Drainage and Wastewater Management Plan

Summary of the methodology for the Baseline Risk and Vulnerability Assessment (BRAVA) on:

Internal Sewer Flooding Risk

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from

Southern Water

Contents

1.   Background

1.1. Purpose

The purpose of this document is to provide a summary of the method for undertaking the Baseline Risk and Vulnerability Assessment (BRAVA) for the planning objective on **Internal Sewer Flooding Risk**.

The BRAVA is an important step in the development of Drainage and Wastewater Management Plans (DWMPs). It is an assessment of current and future risks for each of the planning objectives below and is undertaken for the sewer catchments that were flagged during the Risk Based Catchment Screening (RBCS).

All Water and Sewerage Companies (WaSC's) are required to complete a BRAVA and report to Water UK on the following six common planning objectives:

1. Risk of sewer flooding in a 1 in 50 year storm
2. Storm overflow performance
3. Risk of WTW compliance failure
4. Internal sewer flooding risk
5. Pollution risk
6. Sewer collapse risk

We have developed this methodology in accordance with Water UK guidance on 'BRAVA planning objectives for national reporting' published on 29 July 2020. An extract from the Water UK guidance on the planning objective for the internal sewer flooding risk is provided in the Annex to this document.

1.2. Definitions

Internal Sewer Flooding is defined as flooding incidents caused by an escape from public sewers (whether foul, combined or surface water) which enters a building or passes below a suspended floor. Any escape of water from pumping stations, sewage treatment works and other assets under the control of the water company are also included. Buildings are defined as those normally used for residential, public, community, commercial, business or industrial purposes.

All water companies have a performance commitment to reduce the number of flooding incidents occurring from the sewer network, and submit annual reports to Ofwat, the water industry economic regulator, on the number of incidents over the previous 12 months. Up to the end of March 2020, the number of reportable flooding incidents excluded those due to severe weather. From April 2020 the count will include flooding incidents arising during severe weather (rainfall events with a storm return period greater than 1 in 20 years).

Ofwat defines Internal Sewer Flooding Risk in its reporting guidance on sewer flooding as flooding arising from sewers as a result of hydraulic overload (internal flooding due to the hydraulic capacity of the sewer being exceeded) and "flooding other causes" (FOC) such as blockages, collapses and equipment failure. It excludes incidents where the cause was the failure of non-public sewers such as from a privately owned sewer system, flooding from rivers, land drainage, highways drainage and private drains.

This planning objective allows for a comparison to be drawn between the likely scale of all internal sewer flooding experienced each year compared to the scale of hydraulic only flooding that may be observed during a severe storm, such as a 1 in 50 year storm.

1.3. Reporting Requirements

Water UK guidance requires all WaSCs to report on the risk of Internal Sewer Flooding Risk for the baseline 2020 planning horizon only.

An assessment for the 2050 planning horizon is not required for reporting purposes.

Water UK guidance requires all WaSCs to use Ofwat's reporting methodology where data on the number of actual flooding incidents is "normalised" into an equivalent number of flooding incidents per 10,000 connections (or addresses). Normalising the data allows the catchments to be compared with each other to a common scale, as illustrated in the example below:

Catchment	Average Annualised (3 year average) Number of Incidents	No. Catchment Connections	Normalised per 10,000 Connections
Budds Farm Havant	25	152,294	1.66
East Worthing	10	61,769	1.62

This means there is consistent reporting by all WaSCs and it enables comparative assessments of performance between water companies.

2. Data Sources

The following is a short description of the data that has been used and where it has been obtained from.

2.1. Historical incidents

We record all internal sewer flooding incidents in our Sewer Incident Record Form (SIRF) database. This holds records of the number and causes of internal flooding incidents across the whole of our operating area. The data has been filtered to exclude internal flooding incidents arising from assets which are beyond our control, as per the Ofwat requirement in section 1.3.

2.2. Flood Mitigation Schemes

Flood mitigation schemes are recorded as part of the Asset Plan Wastewater Investigations (AAP) database and on a list of known Flood Mitigation Schemes (Master Spreadsheet). These hold records of flooding mitigation schemes that have been completed across our operating area.

This data is used to identify any flooding incidents relating to hydraulic overload during the last three years that have already been mitigated so they can be removed from the risk assessment. The proportion of internal flooding incidents caused by hydraulic overload is very small compared to flooding due to other causes. The mitigation measures in place may only be effective up to certain storm events, hence we will use the planning objectives on annualised flood risk and 1 in 50 year storm to identify properties in areas still at risk from flooding.

2.3. Data on Sewer Connections

The number of connections to the sewer network enables us to keep track of and record the population served by our sewerage systems (the network of sewers, pumps and treatment works). The number of the population within the catchment and occupancy rates obtained from the Experian 7.1 (SAGE) database which complies domestic data including trade and cesspit wastewater collected from networks which are not directly connected with wastewater treatment works to determine the total number of connected properties.

We report to Ofwat every year on the number of customers connected to our network (using the data reporting form RCF473_10). The record of the population served by our sewerage systems excludes the number of properties in the catchment which are served by septic tanks and private sewerage systems.

We used the total number of connections or properties in the catchment to normalise the average number of internal flooding incidents over the last 3 years. The normalised values per sewer catchment enable comparative assessment of performance of a catchment with other catchments within our operating area, as well as with other water companies.
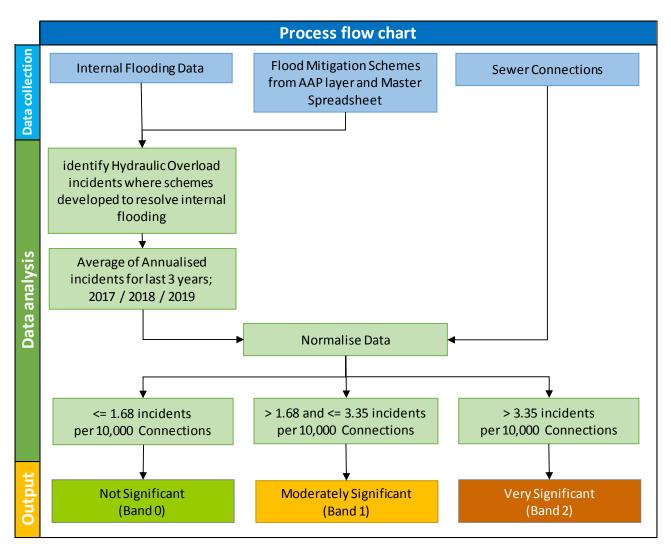
3. Method of Assessment

The following methodology has been developed and has been used for Internal Sewer Flooding risk assessments.

3.1. Process – Baseline 2020 Assessment

The baseline assessment is carried out based on three years of actual recorded incidents. The process for the 2020 baseline assessment is shown in Figure 1. It includes details of the information source, how we assess the data and how the catchments are banded based on the results.

Figure 1 – Process flow chart for 2020 baseline Internal Sewer Flood Risk

The baseline assessment uses the number of sewer catchment connections and the previous 3 years data (2017 / 18 / 19) from the SIRF database to create normalised data – or the number of internal flooding incidents per 10,000 connections per annum.

The results are then assigned a band (0, 1 or 2) to meet the Water UK reporting requirements, set out in section 3.3.

3.2. Process – Future Assessments

Although at this stage we are not required by Water UK to forecast future internal flooding under this planning objective, our intention is to explore how we can incorporate an assessment of future risks of internal flooding within the DWMP.

Historical data attributes most of the reported flooding incidents to blockages, for example, wet wipes, and failures of mechanical and electrical assets, for example, pumping stations within our wastewater networks. Both of these are difficult to predict for the short term, and hence the uncertainties will be much higher in any longer term forecasts.

We use an asset investment planning suite (called Pioneer) to support planning for future investment in our wastewater assets. Within Pioneer are asset deterioration models that are used to predict asset failure and consequence, including the predicted future number of flooding incidents. In addition, we use an Asset Risk Management (ARM) module within the Pioneer suite to determine a risk score for flooding incidents over and above that predicted by deterioration modelling. The risk score derived within ARM is based on the likelihood of an incident taking place and the resulting consequences.

We will explore how to use the risk score in ARM in conjunction with the Pioneer deterioration model to predict future risk of internal flooding arising from both the sewer network as well as treatment works and pumping stations for the future planning horizons up to 2050. Our aim is to incorporate this data and future assessment within the DWMP so future investment needs are identified across all the planning objectives.

3.3. Outputs from the BRAVA

The output from the BRAVA on Internal Sewer Flooding Risk is a risk score for each sewer catchment. These scores are assigned to one of three bands as specified by Water UK. The thresholds for these bands are determined by each water company.

We have set the thresholds based on our AMP7 performance commitments agreed with Ofwat. Band 0 (not significant) is for the sewer catchments that are performing better than the industry upper quartile performance in 2020, set by Ofwat at 1.68. Band 2 (very significant) is based on the Ofwat performance target and is greater than the level at which the maximum penalty cap is set for Southern Water. This is known as the "standard underperformance collar". The threshold is therefore set at 3.35. Band 1 (moderately significant) then is the gap or range between Bands 0 and 2.

The assessment criteria shown in the below table applies to the Baseline 2020 assessment:

Assessment Criteria / Thresholds	Bands	
Equal or Below AMP7 average Target (1.68 incidents per 10,000 connections)	0	Not Significant
Between AMP7 and AMP6 average performance Target (>1.68 and <= 3.35 incidents per 10,000 connections)	1	Moderately Significant
Exceeds AMP6 average performance Target (3.35 incidents per 10,000 connections)	2	Very Significant

We have quality assured the draft results to ensure they have correctly identified the sewer catchments at greatest risk and which will be taken forward for further consideration in the DWMP process. In "normalising" the data for sewer catchments based on the number of connections, the results can be skewed for catchments with relatively small lengths of sewer. We have therefore applied a moderation to ensure that sewer catchments where the annual average number of incidents over the last 3 years is less than 1, then these catchments are considered as not

significant (i.e. band 0). Conversely, for sewer catchments which fall into band 0, we have moved these up one band to moderately significant if there were more than 3 incidents on average over the last three years.

Southern Water
30 November 2020

4. Annex: Water UK guidance on the Planning Objective

<table>
<tr><td rowspan="2">Planning Objective: Internal Sewer Flooding Risk</td><td><u>Objective/Definition</u>

To be applied to all catchments that have triggered a BRAVA assessment only through the RBCS process.

This planning objective defines the 'Internal Sewer Flooding Risk' for both hydraulic & Other Causes e.g. blockages. It allows for a comparison to be drawn between the likely scale of all 'Internal sewer flooding' experienced each year compared to the scale of hydraulic only flooding that may be observed during a rare event such as a 1 in 50-year storm.

As per the Ofwat reporting criteria it covers internal sewer flooding due to hydraulic incapacity and other causes (e.g. blockages, collapses & equipment failure). It excludes: Non-sewer related flooding such as privately owned sewerage, Fluvial, Pluvial (except where linked to the incapacity of a sewer), Land Drainage, Highway drainage and private drains. Results are to be presented at a Baseline (2020) case only.</td><td><u>Definition clarifications</u>

Results to be presented at Baseline (2020).

<u>Thresholds</u>
Bands of 0, 1 & 2 to be applied; with 0 as 'Not Significant', 1 as 'Moderately Significant' and 2 as 'Very Significant'. Where a catchment does not trigger BRAVA, these will be flagged as 'Not applicable'.
Thresholds for bands to be developed by each company appropriate to their needs and to ensure outputs are meaningful to inform stakeholder engagement.

<u>Maps</u>
To be produced for L2 to visually display bands 0, 1 & 2.

<u>Tables</u>
To be produced for L1, L2 & L3 and include only 0, 1 & 2 banding.</td></tr>
<tr><td>Baseline Assessment

The baseline performance is to be based on best available model data.
Where a suitable model is not available, companies will use an average of last 3 years of annual performance.
The results are to be normalised based on connected 'properties' to move between level 3, level 2 and level 1. This is undertaken to ensure comparability of performance is provided across all geographical bases.
Each company will determine the thresholds it will use to ensure the results appropriately reflect their risk and provide an overview of their calculations.</td><td>2050 Assessment

Not to be produced for Cycle 1 but the potential for 2050 assessments to be produced for Cycle 2 to be considered in the 'Cycle 1 to Cycle 2 review'.</td></tr>
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