21ST CENTURY DRAINAGE PROGRAMME

CAPACITY ASSESSMENT FRAMEWORK
EXECUTIVE SUMMARY

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Water UK is a membership organisation which represents all major statutory water and wastewater service providers in England, Scotland, Wales and Northern Ireland, working with government, regulators and stakeholder organisations to develop policy and improve understanding of the business of water on behalf of UK water companies.

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21ST CENTURY DRAINAGE PROGRAMME - CAPACITY ASSESSMENT FRAMEWORK

Executive Summary

The vision of the 21st Century Drainage Programme is to enable the UK water industry, in partnership with the UK's governments and regulators, to make plans now that will ensure the sustainability of our drainage infrastructure in the future.

The Programme recognises the need to move away from the short-term delivery of levels of service towards planning for long-term resilience. As a starting point, we need to have a better understanding at the national level of the current and future performance of our drainage systems. We then need to be able to agree on a desirable future level of resilience and, on this basis, identify the interventions necessary to maintain this level now and in the future.

Part of the programme is look at how we can develop a consistent, transparent and high-level approach to assessing the available capacity in the UK's drainage systems to accommodate the flows we can expect in the future. In essence, we need to know:

- What is the current available capacity in our drainage systems?
- Will this be enough in the future?
- When will lack of capacity become a problem?
- What do we need to do to prevent it becoming too much of a problem?
- When will we need to do it?

This executive summary forms one of a three final document suite (the others being the Project Report and a Guidance Document). A dissemination seminar was held in April 2017.

What do our drainage systems do?

Our drainage systems serve people and industry by taking both wastewater and rainfall runoff and treating it and discharging it to rivers or the sea. This infrastructure comprises a number of different types of system elements:

- Surface water sewers carry rainwater that has drained off our roads, roofs and other hard surfaces, releasing the water directly into rivers and streams, the sea, the ground (via soakaways) or to combined sewers.
- Foul sewers carry wastewater from homes and businesses to wastewater treatment works.
- Combined sewers carry both rainwater and wastewater to wastewater treatment works.
- Combined sewer overflows (CSOs) are points in a combined sewer network where excess water can be released from the network to prevent homes and businesses from

being flooded. These are designed to operate only when there is a large amount of rainwater in the system to dilute the wastewater.

- Wastewater pumping stations are used where water cannot be drained through the sewer network by gravity alone. These often have overflows similar to CSOs to allow excess water to be released either due to extreme rainfall or in an emergency.
- Wastewater treatment works treat the wastewater before it is returned to our rivers or the sea.

Why are we looking at drainage capacity?

Our drainage systems are not full all of the time. They are designed to have spare capacity to cater for an increase in population or surface water runoff when it rains. All drainage systems have a limit on how much water they can conveyed to wastewater treatment works and watercourses. When our drainage systems are full (usually during heavy rainfall), the water either spills via CSOs into our rivers and onto our beaches or, in extreme circumstances, appears as flooding (often on roads and occasionally in our homes and other buildings).

Over time, that spare capacity reduces and our drainage systems fill up more frequently, so the chance of flooding or CSO spills increases up until a point when the sewerage undertaker needs to take action and makes improvements to the system.

Why are the flows in our drainage systems changing?

Flows in our drainage systems have increased over time for several reasons, including:

- Our population and urban areas have been growing, meaning that more homes are now connected to our drainage systems than ever before. Large developments have new drainage systems or changes are made to the existing drainage system to accommodate the additional flows. Small developments are often connected directly into the local existing drainage system without any changes being made.

- Once built, urban areas continue to change and "urban creep" – the term used for describing the increase in impermeable surfaces such as home extensions, conservatories and paving over front gardens for parking – can add to the amount of water going into our drainage systems. The soil and grass that would absorb rain is covered over. Studies show that "urban creep" can make a bigger contribution to the flows in our drainage systems than new housing.

- The pipes that make up our drainage systems also deteriorate over time, causing infiltration; this is where water from the ground can get into our drainage systems through cracks in the pipes or gaps at joints.

- Our climate is also changing, so we also need to plan for more rainfall during the winter period and more intense storm events throughout the year.

What are we already doing to compensate for this?

With all of these pressures, we are expecting more and more from our drainage systems. Yet it would be very expensive to modify our existing drainage systems and make them bigger.

Not only could this have significant implications for customers' bills, but the impact of street works in all our towns and cities would be considerable.

Sustainable Drainage Systems (SuDS) are a vital part of the water industry's long-term strategy to manage the impact of development and increasing amounts of rainwater entering our sewers. SuDS are generally surface-based vegetation features that are designed to slow down and reduce the quantity of rainwater that enters our sewers. This helps us to manage flood risk, reduce the effects of urban pollution, whilst also making our urban areas more pleasant to live in and attractive for wildlife.

Local authority planners have a responsibility for ensuring new developments are drained in a sustainable way, following the non-statutory guidance provided by government[1]. Within existing urban areas, sewerage undertakers and local authorities are working together to reduce the amount of hard surfaces that drain into the sewers: finding ways to divert the rainwater from those hard surfaces into the ground or to an alternative (separate) system where the rainwater is not mixed with wastewater; and storing and treating the water locally so that the downstream drainage system does not have to accommodate large amounts of polluted rainwater.

SuDS, as their name suggests, aim to provide a more sustainable approach to managing surface water in the long-term. They also have the advantage that, when they are full, failure is more gradual, easier to anticipate and manage than traditional drainage systems; thus allowing our communities and urban areas to prepare, recover and adapt.

Why do we need to do more?

As a nation, we need to target our investment where it can have greatest benefit, ensuring that, as much as possible, we increase the resilience of our infrastructure. To do this we need to look at the national picture, which requires collaboration from all 12 of the UK's sewerage undertakers. Measurement of the available capacity in our drainage systems does not give us all the answers, but it is relatively easy to do and it provides a good indicator of the status of the system and where investment is most needed.

How has this project met this challenge?

This project has developed *The 21st Century Drainage Programme Capacity Assessment Framework* that sets out an approach that sewerage undertakers are recommended take to carry out a high-level assessment of the available capacity of their drainage systems.

It provides a pragmatic and consistent approach to assessing: how much capacity is currently available in each drainage system; what will be available in the future; and the beneficial effects of intervention for improving the performance of the drainage system.

It has been developed recognising the need to carry out a relatively simple assessment and takes into account that drainage network data can be scarce in some catchments. It also takes

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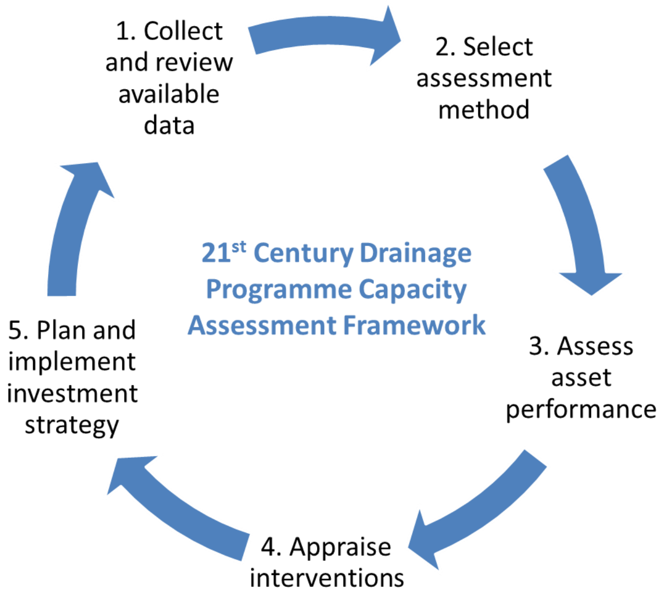
[1] This guidance is different in England, Wales and Scotland. Guidance in Northern Ireland is under development.

into account the uncertainties of predicting future change. The five steps of the Framework are summarised in Figure 1.

Figure 1 The five steps of the Framework



For this project, we have looked at how to assess the available capacity of the UK's foul and combined sewers only. It is intended that the framework will be extended, in time, to assessing the available capacity of our existing surface water drainage. In theory, the assessment process would be the same. But our surface water drainage systems are the responsibility of multiple organisations and so there are additional steps in the process that would need to be carried out to be able to provide a national picture.

How is performance measured?

Although we could simply report the actual available capacity for every pipe, this is meaningless without relating it to the service it is providing. Therefore, a set of "metrics" have been chosen that can be measured easily and relatively quickly, and give a good overview of system performance in the context of drainage capacity.

For each metric we have recommended performance thresholds to enable users to summarise performance based on a simple scoring system. How these scores should be interpreted is explained in the Guidance for applying the Framework. As experience of using the Framework grows, the metrics and scoring may well be refined.

What data is used?

Although we generally know the locations of all our sewers and their sizes, we don't always know their gradient, how they are connected together and exactly what areas they are serving. We generally have the best information in locations where problems have occurred in the past. In these cases we have built detailed computer models to predict the drainage system performance in order to analyse and improve the system.

If we want to have the full picture for the UK, however, we also need to have a way of assessing performance where we do not have existing computer models. Therefore, the Framework has two methods for assessing performance - a simple method, where existing models are not available, and a more accurate method that uses the models already available. As part of this project, we tested these methods and the proposed metrics and scoring on four pilot catchments; one each for England, Scotland, Wales and Northern Ireland. These pilot studies allowed us to make refinements in developing the Framework.

How are results presented?

As part of this project, we looked at how the results of the assessment can be summarised to give a clear understanding of the status of the capacity of drainage systems. The scoring process is used for visualising this information. These results become much more tangible when represented geo-spatially. Therefore, we have made recommendations on how the results for drainage systems across the whole of the UK can be visualised. This takes into consideration what can be shown at a national scale and regional scale, as well as for individual drainage systems. Figure 2 shows an example of how performance can be represented geo-spatially for a drainage system.

What will happen next?

The Framework and the accompanying guidance provide a first iteration of an approach to assessing drainage capacity for long-term investment planning. Sewerage undertakers are encouraged to use the Framework in their long-term planning and in particular to use it in their approaches to PR19 and other equivalent regulatory regimes.

Due to the cyclical nature of investment planning within the UK water industry, application of the Framework should also be undertaken on a cyclical basis. It is expected that lessons will be learnt from its implementation. Therefore, it is also expected that the Framework and guidance will be reviewed and updated in the future.

Figure 2 An example of representing performance for a drainage system