

# Drainage and Wastewater Management Plans (DWMPs)

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

## Wastewater Treatment Works Dry Weather Flow Compliance

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from  
**Southern  
Water** 

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# 1. Introduction

## 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 **Wastewater Treatment Works (WTW) Dry Weather Flow Compliance**.

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 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 developed methodologies for conducting these six BRAVAs in accordance with the Water UK guidance and completed the BRAVAs in December 2020. The methodologies and outputs are published on our website at: <https://www.southernwater.co.uk/dwmp/baseline-risk-and-vulnerability-assessment>

We identified that two additional 'bespoke' objectives would complement the six common national objectives and have included these in our DWMP:

7. Annualised Flood Risk - which is the flood risk arising from sewers as a result of different severities of rainfall
8. Wastewater Treatment Works (WTW) Dry Weather Flow (DWF) Compliance – to assess our compliance with the Environment Agency (EA) permit relating to the DWF arriving at a wastewater treatment works.

This document explains the method for the planning objective on the WTW DWF compliance.

## 1.2. Definition

The Dry Weather Flow is the average daily flow reaching our Wastewater Treatment Works (WTWs) during a period without rain. Daily total flows are measured on flow meters certified on the Environment Agency's (EA) Monitoring Certification Scheme (MCERTS). The DWF is taken as the 10<sup>th</sup> percentile of a year's flow, also known as the Q90 value. It is the total daily flow value that is exceeded by 90% of the measured total daily flows in any period of 12 months.

The DWF figures are submitted to the EA on an annual basis. The EA sets limits on the quality and quantity of treated effluent from WTWs to ensure discharges from WTWs do not cause an unacceptable environmental impact. The flow that may be discharged in dry weather is one of these limits.

### 1.3. Reporting Requirements

We are not required to report the BRAVA outcomes for our bespoke and additional planning objectives to Water UK. However, we will publish the results on our website for consideration by our customers and partner organisations.

## 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. Permitted Dry Weather Flow

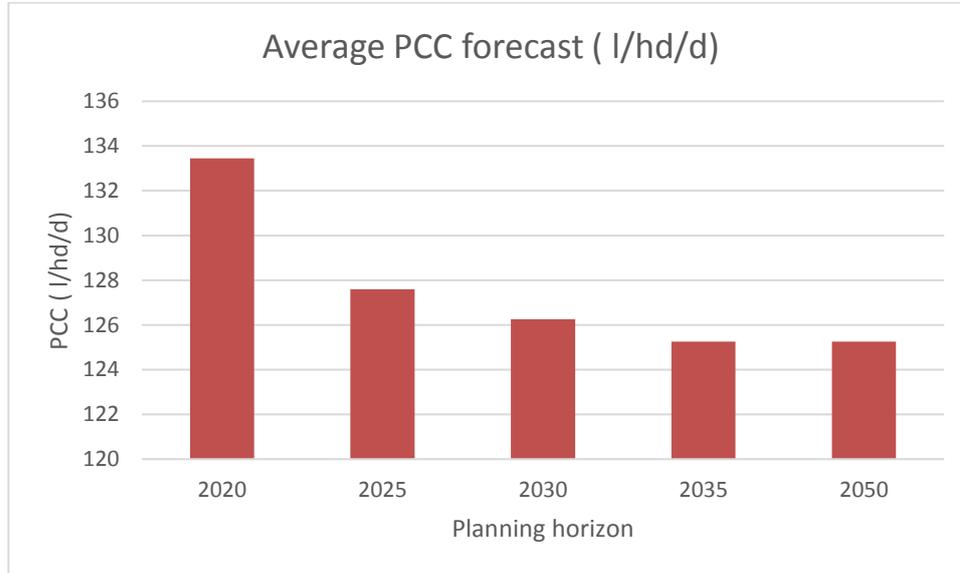
There are 308 WTW sites with DWF permits. Of these, 285 sites have flow records to enable us to assess DWF compliance. We recently installed new flow meters at 11 sites which previously did not have a flow meter. We also have 12 WTW sites where the flow arriving is too low to measure using flow meters. These 23 sites with no record or a very short time span record have therefore not been considered in this assessment.

The details of the DWF Environmental Permit for each site is obtained from the SAGE Experian 7.1 database. This database contains data on the number of domestic properties connected to the wastewater system and includes information on trade and cesspit wastewater collected within the sewer catchment. This enables us to determine the total number of properties connected to the wastewater treatment works.

### 2.2. Per Capita Consumption of Water

Per Capita Consumption of water is the average consumption or use of water by a person each day. It is calculated by dividing the total volume of water supplied to a community by the total population in that community. It has been assumed that 92.5% of the water supplied is returned as wastewater to a sewer system. Figures for the Per Capita Consumption (PCC) are obtained from our Water Resources Management Plan. As shown in the graph below, the average PCC is predicted to decrease from 133 litres per person per day in 2020 to 125 litres per person per day in 2050.

Figure 1: Average PCC forecast



### 2.3. Baseline Dry Weather Flow

We submit a DWF (Q90) compliance record to the EA annually and have used the records from the last three years - 2017, 2018 and 2019 to calculate the three year average DWF. This has been compared against the DWF permit to assess the baseline (2020) DWF compliance.

When designing a treatment works or assessing the future capacity needs, Q80, which is a flow exceeded 80% of the time, is used instead of Q90. It is assumed that, after identifying a WTW at risk of meeting its permit requirement based on Q90, any upgrade or intervention required in the future will be undertaken based on Q80. Therefore the options development and appraisal of the site will be undertaken using Q80 in line with the EA guidance on [calculating DWF](#).

### 2.4. Infiltration

The contribution of infiltration to the baseline DWF is estimated by deducting an estimated foul flow from the recorded flow (Q90) as shown in the equation below:

$$\text{Infiltration (I}_{19}) = \text{DWF(Q90)}_{19} - P_{RC19} \times PCC_{AMP6} \times 0.925 - E_{RC19} - C_{RC19}$$

Where:

- DWF(Q90)<sub>19</sub> = 2019 recorded dry weather flow
- P<sub>RC19</sub> - Resident and Non-resident population reported in 2019
- E<sub>RC19</sub> - Contribution of trade effluent – annual return 2019
- C<sub>RC19</sub> - Contributions from cesspit – annual return 2019

## 2.5. Future Dry Weather Flow projection

We used catchment growth projections from SAGE v16 to calculate future DWF. SAGE v16 provides an estimate of the population equivalent taking into account the following:

- Resident and non-resident population reported in 2019 ( $P_{RC19}$ )
- Trade effluent and cess reported in RC19 ( $E_{RC19}$  and  $C_{RC19}$  respectively)
- Projected population, based on Experian 7.1

The SAGE data is used to project future DWF as shown the equation below.

$$DWF_{(\text{planning horizon e.g 2025})} = \text{Baseline DWF} + \text{Growth in foul contribution} + \text{Increase in infiltration}$$

The following assumption has been made in calculating DWF:

- The proportion of flow returned to a sewer is assumed to be 92.5% of the water supplied
- Future infiltration as a proportion of current Per Capita Infiltration ( $I / P_{RC19}$ ) is assumed to be 0.5 - based on data from the EA.

## 3. Method of Assessment

The following methodology has been developed to assess the current and future risks of WTWs DWF Compliance.

### 3.1 Baseline (2020) and 2050 Assessments

The baseline assessment uses the current flow data from flow meters to identify the modelled capacity of a WTWs and this is compared to the site's permit.

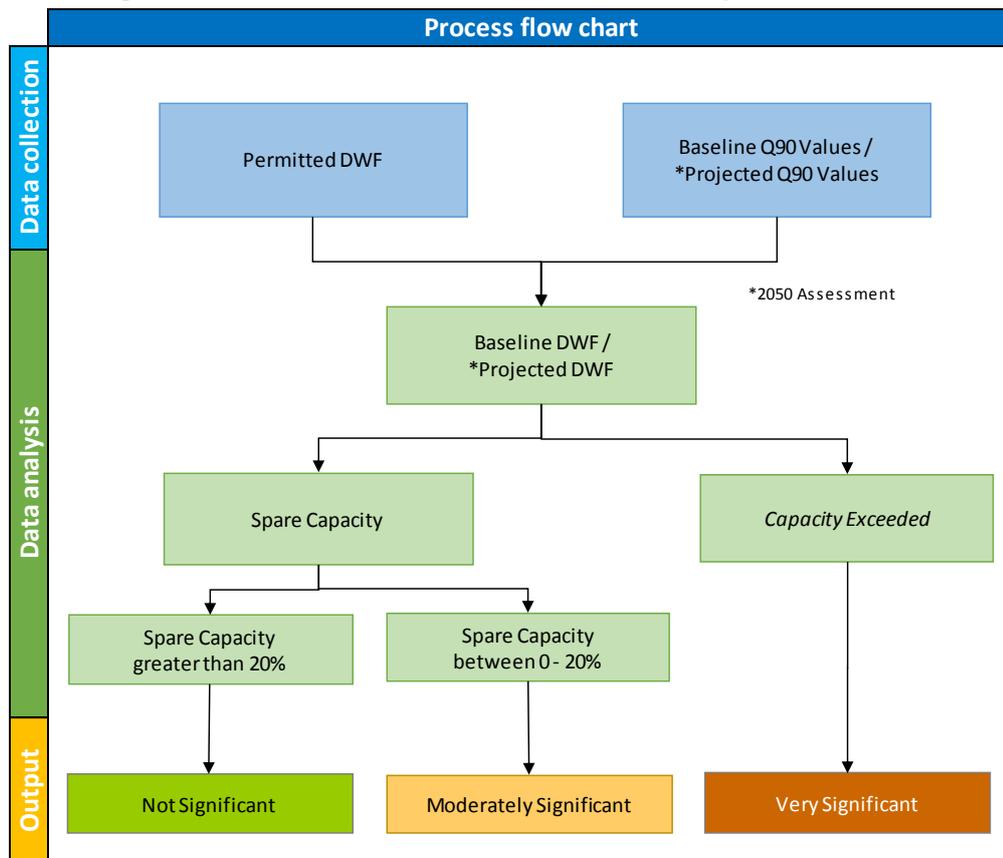
Using the current flow data from the flow meters and projected population SAGE v16 provides the 'Projected DWF' of the WTWs. The 'Projected DWF' is then compared to an updated permit where more stringent targets are anticipated or confirmed for AMP7, the current investment period for 2020 – 2025, through the EA's Water Industry National Environment Programme (WINEP).

We assumed that the condition and performance of assets will remain stable through the base capital maintenance programme between 2020 and 2050, and that receiving permits remain the same unless a change has already been confirmed for AMP7.

### 3.2 Process Flow Chart

The processes for assessing risk of DWF compliance is presented in Figure 2.

Figure 2 - Process flow chart for risk of DWF compliance



### 3.3 Thresholds and Bands

The DWF assessment for the 285 WTWs with a DWF permit was completed for the planning horizons 2020, 2025, 2030, 2035 and 2050 using the methodology outlined above. Calculated DWF for each planning horizon is compared with the DWF permit to assess the risk of a breach at a specific planning horizon. The assessment for the range of planning horizons has allowed us to identify when the current capacity would be exceeded and determine when an intervention will be required.

The results of these assessments have been used to categorise each of our WTWs into three bands. These bands and the thresholds are shown in the table below.

Table 1 Threshold Scoring

Assessment Criteria / Thresholds	Band	
Spare Capacity is greater than 20%	0	<i>Not Significant</i>
Spare Capacity is between 0-20%	1	<i>Moderately Significant</i>
Capacity Exceeded	2	<i>Very Significant</i>