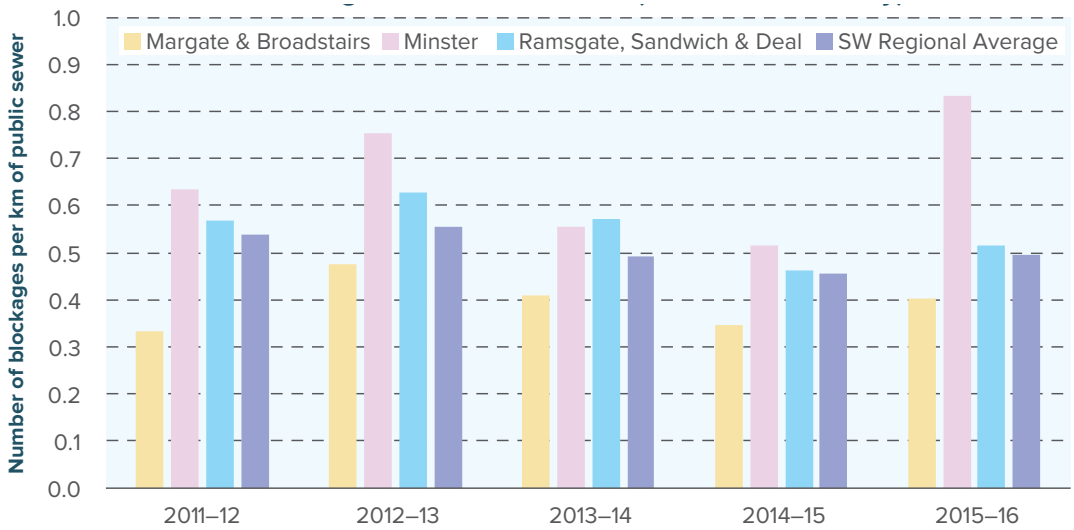



**Figure 11. Blockages in North East Kent**

## 5.4 Wastewater service performance

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

### Sewer blockages

Every year there are thousands of avoidable blockages in our sewers caused by people flushing the wrong things down the toilet or pouring fats, oils and grease down the sink. Sewer blockages can result in flooding to customers' properties or pollution.

Figure 11 shows that the number of blockages recorded per km of public sewer is lower in Margate and Broadstairs when benchmarked against our regional average but an above average number have been recorded in the other North East Kent catchments, particularly in Minster. To manage the number of blockages we experience on our network, we use high-powered water jets to clear them and ensure our sewers are running freely. In 2015, we launched our 'Keep it Clear' campaign which will see our teams visiting blockage 'hotspot' areas to educate customers about how to safely dispose of items in their homes and businesses.

### Sewer collapses and rising main bursts

The number of collapses on public sewers in North East Kent has been three per year on average over the last five years. We have an ongoing programme to replace or refurbish ageing sewers at high risk of collapse. Rising mains contain wastewater that is pumped under pressure from our wastewater pumping stations and a burst will often result in pollution of the environment or flooding. There have been three rising mains bursts per year on average over the last five years in North East Kent. In recent years, the rising main in Military Road, Ramsgate has burst several times due to corrosion. A £3 million project is currently underway to replace a long stretch of this main.

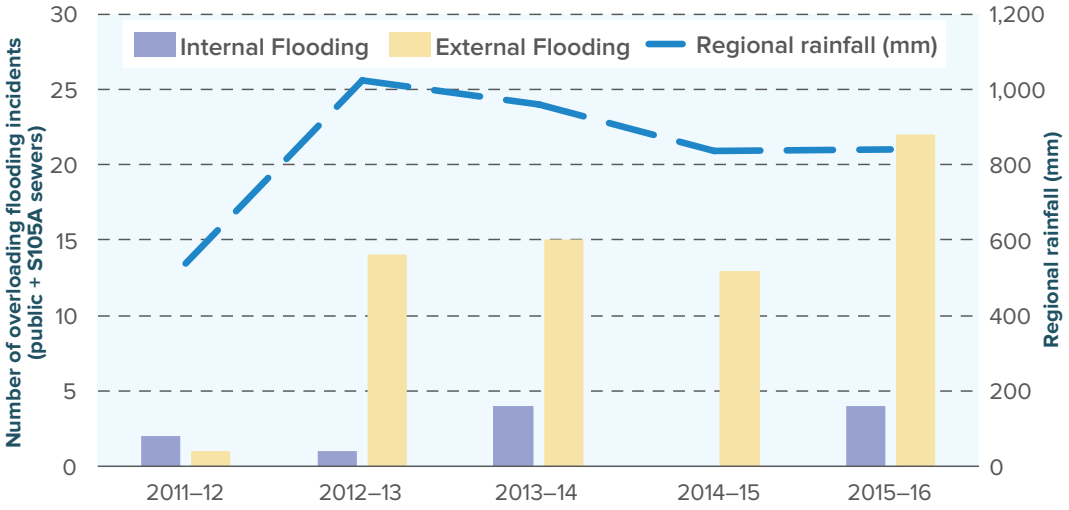



**Figure 12. Flooding due to hydraulic overloading in North East Kent**

## Sewer flooding

Properties can be flooded internally or externally if the sewers do not have sufficient capacity to transfer the flows entering the sewer, which can include surface water due to rainfall. Where hydraulic overloading is identified as the cause of flooding then we add the properties to the DG5 Register (properties at risk of internal and/or external flooding) and consider schemes to reduce or remove the risk of flooding. Figure 12 shows that there were fewer flooding incidents due to hydraulic overloading in 2011–12 when annual rainfall was much lower. Intense storms in August 2015 were responsible for a number of flooding incidents.

Around 85 per cent of internal flooding incidents are due to other causes such as sewer blockages, sewer collapses, or equipment failure. Following a peak in 2012–13, there has been a steady reduction in internal and external flooding incidents due to other causes as shown in Figure 13.

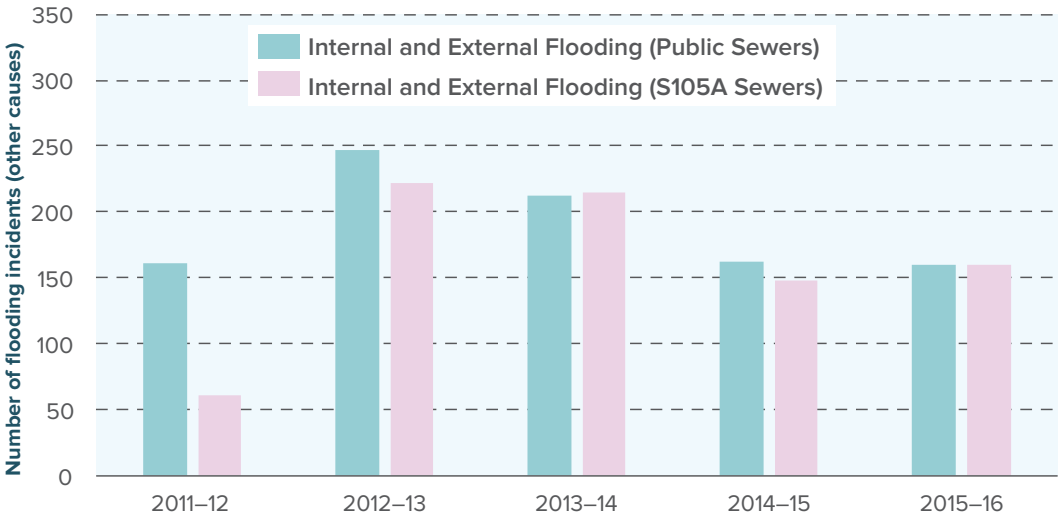



**Figure 13. Flooding due to other causes in North East Kent**

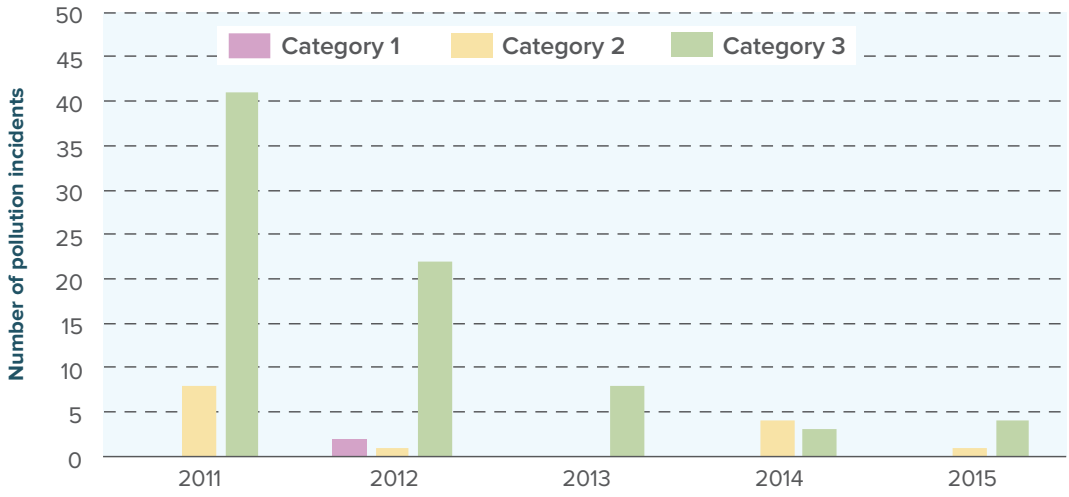



**Figure 14. Pollution incidents in North East Kent**

## Pollution incidents

Pollution incidents due to a failure of our wastewater assets are reported to the EA and the severity of the pollution is agreed and categorised as 1 (major), 2 (significant), 3 (minor) or 4 (no pollution).

Figure 14 shows a steady reduction in the number of pollution incidents in the region. Between 2011 and 2014, approximately 80 per cent of the pollution incidents in North East Kent were due to failures at Margate WPS and Broadstairs WPS. We have recently completed a £4 million improvement programme at Margate WPS and we are planning to invest a further £8 million to increase the resilience of Margate and Broadstairs pumping stations.

## Wastewater treatment works compliance with permits

As part of the wastewater treatment process, we must comply with permits issued by the Environment Agency to release treated wastewater into watercourses. For 2010 to 2015, our wastewater treatment works at Weatherlees Hill and Minster were compliant with their permits.

# 6. Risks to wastewater services

**We have assessed the future risks to delivery of an effective and reliable service in the wastewater catchments of North East Kent. Our risk assessment is based on a 'do nothing' scenario where we do not carry out any activity to reduce the risk.**

## 6.1 Growth

Over the next 25 years, population growth in North East Kent is expected to result in a 15 per cent increase in domestic properties connecting to our sewers as detailed in Table 5.

It is our statutory duty to provide the required sewer capacity for new developments as they are built, and to protect our customers and the environment from additional flooding or pollution that could arise. We will work in collaboration with developers and the planning authority to understand the location and timing of new developments. However, we should only deliver new capacity where there is a demonstrable need to deliver this for growth. Developer contributions may be required in line with the regulatory framework for the water industry.

### Network capacity for growth

To understand the impact of population growth, the forecast number of new wastewater connections between 2015 and 2040 has been added to hydraulic computational models of the sewerage system. The location of new connections over the next 25 years is unknown. However, from local authority plans we have knowledge of the potential locations and number of new connections over the next five years or so. Based on this knowledge, an informed judgement has been made on the location and number of new connections in each catchment to 2040.

For each new development, an assessment has been made on whether there is sufficient capacity in the sewerage system to accommodate the new wastewater connections to 2040. This assessment is based on the modelled change in sewer surcharge and flooding from manholes and whether there is an unacceptable deterioration in the hydraulic performance of the network. Table 6 shows the percentage of new wastewater connections which can be accommodated by the sewerage network without unacceptable deterioration in our wastewater service. This percentage should be considered an approximate value as it is dependent on the assumed location and size of developments.

**Table 5. Growth in wastewater connections in North East Kent (Source: Office for National Statistics and Local Plans)**

| Wastewater catchment | Wastewater treatment works | % Change in properties connecting to our wastewater service from a 2015 baseline | | |
|---|---|---|---|---|
| | | 2020 | 2025 | 2040 |
| Margate and Broadstairs | Weatherlees Hill 'B' | +3% | +5% | +13% |
| Minster | Minster (IOT) | +1% | +2% | +6% |
| Ramsgate | Weatherlees Hill 'A' | +5% | +8% | +17% |
| Sandwich and Deal | | | | |
| North East Kent | | +4% | +6% | +15% |

**Table 6: New connections applied to hydraulic models of wastewater catchments in North East Kent**

| Catchment | Wastewater treatment works | % Change in wastewater connections 2015 to 2040 | Assumed number of new developments | % of new wastewater connections by 2040 which can be accommodated |
|---|---|---|---|---|
| Margate and Broadstairs | Weatherlees Hill 'B' | +13% | 15 | 63% |
| Minster | Minster (IOT) | +6% | 1 | 100% |
| Ramsgate | Weatherlees Hill 'A' | +17% | 11 | 37% |
| Sandwich and Deal | | | 13 | 32% |

**Table 7. Network growth risk assessment for North East Kent**

Network growth risk assessment for a 'do nothing' scenario

| | 2020 to 2025 | 2040 | Comments |
|---|---|---|---|
| Margate and Broadstairs | Medium | Medium to high | Margate and Broadstairs sewerage network has sufficient capacity to accommodate 63% of the forecast new wastewater connections by 2040. Additional capacity could be delivered in parallel with development |
| Minster | Low | Low | Growth can be accommodated in the network depending on the location |
| Ramsgate | Medium | High | Ramsgate, Sandwich and Deal sewerage network has sufficient capacity to accommodate 32 to 37% of the forecast new wastewater connections by 2040. Additional capacity could be delivered in parallel with development |
| Sandwich and Deal | | | |

The sewerage network in the Minster catchment has sufficient capacity to accommodate all the forecast new development over the next 25 years depending on location. However, the sewerage networks for Margate, Broadstairs, Ramsgate, Sandwich and Deal have insufficient capacity to accommodate all of the new connections. This should not be seen as a constraint to development but as an indicator that investment may be required to meet demand.

## Treatment capacity for growth

Process treatment growth is the increase in hydraulic and organic load, which may require additional investment at wastewater treatment works to maintain existing levels of service to customers and to protect the environment. We measure growth in terms of the uplift in population equivalent and uplift in 'Dry Weather Flow' (DWF). Our statutory obligation is to allow timely connection of new development and ensure we maintain compliance with the works' permit conditions.

## Population equivalent

The capacity of a sewage treatment works is measured in terms of the 'population equivalent'(PE) served by the works and is based on the amount of organic material that can be treated. The total population equivalent served by a works is primarily based on the permanent resident population in the catchment and also overnight visitors (non-residents) during the holiday season and industrial effluent. Trade effluent generally makes up less than two per cent of the load treated at the works in the region and is less significant. Table 8 shows that the population equivalent served by the wastewater treatment works in North East Kent is predicted to increase by approximately 15 per cent by 2040 which is primarily due to population growth.

We have assessed the capacity of our process treatment assets at our works in terms of the population equivalent load that can be treated. Both Weatherlees Hill 'B' WTW and Minster (IOT) WTW are currently considered to have sufficient capacity to accommodate the predicted growth in PE to 2040. However, at Weatherlees Hill 'A' WTW, the calculated capacity is currently considered to be insufficient to accommodate the predicted growth in PE to 2040. With a forecast growth of 15 per cent, it is likely that an uplift in PE capacity will be required at Weatherlees Hill 'A' WTW during the next 25 years.

**Table 8. Growth in population equivalent served by wastewater treatment works in North East Kent**

| Catchment | Wastewater treatment works | Total population equivalent (2015) | % change in WTW Population Equivalent from 2015 | | |
|---|---|---|---|---|---|
| | | | 2020 | 2025 | 2040 |
| **Margate and Broadstairs** | Weatherlees Hill 'B' | 89,383 | +3% | +6% | +16% |
| **Minster** | Minster (IOT) | 4,491 | +2% | +4% | +10% |
| **Ramsgate** | Weatherlees Hill 'A' | 95,413 | +3% | +6% | +15% |
| **Sandwich and Deal** | | | | | |
| **North East Kent** | | | +3% | +6% | +15% |

| Table 9. Process growth risk assessment for North East Kent | | | |
|---|---|---|---|
| Process growth risk assessment for a 'do nothing' scenario | | | |
| | 2020 to 2025 | 2040 | Comments |
| Margate and Broadstairs | Low | Medium | Weatherlees Hill 'B' WTW has PE capacity and DWF headroom to accommodate growth |
| Minster | Low | Low | Minster WTW has PE capacity and DWF headroom to accommodate growth |
| Ramsgate | Medium | High | Weatherlees Hill 'A' WTW has insufficient PE capacity to accommodate growth. Investment will be required to provide additional capacity in parallel with development. The DWF consent may need to be increased |
| Sandwich and Deal | | | |

### Dry weather flow (DWF)

Wastewater treatment works are issued with a discharge consent to limit pollution of the watercourse receiving the treated effluent. The Environment Agency sets DWF consents for each works, based on the flow of the receiving watercourse being at its lowest after a long period of dry weather. After a dry period, the treated effluent will have minimal dilution and maximum potential pollution impact on the receiving watercourse. We monitor the DWF and report any breaches of the DWF consent conditions to the Environment Agency.

We have estimated the increase in DWF due to growth and we expect to be able to comply with our DWF consents at Weatherlees Hill 'A', Weatherlees Hill 'B' and Minster WTW while accommodating growth in the catchments to 2040. However, it is possible that we will need to apply to the Environment Agency to increase the DWF consent at Weatherlees Hill 'A' WTW in line with the anticipated demand.

## 6.2 Climate change

Climate change is likely to result in changes in rainfall, sea level and temperature. We recently assessed the risks from climate change and identified actions to reduce them in our report on 'Adapting to Climate Change 2015' (Southern Water, 2015) which found that:

Less rainfall is likely to result in:

- *increased demand for water for agriculture, horticulture, gardening etc; and*
- *longer dry periods and potential for increased blockage rates in sewers.*

*Increase in extreme rainfall intensity is likely to result in:*

- *surcharging of combined/ surface water sewers which can result in flooding of properties;*
- *an increase in controlled releases from combined sewer overflows potentially impacting upon bathing/shellfish water quality;*
- *direct flooding of critical assets at wastewater treatment works and pumping stations; and*
- *loss of power supply, logistic and transport difficulties caused by extreme weather.*

A sea-level rise is likely to result in:

- *direct flooding of customers' properties, wastewater treatment works and pumping stations;*
- *higher groundwater levels resulting in increased sewer infiltration by groundwater and a potential increase in saline intrusion; and*
- *increased sea level preventing the free discharge of surface water from outfalls.*

An increase in temperature is likely to result in:

- *increased demand for water for drinking, agriculture, horticulture etc;*
- *demographic change (e.g. a redistribution of population across the region due to water stress);*
- *increased microbial action and consequential increase from H2S attack on sewers and mains;*
- *a potential detrimental effect on wastewater treatment processes;*

**Table 10. Climate change risk assessment for North East Kent**

Climate change risk assessment for a 'do nothing' scenario

| | 2020 to 2025 | 2040 | Comments |
|---|---|---|---|
| Margate and Broadstairs | Low to medium | Medium | Broadstairs sewers are mainly combined while Margate sewers are mainly foul in an urban area |
| Minster | Low to medium | Medium | Sewers are mostly combined in a rural area. Hydraulic modelling has identified areas where uplift in extreme rainfall intensity would lead to an unacceptable deterioration in service which we would need to address |
| Ramsgate | Low to medium | Medium | Ramsgate sewers are predominantly combined in a highly urbanised area. Hydraulic modelling has identified areas where uplift in extreme rainfall intensity would lead to a deterioration in service which we would need to address |
| Sandwich and Deal | Low to medium | Medium | Sandwich sewers are mainly combined while Deal sewers are mainly foul with some combined in the north of the town. Deal has a complex separate surface water sewerage system and its capacity will need to be monitored |

- *ground movement that can damage sewers and other wastewater assets; and*
- *potential increased impact on receiving waters due to lower river flows.*

Based on EA advice (Environment Agency, 2010) the increase in extreme rainfall intensity by the 2050s is predicted to be five per cent, 10 per cent and 20 per cent for lowerbound, average and upperbound forecasts respectively. When assessing network capacity for new developments or schemes to relieve hydraulic overloading, we use an upperbound forecast of a 20 per cent increase in extreme rainfall intensity to model the impact of climate change. We will work in collaboration with developers and planning authorities to ensure that the risk caused by climate change is not a constraint to new development.

Climate change is generally considered to create a medium risk to the long-term performance of our wastewater services in North East Kent due to:

- *a relatively high number of properties at risk of surface water flooding in Kent;*
- *hydraulic modelling has identified a lack of capacity in the sewerage system in some areas to accommodate additional surface water due to climate change; and*
- *the uncertainty in the effects of climate change makes it difficult to predict the potential impact and degree of risk to our sewerage system.*

## 6.3 Urban creep

'Urban creep' describes the gradual change of permeable land areas to impermeable areas within the urban environment. Typical urban creep activities include the creation of impermeable hard standing for vehicles in front gardens, the laying of patios in back gardens or the building of house extensions and conservatories. The loss of permeable land in urban areas results in more rainwater and surface water run-off entering the surface water or combined drainage system. This increases the risk that the capacity of the drainage system will be exceeded during storm events with an increased potential for flooding or pollution.

Research has found that urban creep is related to the density of housing in an area (Allitt & Tewkesbury, 2009). For low to medium density housing , the average urban creep would be approximately 0.8m$^2$/house/year for detached housing and 0.4m$^2$/house/year for semi-detached housing. For high density housing such as terraced houses, which generally have smaller gardens, the average urban creep would be approximately 0.15 to 0.2 m$^2$/house/year.

There is some uncertainty regarding the relationship between urban creep and the volume of surface water run-off entering the sewerage system. Further work is required to understand this relationship and to model the effect of urban creep on network models.

**Table 11. Urban creep risk assessment for North East Kent**

Urban creep risk assessment for a 'do nothing' scenario

| | 2020 to 2025 | 2040 | Comments |
|---|---|---|---|
| **Margate and Broadstairs** | Low to medium | Medium | Broadstairs sewers are mainly combined while Margate sewers are mainly foul in an urban area |
| **Minster** | Low | Low to medium | Sewers are mostly combined in a rural catchment with a surface area that is mainly permeable (eg fields) |
| **Ramsgate** | Low to medium | Medium | Ramsgate sewers are predominantly combined in a highly urbanised area |
| **Sandwich and Deal** | Low to medium | Medium | Sandwich sewers are mainly combined while Deal sewers are mainly foul with some combined in the north of the town |

Urban creep is considered to create a low to medium risk to the long-term performance of our wastewater services in North East Kent due to:

- *the predominantly urban nature of the catchments; and*
- *lack of capacity in the sewerage system in some areas to accommodate the additional surface water entering the system due to urban creep.*

Southern Water will work in collaboration with developers and planning authorities to ensure that the risk caused by urban creep is not a constraint to new development.

## 6.4 Asset deterioration

The deterioration of our wastewater assets is an ongoing risk to the wastewater service we provide to our customers both now and in the future. These assets include pumps, process treatment equipment and all mechanical and electrical equipment. It also includes the sewers and rising mains which deteriorate over time depending on the material type and age, soil type etc.

We reduce the risk of asset deterioration by identifying which assets will require maintenance, refurbishment or replacement in the short, medium and long term. We use deterioration modelling which is a risk-based system that identifies optimal future investment to achieve a specified level of service at least cost.

For the purposes of this Drainage Strategy, we have carried out an assessment of the age and material types of sewers and rising mains to be found in the wastewater catchments of North East Kent. This has been compared with the sewerage system in the county of Kent and the entire Southern Water region which also includes Hampshire, East/West Sussex and the Isle of Wight. This enables us to identify any particular risks in these catchments and whether there will be a requirement for significant investment to manage risks due to sewer deterioration.

In general, we have found that the risk of deterioration of our infrastructure assets

**Table 12. Asset deterioration risk assessment for North East Kent**

Asset deterioration risk assessment for a 'do nothing' scenario

| | 2020 to 2025 | 2040 | Comments |
|---|---|---|---|
| Margate and Broadstairs | Low | Low to medium | Above average % of vitrified clay sewers laid in the 1970s and rising main laid in the 2000s |
| Minster | Low to medium | Medium | Above average % of vitrified clay sewers laid in the 1940s. Cast iron/PVC rising mains laid in the 1970s are at risk |
| Ramsgate | Low | Low to medium | Average % of vitrified clay sewers laid in the 1940s. Military Road rising main is currently being replaced |
| Sandwich and Deal | Low to medium | Medium | Above average % of vitrified clay sewers laid in the 1940s. PVC/ductile iron rising mains laid in the 1970s are at risk |

**Table 13. Infiltration risk assessment for North East Kent**

Infiltration risk assessment for a 'do nothing' scenario

| | 2020 to 2025 | 2040 | Comments |
|---|---|---|---|
| Margate and Broadstairs | Low | Low | Groundwater infiltration has not been an issue in the past |
| Minster | Low | Low to medium | Groundwater flooding has been a minor issue in the past |
| Ramsgate | Low | Low to medium | Groundwater flooding has been a minor issue in the past |
| Sandwich and Deal | Low | Low | Groundwater infiltration has not been an issue in the past |

affecting long-term performance is generally low to medium in North East Kent in comparison to other areas of the Southern Water region due to:

- *above average percentage of vitrified clay sewers which have high integrity and long life;*
- *below average percentage of pitch fibre sewer pipes which have a short life;*
- *above average percentage of ductile iron rising mains laid in the last 20 years;*
- *below average percentage of PVC rising mains which have a short life and are vulnerable to bursts; and*
- *the sewers in North East Kent were laid in the 1940s on average, which compares to the 1950s as the average laying date across the entire Southern Water region.*

## 6.5 Infiltration

Infiltration of groundwater into sewers generally occurs through cracks or joints. In areas where the groundwater level is high following prolonged rain, then groundwater infiltration can be significant and fill the sewers to their capacity which can cause restricted toilet use or sewer flooding of properties. In areas where high infiltration creates problems, we carry out surveys of the sewers to identify the location of infiltration and carry out repairs to seal the cracks or joints. For other areas, we manage infiltration through deterioration modelling to identify sewers requiring replacement or refurbishment in the short, medium and long term.

There are few historical incidents of infiltration affecting the provision of wastewater services in the North East Kent region. However, climate change may result in higher sea levels which could result in higher groundwater levels that would affect the degree of infiltration. Southern Water will work in collaboration with developers and planning authorities to ensure that the risk caused by infiltration is not a constraint to new development.

## 6.6 Clean water consumption

The volume of wastewater in the sewerage system is directly related to the volume of clean potable water supplied for domestic, business, industrial, agricultural and horticultural use. In general, we assume that 92.5 per cent of the clean water supplied to a domestic property is disposed of as wastewater through the sewerage system. The remaining 7.5 per cent is used for watering the garden, car washing, etc.

Southern Water supplies clean water to the North East Kent region which is located in the Kent Thanet Water Resource Zone (WRZ). The average water consumption per person in

**Table 14. Per capita consumption for the Southern Water region**

| Southern Water region | 2015 | 2020 | 2025 | 2040 |
|---|---|---|---|---|
| Per Capita Consumption (litres/head/day) for a dry year (annual average) | 147 | 144 | 142 | 138 |
| Percentage change in PCC from 2015 | | -2% | -3% | -6% |

**Table 15. Clean water consumption risk assessment for North East Kent**

| Clean water consumption risk assessment for a 'do nothing' scenario | | | |
|---|---|---|---|
| | 2020 to 2025 | 2040 | Comments |
| North East Kent | Low | Low | PCC is forecast to reduce with a corresponding reduction in wastewater |

the region is called 'per capita consumption' or PCC. Based on our Water Resources Management Plan (Southern Water, 2014), Table 14 shows that PCC is forecast to reduce across the Southern Water region over the next 25 years. This is due to the initial impact of installing water meters to 92 per cent of our customers between 2010 and 2015 and also due to water efficiency measures.

The corresponding forecast reduction in wastewater entering the sewerage system should increase the available capacity for additional wastewater flows due to growth or surface water flows due to climate change and urban creep. However, lower wastewater flows may reduce the self cleaning of sewers which could lead to an increase in sewer blockages.

## 6.7 Environmental legislation

Over the last 25 years, the UK water environment has been significantly improved through the introduction of tightened environmental legislation implemented by the UK Government and the European Commission. For example, the environment has been protected from the adverse effects of discharges of urban waste water through the Urban Waste Water Treatment Directive (91/271/EEC) introduced in the early 1990s. This has resulted in cleaner seas and bathing waters in our region.

The introduction of the Water Framework Directive has established a strategic approach to managing the water environment. It takes a common approach to setting environmental objectives for groundwater, dependent wetlands and surface water bodies within the EU, compliance with standards and objectives set for protected areas, and the implementation of programmes of measures to meet those objectives.

To understand current and future legislation and policies, Southern Water liaises closely with the Environment Agency, Department for the Environment, Food and Rural Affairs, Drinking Water Inspectorate etc who are responsible for developing and implementing legislation in the UK. This provides us with a view of potential changes to legislation in the short to medium term. For the long term 25 year view, it is difficult to predict changes in legislation that would need to be considered in this Drainage Strategy.

Where required to meet more stringent environment legislation, Southern Water will seek investment to improve the quality of the effluent through traditional or alternative solutions and at the same time allow new development to connect to our services in line with our statutory obligations.

**Table 16. Environmental legislation risk assessment for North East Kent**

| Environmental legislation risk assessment for a 'do nothing' scenario | | | |
|---|---|---|---|
| | 2020 to 2025 | 2040 | Comments |
| North East Kent | Low to medium | Medium | Southern Water will seek investment to comply with changes in legislation where applicable. |

# 7. Strategic assessment

## 7.1 Outcomes for North East Kent

Our Business Plan for 2015–20 (Southern Water, 2013) sets out details of the improved water and wastewater services we will provide in the future. It was developed as a result of the company's biggest ever consultation programme which included feedback from more than 34,000 customers and stakeholders.

The Business Plan is built around the delivery of six outcomes which our customers and stakeholders told us were their priorities. For each outcome we have developed a clear set of promises that detail what we will achieve for our customers. Three of these outcomes are relevant to this drainage strategy for North East Kent and are shown in Figure 15 below alongside the relevant promises associated with them.

**Figure 15. Outcomes of relevance to the Drainage Strategy for North East Kent**

**Removing wastewater effectively**

- *Minimising flooding from our sewers with a 25 per cent reduction in internal sewer flooding incidents by 2020*
- *No increase in the number of incidents of sewer flooding affecting outside areas*
- *Maintaining stable asset health which includes our performance for sewer collapses and external flooding due to other causes*
- *No increase in the number of blockages in our sewer network*
- *A five per cent reduction in complaints about smells from our wastewater treatment works and pumping stations by 2020*

**Looking after the environment**

- *Minimising pollution from wastewater including zero serious (Cat. 1 & 2) pollution incidents by 2020 and a halving of minor (Cat. 3) incidents by 2017*
- *Maintaining wastewater treatment works compliance by ensuring that any releases to the environment comply with permit conditions*
- *Maintaining 'excellent' bathing water quality and improving other bathing waters*

**Better information and advice**

*Improved advice on how to prevent blocked drains to help reduce blockages*

In the medium term (five to 10 years) and long term (10 to 25 years), our outcomes have been developed during the preparation of outcome delivery strategies for key promises and outcomes. In Table 17, we have identified the outcomes for North East Kent to be achieved by 2020, 2025 and 2040. These include generic outcomes applicable to the entire Southern Water region and outcomes specifically related to the drainage issues identified for North East Kent.

**Table 17. Key outcomes for North East Kent**

| Year to achieve key outcome | Minimise flooding due to wastewater | Minimise flooding due to surface water | Minimise pollution from wastewater | Maintain compliance at wastewater treatment works | Improve water bodies (groundwater, river, estuarine and shellfish waters) | Clean seas (bathing waters) |
|---|---|---|---|---|---|---|
| **2020** | Reduce internal sewer flooding incidents by 25% and no increase in external flooding incidents | Complete agreed actions for Southern Water in the Surface Water Management Plans for Thanet and Margate (Ramsgate and Deal when available) | Aim for zero Cat 1 & 2 pollution incidents and reduce Cat 3 incidents by more than half | Maintain population equivalent compliance at 99.9% or above and numeric compliance at 97.7% or above | Complete Phase 2 of the Thanet Sewers scheme. Aim to achieve 'good' status for all water bodies by 2021 or 2027 | Maintain current 'excellent' classification of bathing waters in the region and potentially improve others to 'excellent' |
| **2025** | Reduce internal and external sewer flooding incidents further | Minimise surface water flooding in collaboration with our drainage partners | Aim for zero Cat 1 & 2 pollution incidents and reduce Cat 3 incidents further | Aim for 100% compliance | Aim to achieve 'good' status for all water bodies by 2021 or 2027 | Maintain current 'excellent' classification of bathing waters in the region and potentially improve others to 'excellent' |
| **2040** | Aim for zero internal and external sewer flooding incidents | Minimise surface water flooding in collaboration with our drainage partners | Aim for zero Cat 1,2 & 3 pollution incidents | Aim for 100% compliance | Aim to achieve 'good' status for all water bodies | All designated bathing waters in region to meet the 'excellent' classification |

## 7.2 Key outcomes at risk

In Section 6, we assessed the current and future risks to the delivery of an effective and sustainable wastewater service in the catchments of North East Kent. In Table 18, we have assessed these risks against delivery of our key outcomes if we do nothing.

The risk assessments in Section 6 and Table 18 were based on a 'do nothing' scenario. However, these risks will be identified, assessed and reduced through our 'business as usual' activities which are detailed in Section 7.3.

**Table 18. Key outcomes at risk in the North East Kent wastewater catchments**

| Key outcome | Risk of not delivering the outcome by; | | Catchments affected | Comments |
|---|---|---|---|---|
| | 2020-25 | 2040 | | |
| **Minimise flooding due to wastewater** | Medium | High | Margate, Broadstairs, Ramsgate, Sandwich, Deal | Margate and Broadstairs sewerage network has sufficient capacity to accommodate 63% of the forecast new wastewater connections by 2040 whilst Ramsgate, Sandwich & Deal can only accommodate 32 to 37% of new connections. |
| **Minimise flooding due to surface water** | Low to medium | Medium | Broadstairs, Ramsgate, Minster Sandwich, Deal | Climate change, population growth and urban creep increases the risk of flooding where the capacity of sewers is insufficient to handle additional flows. Ramsgate, Broadstairs, Minster and Sandwich have mainly combined sewers. |
| **Minimise pollution** | Low to medium | Medium | All | Climate change and population growth increases the risk of pollution where the capacity of sewers is insufficient to handle additional flows. |
| **Maintain WTW compliance** | Medium | High | Ramsgate, Sandwich, Deal | Weatherlees Hill 'A' WTW has insufficient treatment capacity to accommodate population growth to 2040 |
| **Improve water bodies (river, groundwater, estuarine, shellfish)** | Low to medium | Medium | All | Climate change and population growth increases the risk of pollution and frequency/duration of CSO releases where the capacity of combined or surface water sewers is insufficient to handle additional flows |
| **Clean seas (bathing waters)** | | | | |

## 7.3 Strategies: Business as usual activities

We carry out 'business as usual' activities to identify and reduce risks to delivery of our short and medium term outcomes as detailed in Table 19.

**Table 19. Business as usual activities to manage risk**

| Future risk | Identification and assessment of risk | Activities to reduce risk |
|---|---|---|
| Growth | Working closely with planners and developers to understand the location and timing of new developments | Where there is an identified need, deliver the required network and treatment capacity to accommodate growth. Developer contributions may be required in line with the regulatory framework for the industry |
| | Forecasts of growth at catchment level based on data from local plans and the Office for National Statistics | |
| | Hydraulic modelling of the impact of growth on our wastewater service | |
| Climate change and urban creep | Review published research and participate in industry research projects | When upgrading the network to accommodate growth, make an allowance for an uplift in extreme rainfall intensity due to climate change |
| | Partnership working on surface water management plans and flood risk management strategies | |
| | Hydraulic modelling of the impact of additional surface water flows | |
| Asset deterioration | Modelling of asset deterioration to optimise maintenance programmes | Maintenance programmes to repair, refurbish or replace sewers, rising mains, pumping station or process equipment |
| Infiltration | Survey of networks with known infiltration issues in the catchment | Sealing of sewers and manholes to minimise infiltration in catchments with known issues |
| | Preparation and implementation of infiltration reduction plans | |
| Clean water consumption | Measurement and assessment of per capita consumption (PCC) in each Water Resource Zone | Provision of water meters to 92% of Southern Water customers through the Universal Metering Programme |
| | Forecasts of PCC | Education of customers on water efficiency |
| Environmental legislation | Close liaison with the Environment Agency, Department for Environment, Food and Rural Affairs, Drinking Water Inspectorate on environmental legislation and policy | Identification and implementation of schemes to meet our statutory obligations under the EA National Environment Programme |
| | Review of EU and UK government legislation on environmental issues | Upgrade of wastewater treatment assets to meet the requirements of environmental legislation |

## 7.4 Strategies: Least whole life cost approach

The risks to delivery of our key catchment outcomes can be reduced by traditional solutions to upgrade the sewerage network or wastewater treatment works. However, the cost of traditional solutions can be high and the benefits may be limited. To deliver our outcomes, we will always seek to implement the least whole life cost solution, such as elimination or education, before we carry out more expensive activities such as fabrication as illustrated in Table 20.

**Table 20. Strategies to achieve outcomes at least whole life cost**

| Strategy | Definition | Examples |
|---|---|---|
| Investigate | Understand better ways to achieve improved outcomes or reduce the whole life cost | Impact of climate change, improvements in growth planning, use of 'big data', investigations for the National Environmental Programme, opportunities for CSO removal, measurement of infiltration |
| Eliminate | Remove the root cause | Surface water separation, Integrated Water Cycle Management (IWCM), sustainable drainage systems (SuDS), improved targeting of blockages in sewer jetting programme |
| Engage and educate | Change behaviours to reduce demand for improved service levels | Educate customers on fat, oil and grease (FOG) and wet wipe disposal, identification of misconnections, trade effluent control, reduce diffuse agricultural pollution through engagement with landowners and diffuse urban pollution by engagement with customers and local authorities |
| Optimise | Operational or maintenance solution to extend asset life/ improve performance | Optimal operational maintenance with capital maintenance, optimisation supported by fault cause analysis |
| | Leverage of asset capability and unused headroom | Real time network control, reconfiguration of works control/ process, flood reduction measures |
| | Management action to reduce risk/improve performance | Lean processes, standards, risk management, capability, swifter response to failures |
| Work in partnership | Partnership with others, finding synergies to meet overall service | Drainage Strategies, SWMPs, flood management plans, infiltration reduction plans, improving bathing waters in conjunction with others |
| Fabricate | Design and construct new assets | Lean design and build of physical assets |

Alternative long-term strategies such as the use of innovation, sustainable drainage systems, surface water separation and integrated water cycle management are described in Sections 7.5 to 7.8 respectively.

## 7.5 Strategies: Innovation

A key driver for improving our capabilities is the use of innovative techniques. Between 2015 and 2020, we will be investing significantly in research and development to investigate and implement innovative techniques that will improve our capabilities and performance.

We will be bringing leading edge new approaches and technology to operational use. We will also develop solutions to support outcome delivery strategies and our technology roadmap. Our innovation priorities include the following;

- **Real time control systems (RTS)** *to monitor the sewerage network (sewer/wet well levels and flow) to detect blockages, collapses, equipment failures and hydraulic overloading. Alarms will provide warning to control centres and intelligent systems can automatically control flows to prevent flooding. Real time control systems could also be used to manage high flows during storm events and enable the transfer of flows to areas with available capacity.*
- **Network modelling and optimisation and predictive analytics** *to drive more responsive management and better targeted intervention to reduce the frequency of asset and service failure and improve resilience to extreme events.*
- **Plant and process optimisation** *to reduce the use of power and chemicals to reduce cost and to improve water and wastewater compliance.*
- **Energy efficiency and renewables** *to reduce our carbon footprint and energy costs.*
- **Recovering value from wastewater.** *Value wastewater as a resource rather than waste.*
- **Integrated Water Cycle Management.** *A new strategic approach to managing water and environment pressures through strong partnership working and collaboration.*

## 7.6 Strategies: Sustainable drainage systems

Sustainable drainage systems (SuDS) can be used to manage the quantity of surface water run-off from new and existing developments in a natural way by replicating natural processes. The implementation of SuDS can have a significant impact on reducing the peak flows of surface water being discharged through drains and sewers following intense rainfall events. The primary benefits from the use of SuDS techniques include the following:

- *Reduced flooding risk from surface water*
- *Reduced surface water in combined sewers which releases capacity for wastewater flows*
- *Reduced carbon emissions and energy costs due to less pumping and wastewater treatment*
- *Reduce the urban heat island effect*
- *Improved water quality of water bodies due to reduced diffuse urban pollution and CSO releases*
- *Recharge of aquifers which is important in water stressed areas such as Southern England*
- *Enhancement of urban spaces which improves the quality of life for local residents*
- *Increased biodiversity.*

There are a range of SuDS techniques that are suitable for various ground conditions, topography etc. Infiltration SuDS techniques allow the surface water to infiltrate into the ground in a controlled manner which reduces the risk of surface water flooding. Examples of infiltration SuDS techniques include filter strips, permeable pavement, soakaways, swales, infiltration basins and wetlands.

In some areas, infiltration techniques are not suitable due to pollutants in the surface water or soil, unavailability of land for swales or wetlands etc. There are other SuDS techniques which involve non-infiltration or attenuation (temporary storage of surface water) such as green roofs, rainwater harvesting, water butts, detention basins and underground storage tanks. In North East Kent, there are some physical constraints to the use of SuDS which are described below.

### Thanet SuDS

Thanet contains Groundwater Source Protection Zones which mainly cover the rural parts of Thanet, but also include the western parts of Broadstairs and Ramsgate (see the Environment Agency's 'What's in your backyard' website). To prevent further deterioration of groundwater quality in these areas, there are likely to be restrictions on SuDS techniques which involve infiltration. As an alternative, the discharge of surface water to non-infiltration SuDS options or watercourses is considered more appropriate than a discharge to combined sewers. In areas where groundwater is less vulnerable to pollution, there is likely to be more potential for the use of infiltration SuDS techniques, but this is dependent on soil type and land-use.

### Sandwich and Deal SuDS

Groundwater Source Protection Zones are present along the western boundaries of Deal, Kingsdown, St Margaret's at Cliffe and also fully cover the village of Martin. To prevent further deterioration of groundwater quality in these areas, there are likely to be restrictions on infiltration SuDS techniques.

## 7.7 Strategies: Surface water separation

In the Victorian age and the first half of the 20th century, most sewers were designed to carry wastewater and surface water run-off together in combined sewers. During storms, the rainwater in combined sewers can be up to 25 times the volume of wastewater which is carried in all weathers. Extreme rainfall intensity increases the risk of dilute wastewater flooding, pollution or overflows from combined sewers.

In more modern developments, separate networks have been provided for wastewater and surface water. In areas with a high density of combined sewers, it is possible to separate some of the surface water from the wastewater by providing a separate surface water network. However, retro-fitting a new surface water sewerage system in an urban environment is expensive and may require the construction of new pumping stations and outfalls to watercourses.

Between 2012 and 2014, Southern Water invested £20 million in a surface water separation scheme in Portsmouth. The project has been successful and has reduced the risk of sewer flooding for thousands of properties and businesses in the city.

## 7.8 Strategies: Integrated Water Cycle Management

North East Kent faces a number of challenges including water stress, stringent environmental needs, high population growth, and a risk of drought or flooding and climate change. To meet our long-term challenges, Southern Water needs to develop a more integrated approach to managing the water environment. We will work across the whole water cycle rather than at individual solutions that only address specific environmental aspects in certain geographical areas. This is an innovative approach and will show leadership within the region. Greater collaboration and working with third parties, as well as enhanced technical understanding will be required to realise the expected benefits.

Integrated Water Cycle Management (IWCM) recognises that issues related to water are complex and that the main causes of negative impacts are inter-linked. IWCM requires the integration of all elements of the water cycle such as water resources, water use, natural water processes and treatment of wastewater.

Between 2015 and 2020, we will pilot IWCM in two catchments in Kent and West Sussex with a combined catchment area of over 3,200 km2, 108 wastewater treatment works and over 130 water bodies. These catchments have been selected on the basis of the environmental circumstances, a mix of stakeholders and responsibilities and representation of varied water cycle challenges. We will be identifying world-wide best practice and emerging methodology including catchment management and restoration, sensitive urban design, surface water management, wastewater re-use, changes in customer behaviour and adopting new technology.

By 2040, we intend to be operating a fully integrated water environment and working seamlessly with all water users.

## 7.9 Strategic assessments for the delivery of key catchment outcomes

Table 21 summarises the key outcomes that have been identified as requiring a strategic approach to reduce the risk. We are currently assessing a range of traditional engineering and alternative strategies to reduce these risks which are listed in Table 21. The strategic assessment is based on a SWOT (strengths, weaknesses, opportunities, threats) analysis where each strategy has been assessed under the following criteria which are described in more detail in Appendix A,Table 24.

These are:

- *Residual risk*
- *Whole life costs (capital and operational expenditure)*
- *Environmental impact*
- *Input required from other stakeholders*
- *Other constraints*
- *Programming*
- *Uncertainty.*

**Table 21. Key outcomes at risk and potential solutions for the North East Kent region**

| Key outcomes at risk | Risk | Potential strategies | Detailed strategic assessment in Appendix A |
|---|---|---|---|
| **Maintaining compliance with permits at our treatment works** | Insufficient treatment capacity to accommodate population growth | • Provide additional treatment capacity at the works as required<br>• Transfer wastewater to other treatment works with spare capacity | Table 25 |
| **Minimising flooding and pollution due to wastewater** | Insufficient network capacity to accommodate new wastewater connections due to population growth | • Upsize sewers and pumps as required<br>• Provide additional capacity in combined sewers for wastewater by reducing surface water flows | Table 26 |
| **Minimising flooding and pollution due to surface water** | Insufficient network capacity to accommodate additional surface water flows due to climate change and urban creep | • Upsize surface water and combined sewers and pumps as required<br>• Delivery of Surface Water Management Plans<br>• Encourage the take-up of sustainable drainage systems (SuDS) by others and retrofitting of SuDS in urban areas<br>• Separation of surface water from foul water in combined sewers<br>• Provision of stormwater tanks in the network | Table 27 |
| **Improving water bodies to 'good' status by 2021 or 2027 and improving bathing waters** | Diffuse urban and rural pollution | • Implementation of Integrated Water Cycle Management and working with Local Authorities, Highways Authorities, Environment Agency and landowners to reduce pollution | Table 28 |
| | Pollution due to insufficient network capacity to accommodate additional flows | • Minimise pollution due to additional wastewater, surface water and groundwater flows using the potential strategies described above | |

# 8. Next steps

Tables 24 to 28 in Appendix A provide the detailed assessment for each of the strategies to reduce the key outcomes at risk.

The Drainage Strategy Framework (Environment Agency et al., 2013) recommends a four-stage planning process when preparing a Drainage Strategy as discussed in Section 2. This Drainage Strategy is currently at Stage 3 (Options Appraisal) and we are consulting with customers and key stakeholders in the region to identify and agree the following:

- *Current drainage issues, future risks and shared outcomes for the region*
- *Potential strategies to reduce risk in the short, medium and long term*
- *A preferred strategy to achieve the outcomes required by Southern Water and key stakeholders*

Agreed actions to be carried out by Southern Water and key stakeholders which will be added to the action plan provided in Section 9.

It is proposed that the development and implementation of the Drainage Strategy will follow the timeline shown in Figure 16. This will enable the strategy to be in line with the water industry's regulatory framework that requires each water company to submit an investment plan to Ofwat for a price review on a five-yearly cycle.

**Figure 16. Timeline for development and implementation of a Drainage Strategy**

# 9. Action plan

**Table 22. Action plan for the North East Kent Drainage Strategy**

| No. | Applicable drainage area | Action | Lead action owner | Supporting action owners | Due date | Action delivery status |
|---|---|---|---|---|---|---|
| 1 | All | Through the Drainage Strategy, identify and agree current drainage issues, key risks, shared outcomes and potential actions with drainage partners | SW | KCC, EA, TDC, DDC | 2016 | Ongoing. A draft Drainage Strategy (DS) was issued for comment in January 2016. The DS has been discussed at a number of stakeholder meetings between December 2015 and June 2016 |
| 2 | All excluding Minster | Produce a Drainage Area Plan for the Weatherlees Hill 'A' and 'B' wastewater catchments | SW | KCC, EA, TDC, DDC | 2017 | Work on the DAPs will start during the 2016/17 financial year. The Drainage Strategy will be updated with the results of the DAPs |
| 3 | All | Investigate the use of SuDS to manage surface water issues in the Southern Water region | SW | KCC | 2016–17 | Consultants have been appointed to carry out a study on the benefits of SuDS for Southern Water and its customers |
| 4 | Margate | Investigate the potential use of SuDS to manage surface water issues in the Margate area | KCC | TDC, SW | 2016–17 | KCC are currently undertaking studies to identify and cost small scale SuDS schemes to manage surface water flooding issues in Margate |
| 5 | All | Investigate the potential for surface water separation in North East Kent | SW | | 2016–17 | A feasibility study on the suitability of surface water separation in the region will be carried out |

(SW=Southern Water, EA =Environment Agency, KCC=Kent County Council, TDC=Thanet District Council, DDC=Dover District Council, IDB=Internal Drainage Board)

# 10. Glossary of terms

**Table 23: Glossary of terms**

| Term | Description |
|---|---|
| Big data | Large and complex external data sets that can be analysed to provide information that may not be available from routine company performance data |
| Combined sewer overflow (CSO) | Enables a release of wastewater and stormwater into a watercourse or the sea to protect properties from potential flooding |
| Defra | Department for Environment, Food and Rural Affairs |
| DG5 Register | A water company-held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years |
| Drainage Area Plan (DAP) | Modelling of wastewater catchments to identify hydraulic overloading and other issues due to new developments, climate change etc. The DAP provides outline solutions to resolve flooding issues and accommodate growth |
| Drainage Strategy Framework (DSF) | Long-term (25 year) strategies to provide a reliable and sustainable wastewater service in a catchment while accommodating growth, climate change and improving water bodies, bathing and shellfish water quality etc |
| Dry Weather Flow (DWF) | The average daily flow to a wastewater treatment works during seven consecutive days without rain |
| EA | Environment Agency |
| FOG | Fat, oil and grease (FOG) poured down kitchen sinks which hardens in sewers, restricting flow, and can lead to blockages |
| Headroom | Spare capacity in a sewerage network or wastewater treatment works |
| Infiltration Reduction Plan (IRP) | Infiltration is the ingress of groundwater into sewers through cracks and joints. IRPs are an EA requirement for water and sewerage companies to report on the activities being carried out to reduce infiltration |
| Integrated Water Cycle Management (IWCM) | An integrated approach to managing the water environment to meet long-term challenges of water stress, stringent environmental needs, high population growth, risk of drought or flooding and climate change |
| Lead Local Flood Authority (LLFA) | LLFA are county councils and unitary authorities that have a number of flood management responsibilities including the local flood risk management strategy |
| Ofwat | Ofwat is the economic regulator of the water sector in England and Wales |
| Per Capita Consumption (PCC) | Generally refers to the volume of water consumed by a person. The units for PCC are normally litres per day |
| Population equivalent | The unit of measure used to describe the size of a wastewater discharge. One population equivalent is the biodegradable load (matter) in waste water having a five-day biochemical oxygen demand (BOD) of 60g of oxygen per day. Population equivalent doesn't necessarily reflect the actual population of a community and will include effluent from industrial or commercial premises |
| Preliminary Flood Risk Assessment (PFRA) | Similar to a SFRA and provides a high level overview of flood risk in a county |
| Preliminary treatment | A simple treatment which will typically involve screening to remove rags and other similar large solids, maceration of solids and grit removal |
| Primary treatment | Primary treatment involves a physical and/or chemically-enhanced settlement of suspended solids that is not removed by preliminary treatment |
| Private sewers | The ownership of private sewers and lateral drains was transferred to water and sewerage companies on 1 October 2011. Private pumping stations ownership was transferred on 1 October 2016 subject to certain criteria |
| Secondary treatment | Secondary treatment involves biological treatment where bacteria are used to break down the biodegradable matter in waste water |
| Strategic Flood Risk Assessment (SFRA) | A study carried out by one or more local planning authorities to assess the risk to an area from flooding from all sources in a district. The SFRA reviews the impact of climate change, and assesses the impact that land use changes will have on flood risk |
| Sustainable drainage systems (SuDS) | Techniques used to manage the quantity of surface water run-off from new and existing developments by replicating natural processes. An SAB is a SuDs Approval Body to ensure that SuDS schemes meet requirements |
| Surface Water Management Plan | A SWMP is used to assess the flood risks due to local flooding by surface water, groundwater and ordinary watercourses using a partnership approach |
| Tertiary treatment | Tertiary treatment can involve disinfection to reduce pathogenic bacterial and viral organisms by treating wastewater with ultra violet light. It can also involve nutrient removal to help prevent eutrophication (excessive richness of nutrients in water) |
| Urban Waste Water Treatment Directive (UWWTD) | This European Union Directive was agreed in 1991 and sets standards for sewage treatment. The general principle of the Directive is to provide treatment of sewage from the largest discharges first and to protect sensitive waters |
| Water Framework Directive (WFD) | The EU Water Framework Directive is aimed at ensuring the sustainability of all activities that impact on water, thereby securing the availability of good quality water for sustainable and equitable water use |

# 11. References

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# Appendix A – Strategic assessments

# Appendix A – Strategic assessments

**Table 24: Key to strategic assessments**

| Strategic Assessment Level | Residual Risk | Whole Life Costs | | Environmental Impact (due to implementation of the strategy) | Input Required from Other Stakeholders | Other Constraints | Programming | Uncertainties |
|---|---|---|---|---|---|---|---|---|
| | | Capital Expenditure (Capex) | Operational Expenditure (Opex) | | | | | |
| **Low** | The strategy reduces the original risk to an acceptable level within the required time frame | **Low**<br>= < £1 Million (estimate) | Minimal additional operational expenditure | Minimal environmental impact due to construction or operational activities resulting in;<br>• *Insignificant increase in carbon emissions*<br>• *Temporary noise, odours or traffic disruption* | Southern Water would lead on the strategy with minimal input required from other stakeholders | Zero or minimal other constraints against successful implementation of the strategy | **Short term**<br>The strategy could be implemented within the next 5 years | Minimal uncertainty in the data or methods used to evaluate the risk or strategy |
| **Medium** | The strategy would not fully reduce the original risk to an acceptable level within the required time frame;<br>• *The strategy would be effective in the long term but insufficient for short to medium term*<br>• *Or strategy would be effective in the short to medium term but insufficient for the long term* | **Medium**<br>£1 Million to £10 Million (estimate) | A significant increase in operational expenditure (power, labour etc) due to additional;<br>• *Pumping*<br>• *Operation of treatment assets*<br>• *Cleaning and maintenance*<br>• *Education campaigns*<br>• *Stakeholder/ customer engagement plans*<br>• *Analysis and modelling* | There would be a significant impact on the environment as a result of the strategy due to;<br>• *Permanent increase in carbon emissions (eg increased pumping or major construction)*<br>• *Increased risk of pollution*<br>• *Increase in discharge of treated/untreated effluent*<br>• *Significant traffic disruption, noise, odours etc.* | Some input would be required from other stakeholders such as;<br>• *Partnership working on development and implementation of the strategy*<br>• *Joint development and management of policies*<br>• *Provision of land or planning permission for construction*<br>• *Review of permit consents (DWF, discharges)* | Other constraints which would need to be considered in the strategic assessment such as;<br>• *Customer behaviour*<br>• *Potential changes to legislation*<br>• *Approval by other stakeholders*<br>• *Availability of land for construction*<br>• *Ease of access to land for construction/ operational activities*<br>• *Potential upgrading of associated assets as a result of the strategy* | **Medium term**<br>The strategy could be implemented within the next 5 to 10 years | Some uncertainty in the data or methods used to evaluate the risk or strategy.<br>The uncertainties would affect the assessment of the risks and/ or strategic assessment.<br>Work is required to increase the quality and/or quantity of data to improve our understanding. |
| **High** | The strategy would be ineffective at reducing the original risk to an acceptable level in the short, medium and long term | **High Capex**<br>£10 Million to £30 Million (estimate)<br><br>**Very high Capex**<br>=> £30 Million (estimate) | The strategy would result in a high increase in operational expenditure which would significantly affect the whole life total expenditure (Totex) | The strategy would result in a very high impact on the environment which would be unacceptable. Additional investment would be required to reduce the environmental impact to an acceptable level. | High input would be required from other stakeholders to enable the strategy to be successful. Activities would include;<br>• *Activities listed above for the medium level*<br>• *Partnership working to share risks, costs and resources*<br>• *Implementation of additional actions and activities by stakeholders which are essential to successful achievement of the strategy* | A high number of additional constraints which would have a significant impact on successful implementation of the strategy | **Long term**<br>The strategy could be implemented within the next 10 to 25 years | A high level of uncertainty in the data or methods used to evaluate the risk or strategy. This uncertainty significantly affects the quality of the risk/ strategic assessment. Significant work is required to improve the quality and/or quantity of data. |

# Appendix A – Strategic assessments continued

### Table 25: Strategic assessment for maintaining WTW compliance with permits

| Outcome: Maintaining WTW compliance with permit conditions | | | | | Risk: Treatment capacity at Weatherlees Hill 'A' WTW is forecast to be exceeded due to population growth by 2040 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Strategy Description | Residual Risk | Whole Life Costs | | Environmental Impact | Input Required from Other Stakeholders | Other Constraints | Environmental and Societal Benefits | Programming | Uncertainties |
| | | Capital Expenditure (Capex) | Operational Expenditure (Opex) | | | | | | |
| **1) Uplift P.E. capacity at Weatherlees Hill 'A' WTW** | **Low**<br>Reduces the compliance risk in the Weatherlees Hill 'A' catchment | **High**<br>New treatment assets | **Medium**<br>Operation of new assets | **Low to medium**<br>• *Additional treated effluent discharged to Stour Estuary/Pegwell Bay. Assess potential impact on bathing/ shellfish waters*<br>• *Increased carbon emissions due to new assets* | **Medium**<br>• *Requires EA consent for additional discharges, Dry Weather Flow*<br>• *Planning permission to extend works* | **Low to medium**<br>Availability of land next to Weatherlees Hill 'A' WTW | Enables economic development of the region | **Medium term**<br>Benefits could be realised by 2025 | **Low to medium**<br>• *P.E. capacity of Weatherlees Hill 'A' WTW*<br>• *Growth in region to 2040*<br>• *Environmental impact* |
| **2) Transfer additional flows to Weatherlees Hill 'B' WTW** | **Medium**<br>Reduces the compliance risk in the Weatherlees Hill 'A' catchment but increases the risk in Weatherlees Hill 'B' catchment | **Low to medium**<br>Potential additional preliminary treatment required at Weatherlees Hill 'A' or 'B' | **Medium**<br>Additional pumping cost to Margate sea outfall and operation of existing assets | **Medium**<br>• *Additional treated effluent discharged to sea outfall in Margate/ Broadstairs. Assess potential impact on bathing waters etc.*<br>• *Assess risk of pollution at Margate/ Broadstairs WPS if insufficient capacity*<br>• *Increased carbon emissions due to pumping to Margate* | **Medium**<br>Requires EA consent for additional discharges, Dry Weather Flow | **Low to medium**<br>Possible upgrades to capacity of Margate WPS, Broadstairs WPS, rising mains and sea outfall | Enables economic development of the region | **Medium term**<br>Benefits could be realised by 2025 | **Low to medium**<br>• *P.E. headroom capacity of Weatherlees Hill 'B'*<br>• *Capacity of Margate WPS, rising main, outfall*<br>• *Growth in region to 2040*<br>• *Environmental impact* |
| **3)Transfer cess flows from Weatherlees Hill 'A' to 'B' WTW** | **Medium**<br>Reduces the original risk in the short to medium term but not acceptable for medium to long term | **Low**<br>Minimal Capex if cess facilities retained at 'A'. Additional pump to transfer cess to 'B' | **Low**<br>Low additional pumping cost from 'A' to 'B' | **Low**<br>• *Some additional treated effluent discharged to sea outfall in Margate/ Broadstairs considered to have low impact*<br>• *No change in cess tanker movements* | **Low**<br>May require consent from EA, local authorities | **Low to medium**<br>• *Provision of preliminary treatment required at Weatherlees Hill 'B' for cess ?*<br>• *Pumping of cess flow from 'A' to 'B' WTW* | Enables some economic development in the short to medium term | **Short term**<br>Benefits could be realised by 2020 | **Low to medium**<br>Ability of Weatherlees Hill 'B' WTW to accept cess |
| **4) Significantly uplift P.E. capacity at Minster WTW and transfer additional flows from Weatherlees Hill 'A' catchment** | **Low**<br>Reduces the compliance risk in the Weatherlees Hill 'A' catchment | **High**<br>• *Major expansion of existing works with new treatment assets*<br>• *New WPS and rising main to transfer flows from Weatherlees Hill 'A' catchment to Minster* | **Medium**<br>Additional pumping cost to Minster and operation of new assets | **Medium**<br>• *Significant increase in treated effluent in the River Stour*<br>• *Impact on rural environment due to construction works*<br>• *Increased carbon emissions due to new assets and pumping to Minster* | **Medium**<br>• *Requires EA consent for additional discharges, Dry Weather Flow*<br>• *Planning permission to extend works* | **Medium**<br>• *Availability of land next to Minster WTW*<br>• *Constraints to providing new WPS and rising main to pump flows from Weatherlees Hill 'A' catchment to Minster WTW* | Enables economic development of the region | **Medium/Long term**<br>Benefits could be realised by 2025 to 2030 | **Low to medium**<br>• *P.E. headroom capacity of Minster WTW.*<br>• *Growth in region to 2040*<br>• *Environmental impact* |

# Appendix A – Strategic assessments continued

**Table 26: Strategic assessment for minimising flooding and pollution due to wastewater**

| Outcome: Minimise flooding and pollution due to wastewater | | | | | | Risk: New wastewater connections due to population growth | | | |
|---|---|---|---|---|---|---|---|---|---|
| Strategy Description | Residual Risk | Whole Life Costs | | Environmental Impact | Input Required from Other Stakeholders | Other Constraints | Environmentaland Societal Benefits | Programming | Uncertainties (to be investigated) |
| | | Capital Expenditure (Capex) | Operational Expenditure (Opex) | | | | | | |
| 1) Upgrade sewerage network and pumping stations to accommodate additional sewage flows | Low<br>Reduces the original risk of flooding and pollution due to additional flows | High<br>• *Upgrade of sewers*<br>• *Potential upgrade of WPS and rising mains* | Medium<br>• *Additional pumping costs* | Low to medium<br>• *Impact during construction work to upgrade/install larger sewers*<br>• *Increase in carbon emissions* | Low<br>Minimal input required from other stakeholders | Low<br>Access to land to upgrade/ install new sewers | • *Enables economic development of the region*<br>• *Reduces risk of flooding and pollution* | Medium term<br>Ongoing benefits realised as the need to accommodate growth is identified | Low<br>Check capacity of existing network to accommodate growth in sewer flows |
| 2) Provide additional capacity in combined sewers for wastewater flows by the reduction of surface water flows | See Table 27 | | | | | | | | |

# Appendix A – Strategic assessments continued

### Table 27: Strategic assessment for minimising flooding and pollution due to surface water

| Outcome: Minimise flooding and pollution due to surface water | | | | | | | Risk: Additional surface water due to climate change and urban creep | | |
|---|---|---|---|---|---|---|---|---|---|
| Strategy Description | Residual Risk | Whole Life Costs | | Environmental Impact | Input Required from Other Stakeholders | Other Constraints | Environmental and Societal Benefits | Program-ming | Uncertainties (to be investigated) |
| | | Capital Expenditure (Capex) | Operational Expenditure (Opex) | | | | | | |
| **1) Work with drainage partners to manage surface water run-off through SWMPs. Business as usual maintenance of the sewerage network.** | **Medium**<br>Reduces the risk of surface water flooding but may require additional work to reduce long term risks due to climate change | **Medium**<br>• *Complete actions in SWMPs*<br>• *Repair sewers and rising mains at risk of collapse*<br>• *Maintain equipment at pumping stations and CSOs* | **Medium to high**<br>• *Complete actions in SWMPs*<br>• *Jetting of sewers to prevent blockages*<br>• *Root removal*<br>• *Education of customers to reduce FOG in sewers* | **Low to medium**<br>• *Some impact during renewal of sewers*<br>• *Low impact from sewer jetting or other routine maintenance* | **High**<br>• *Maintenance of highway gullies,ditches by others*<br>• *Review planning policy and ensure new developments incorporate SuDS*<br>• *Others to complete actions in SWMPs* | **Medium**<br>• *Riparian owners may not maintain watercourses*<br>• *Customers may continue to dispose of inappropriate objects in the sewerage system* | • *Reduces risk of flooding of properties*<br>• *Reduced pollution leading to improved bathing and shellfish waters and watercourses* | **Short to medium term**<br>Ongoing benefits realised as actions completed in SWMPs | **Medium**<br>Quantity of additional surface water flows due to climate change etc. |
| **2) Upgrade combined and surface water sewers and pumping stations to accommodate additional surface water flows** | **Low**<br>Reduces the risk of additional surface water flows causing flooding and pollution | **High**<br>• *Upgrade of sewers*<br>• *Potential upgrade of WPS and rising mains* | **Medium**<br>• *Additional pumping costs* | **Medium**<br>• *Impact during construction work to upgrade sewers*<br>• *Increase in carbon emissions from construction and additional pumping* | **Low**<br>Minimal input required from other stakeholders | **Low**<br>Access to land to upgrade/ install new sewers | • *Enables economic development of the region*<br>• *Reduces risk of flooding and pollution*<br>• *Improved bathing and shellfish waters* | **Medium term**<br>Ongoing benefits realised as the need to accommodate growth is identified | **Medium**<br>Quantity of additional surface water flows due to climate change etc. |
| **3) Construct large volume underground stormwater storage tanks to temporarily store stormwater** | **Low**<br>Reduces the risk of additional surface water flows causing flooding and pollution | **Very high**<br>• *Construction of large concrete underground tanks* | **Medium to high**<br>• *Additional cleaning and maintenance costs in confined space*<br>• *Additional pumping costs from storage* | **High**<br>• *Impact during construction of underground storage tanks*<br>• *Increase in carbon emissions from construction and additional pumping* | **Medium**<br>Planning permission required for underground tanks | **High**<br>Availability of land to construct underground tanks | • *Enables economic development of the region*<br>• *Reduces risk of flooding and pollution*<br>• *Improved bathing and shellfish waters* | **Medium term**<br>Benefits could be realised by 2025 to 2030 | **Medium**<br>Quantity of additional surface water flows due to climate change etc. |
| **4) Encourage take up of SuDS by others through;**<br>• *adopting SuDS in public open spaces*<br>• *reducing bills for partial/full disconnection of surface water flows*<br>• *provision of water butts to customers* | **Medium**<br>Removes some surface water flows in the sewers. May not reduce the risk of additional surface water flows due to climate change and urban creep | **Medium**<br>• *Low cost for each water butt*<br>• *Costs depend on number of properties provided with water butts etc.* | **Low to medium**<br>• *Cleaning and maintenance of adopted SuDS*<br>• *Reduced pumping costs* | **Low**<br>Minimal environmental impact | **Medium**<br>Partnership working on SuDS adoption policy | **Low to medium**<br>• *Potential changes in legislation on SuDS adoption etc*<br>• *Obtaining Ofwat support for investment in SuDS* | • *Reduces some risk of flooding, pollution, releases*<br>• *Reduces bills for property owners who install SuDS*<br>• *SuDS improves public spaces*<br>• *Reduces carbon* | **Short term**<br>Policy adoption could realise benefits in the short term | **Medium**<br>• *Quantity of additional surface water flows due to climate change etc.*<br>• *Quantity of flows removed by SuDS* |
| **5) Large scale retrofitting of SuDS in urban areas** | **Low**<br>Reduces the risk of additional surface water flows causing flooding and pollution | **High**<br>• *Retrofitting of basins, swales, planters, permeable surfaces*<br>• *Costs may be shared with other stakeholders* | **Low to medium**<br>• *Cleaning and maintenance of adopted SuDS*<br>• *Reduced pumping costs* | **Low**<br>• *Some environmental impact during the construction of SuDS*<br>• *The strategy will improve the environment significantly* | **High**<br>• *Partnership working to share risks, costs and resources* | **Medium**<br>• *Availabilty of land for swales, planters etc*<br>• *Obtaining Ofwat support for investment in SuDS* | • *Reduces some risk of flooding, pollution,releases*<br>• *Reduces bills for property owners who install SuDS*<br>• *Improves public open spaces*<br>• *Reduces carbon* | **Medium to long term**<br>Initial benefits could be realised by 2030 | **Medium**<br>• *Quantity of surface water flows due to climate change etc.*<br>• *Quantity of flows removed by SuDS* |
| **6) Remove surface water flows from combined sewers by providing a separate surface water sewer system** | **Low**<br>Reduces the risk of additional surface water flows causing flooding and pollution | **High**<br>• *Construction of new surface water sewers, pumping stations and outfalls* | **Medium**<br>• *Additional surface water pumping costs offset by reduced pumping of combined flows*<br>• *Additional surface water sewers to maintain and clean* | **Medium**<br>• *Impact during construction work of new sewers and pumping stations*<br>• *Increase in carbon emissions from construction* | **Medium**<br>• *Partnership working to separate surface water from combined sewers*<br>• *Planning permission for new pumping stations, outfalls etc.* | **Medium**<br>• *Availability of land to construct new surface water pumping stations or outfalls*<br>• *Availability of suitable discharge points* | • *Reduces risk of flooding of properties*<br>• *Reduced pollution leading to improved bathing & shellfish waters and watercourses* | **Medium term**<br>Benefits could be realised by 2025 to 2030 | **Medium**<br>• *Quantity of surface water flows due to climate change etc.* |

# Appendix A – Strategic assessments continued

**Table 28: Strategic assessment for improving water bodies to 'good' status by 2021 or 2027 and improving bathing waters**

| Outcome: Improve water bodies to good status by 2021 or 2027 and improve bathing waters | | | | | Risk: Diffuse urban and rural pollution | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Strategy Description | Residual Risk | Whole Life Costs | | Environmental Impact | Input Required from Other Stakeholders | Other Constraints | Environmental and Societal Benefits | Programming | Uncertainties (to be investigated) |
| | | Capital Expenditure (Capex) | Operational Expenditure (Opex) | | | | | | |
| 1) Integrated Water Cycle Management in combination with reducing diffuse rural and urban pollution through engagement with other stakeholders | **Medium**<br>IWCM is a long term strategy | **Low to medium**<br>• *Requires investment in research and development of innovative solutions to aid the delivery of IWCM*<br>• *May require improvements to wastewater treatment* | **Medium**<br>• *Collection and analysis of data to assess sources of pollutants*<br>• *Modelling of catchments*<br>• *Use of decision analysis tools*<br>• *Ongoing engagement with all stakeholders* | **Low**<br>The strategy will improve the environment significantly | **High**<br>• *Requires significant engagement and input from other stakeholders including local authorities and landowners.*<br>• *Requires a change in practice and behaviour of all polluters of water bodies.* | **Medium**<br>• *IWCM requires the development of an institutional and legal framework* | • *Improve biodiversity*<br>• *Improve the wellbeing of residents and visitors*<br>• *Increase recreational use of water bodies*<br>• *Increase tourism and improve the local economy* | **Medium to long term**<br>Benefits from pilot schemes could be realised between 2020 and 2025 and from other catchments in the longer term | **Medium to high**<br>• *Will IWCM be effective? (Use trials to investigate)*<br>• *Willingness of other stakeholders to change their behaviour* |
| 2) Reduce CSO spills and pollution of water bodies | See Tables 26 to 27 | | | | | | | | |

We'll update and republish this Drainage Strategy as we continue to engage with our customers and stakeholders.

You can find further information on how to share your feedback via our website:

**southernwater.co.uk/drainagestrategies**

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