

# DRAINAGE AND WASTEWATER MANAGEMENT PLANS (DWMP)

## INTEGRATED DELIVERY ALLIANCE (IDeA)

# PROBLEM CHARACTERISATION METHODOLOGY

### ***Intended Use***

*For reference by technical staff involved in undertaking and checking/reviewing the Problem Characterisation process within the DWMP framework.*



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Version	Date	Description/Amendment	Prepared by (Author)	Checked by	Reviewed by
01	August 2019	Draft issue for NWL review	AT	GH / GM	GH
02	February 2020	Updated following NWL review and stakeholder meetings	AT	GM	GH
03	August 2021	Updated following Problem Characterisation completion	LR	GM	AT
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### INTRODUCTION

This document will define the process of Problem Characterisation for the DWMP programme. The process will;

- Relate to the Risk Based Catchment Screening (RBCS) outputs.
- Be based on the performance of the drainage system in the defined planning horizons and the Baseline Risk and Vulnerability Assessment (BRAVA) analysis.
- Define the strategic approach to managing the performance of the system against a number of defined Planning Objectives.
- Define the pathway of the DWMP into the Option Development and Appraisal (ODA) phase.

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### PROBLEM CHARACTERISATION OVERVIEW

The BRAVA stage of the DWMP outlines the performance of drainage and wastewater catchments across the defined planning horizons. Performance is measured from an asset level (storm overflows, WwTW) up to the L3 planning area level.

The Problem Characterisation stage of the DWMP will look to set out the scale, complexity and timing of the problems within the NWL region and will identify where investment may be required to achieve performance targets against a number of Planning Objectives.

### OVERVIEW OF PLANNING OBJECTIVES

The DWMP framework recommends the definition of Planning Objectives '*against which catchment constraints are to be assessed and options developed*'<sup>1</sup>. The performance of catchments is to be assessed using the results from the BRAVA stage against a set of Planning Objectives that have been defined for NWL. The performance of catchments will be assessed using results from the sewer network hydraulic models, which are a mixture of 1D and 2D model simulations, as described in the BRAVA Methodology.

The Planning Objectives to be applied in the NWL DWMPs are defined as follows.

#### PO1 – Internal Property Flood Risk

Planning Objective PO1 is an assessment of internal property flood risk during a 1 in 20 year return period rainfall event because of modelled hydraulic incapacity within the sewer network, and how this is projected to change from the baseline through the planning horizons. This Planning Objective is to be assessed using the results from 2D hydraulic model simulations and properties will be deemed at risk of internal flooding when there is a flood depth of greater than 150mm impacting the property. Options will be promoted across catchments to reduce the risk of internal flooding in line with NWL's Long-Term Delivery Strategy.

##### Link with RBCS Indicators

Planning Objective PO1 can be linked to a number of the RBCS indicators, such that a reduction in internal property flood risk through planned options should have the impact of improving the performance of a catchment against the indicators in future RBCS reviews. The RBCS indicators that can be linked with this Planning Objective are;

- Indicator 01 – Catchment Characterisation.
- Indicator 06 – Capacity Assessment Framework.
- Indicator 07 – Internal Sewer Flooding.
- Indicator 18 – Customer Complaints.

#### PO2 – External Property Flood Risk

Planning Objective PO2 is an assessment of external property flood risk during a 1 in 20 year return period rainfall event because of modelled hydraulic incapacity within the sewer network, and how this is projected to change from the baseline through the planning horizons. This Planning Objective is to be assessed using the results from 2D hydraulic model simulations and properties will be deemed at risk of internal flooding when there is a flood depth of less than 150mm (but greater than 5mm) impacting the property. Options will be promoted across catchments to reduce the risk of external flooding in line with NWL's Long-Term Delivery Strategy.

##### Link with RBCS Indicators

Planning Objective PO2 can be linked to a number of the RBCS indicators, such that a reduction in external property flood risk through planned options should have the impact of improving the performance of a catchment against the indicators in future RBCS reviews. The RBCS indicators that can be linked with this Planning Objective are;

- Indicator 01 – Catchment Characterisation.

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<sup>1</sup> Water UK, A framework for the production of Drainage and Wastewater Management Plans, May 2019

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- Indicator 06 – Capacity Assessment Framework.
- Indicator 08 – External Sewer Flooding.
- Indicator 18 – Customer Complaints.

#### PO3 – 1 in 50 Year Population at Risk

Planning Objective PO3 is an assessment of the population at risk of flooding during a 1 in 50 year return period design storm event because of hydraulic incapacity within the sewer network, and how this is projected to change from the baseline through the planning horizons. The 1D modelling approach outlined in the 21<sup>st</sup> Century Drainage methodology has been applied.

##### Link with RBCS Indicators

Planning Objective PO3 can be linked to a number of the RBCS indicators, such that a reduction in population at risk in a 1 in 50 year return period event through planned options should have the impact of improving the performance of a catchment against the indicators in future RBCS reviews. The RBCS indicators that can be linked with this Planning Objective are;

- Indicator 01 – Catchment Characterisation.
- Indicator 06 – Capacity Assessment Framework.
- Indicator 13 – Risks from other Management Authorities.

#### PO4 – Bathing Water Quality

Planning Objective PO4 is an assessment of the risk of a deterioration in bathing water quality caused by storm overflows on the sewer network, and how this is projected to change from the baseline through the planning horizons. PO4 is also assessed in relation to the Storm Overflow Discharge Reduction Plan (SODRP) targets for the reduction of storm overflow spill frequency. Storm overflows associated with bathing waters that are currently spilling in excess of the required targets under the SODRP will be identified during the Problem Characterisation stage.

This Planning Objective is to be assessed using the results from a three-year timeseries rainfall (TSR) 1D hydraulic model simulation.

Options will be developed to reduce spill frequency at assets that discharge to or impact upon a designated bathing water, in line with the guidance outlined in the SODRP.

##### Link with RBCS Indicators

Planning Objective PO4 can be linked to a number of the RBCS indicators, such that a reduction in the risk of bathing water quality deterioration and/or storm overflow spill frequency reduction through planned options should have the impact of improving the performance of a catchment against the indicators in future RBCS reviews. The RBCS indicators that can be linked with this Planning Objective are;

- Indicator 02 – Bathing Water or Shellfish Waters.
- Indicator 03 – Discharge to Sensitive Water (Part A).
- Indicator 04 – Discharge to Sensitive Water (Part B).
- Indicator 05 – Storm Overflow Assessment Framework.
- Indicator 09 – Pollution.
- Indicator 15 – WINEP.

#### PO5 – River Water Quality

Planning Objective PO5 is an assessment of the risk of a deterioration in Water Framework Directive (WFD) river water quality classification caused by storm overflows, and how this is projected to change from the baseline through the planning horizons. PO5 is also assessed in relation to the SODRP targets for the reduction of storm overflow spill frequency. Storm overflows associated with inland watercourses that are currently spilling in excess of the required targets under the SODRP will be identified during the Problem Characterisation stage.

This Planning Objective is to be assessed using the results from a three-year TSR 1D hydraulic model simulation.

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Options will be developed to reduce spill frequency at assets that discharge to inland watercourses, in line with the guidance outlined in the SODRP.

#### Link with RBCS Indicators

Planning Objective PO5 can be linked to a number of the RBCS indicators, such that a reduction in the risk of WFD river water quality deterioration through planned options should have the impact of improving the performance of a catchment against the indicators in future RBCS reviews. The RBCS indicators that can be linked with this Planning Objective are;

- Indicator 03 – Discharge to Sensitive Water (Part A).
- Indicator 04 – Discharge to Sensitive Water (Part B).
- Indicator 05 – Storm Overflow Assessment Framework.
- Indicator 06 – Capacity Assessment Framework.
- Indicator 09 – Pollution.
- Indicator 15 – WINEP.
- Indicator 18 – Customer Complaints.

#### PO6 – Pollution

Planning Objective PO6 is an assessment of the risk of pollution incidents occurring and how this is projected to change from the baseline through the planning horizons. The Planning Objective focuses on the risk of pollution incidents as a consequence of modelled hydraulic capacity issues on the sewerage network. In the first cycle of DWMPs, pollution incidents caused by operational issues (e.g. blockages, collapses, pumping station failure) are to be assessed separately as part of NWL's existing processes. Predicted flooding during a 1 in 5 year return period rainfall event at manholes within 100m of a watercourse will be assessed for this Planning Objective. This Planning Objective is to be assessed using the results from 2D hydraulic model simulations.

Options will be promoted across catchments to reduce the risk of pollution in line with NWL's Long-Term Delivery Strategy.

#### Link with RBCS Indicators

Planning Objective PO6 can be linked to a number of the RBCS indicators, such that a reduction in the risk of pollution events through planned options should have the impact of improving the performance of a catchment against the indicators in future RBCS reviews. The RBCS indicators that can be linked with this Planning Objective are;

- Indicator 05 – Storm Overflow Assessment Framework.
- Indicator 06 – Capacity Assessment Framework.
- Indicator 09 – Pollution.
- Indicator 15 – WINEP.
- Indicator 18 – Customer Complaints.

#### PO7 – Sewage Pumping Station (SPS) Performance

Planning Objective PO7 was an assessment of the risk of a deterioration in the asset-life expectancy at sewage pumping stations (through excessive pump run times) and how this is projected to change from the baseline through the planning horizons.

This Planning Objective is no longer included in the DWMP.

#### PO8 – Wastewater treatment works (WWTW) Dry Weather Flow (DWF) Compliance

Planning Objective PO8 is based on an assessment of the risk of wastewater treatment works (WwTW) dry weather flow (DWF) permit compliance failure, and how this is projected to change from the baseline through the planning horizons. Options will be developed to reduce the likelihood of permit compliance failure because of catchment pressures such as population growth. A threshold of greater than 80% of the 80<sup>th</sup> percentile flow day (indication of typical dry weather flow) will be used to identify WwTWs where there is potential for compliance failure in the future.

#### Link with RBCS Outputs

Planning Objective PO8 can be linked to a number of the RBCS indicators, such that a reduction in the risk of permit compliance failures through planned options should have the impact of improving the performance of a catchment against the indicators in future RBCS reviews. The RBCS indicators that can be linked with this Planning Objective are;

- Indicator 09 – Pollution.
- Indicator 10 – WWTW Quality.
- Indicator 11 – WWTW DWF.
- Indicator 19 – SPS Capacity.



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The output from the Problem Characterisation phase will be the identification of the areas that require options to be developed.

The Storm Overflow Discharge Reduction Plan<sup>2</sup> was published on 26<sup>th</sup> August 2022. The Problem Characterisation methodology has been modified to reflect the targets for the reduction of spills from storm overflows for the related Planning Objectives.

Problem Characterisation for the DWMP will be primarily based upon:

- Requirement for options within an L3 to achieve the storm overflow spill frequency performance targets outlined in the SODRP.
- Requirement for options within an L3 to ensure that WwTWs do not exceed their DWF compliance permit values.
- Requirement for options within an L3 to contribute to NWL's Long-Term Delivery Strategy related to flooding and pollution risk.

Options will therefore be developed that are linked with the following Planning Objectives:

- PO1 – Internal Property Flood Risk
- PO2 – External Property Flood Risk
- PO4 – Bathing Water Quality
- PO5 – River Water Quality
- PO6 – Pollution
- PO8 – WWTW DWF Compliance

### Storm Overflow Discharge Reduction Plan

In line with the SODRP, storm overflows are to be categorised for improvement based upon spill frequency performance.

A Need and therefore an option will be identified for a storm overflow where it has been identified as performing outside of the SODRP criteria. This means that a Need will be identified for all:

- Storm overflows discharging to inland watercourses that are spilling more than ten times per year on average.
- Storm overflows discharging to or linked to bathing waters that are spilling more than two times per bathing season on average.
- Storm overflows that do not currently include 6mm screening of discharges.

### WWTW DWF Compliance Assessment

A Need will be identified for a WwTW that is projected to exceed 80% of the 80<sup>th</sup> percentile DWF Compliance volume limit as a result of catchment growth.

### Flooding and Pollution

The BRAVA phase of the DWMP will identify the levels of property flood risk and pollution risk within catchments.

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<sup>2</sup>[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1101686/Storm\\_Overflows\\_Discharge\\_Reduction\\_Plan.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1101686/Storm_Overflows_Discharge_Reduction_Plan.pdf)

**RISK SCORING**

The following table outlines the method to be followed to risk score NWL's drainage areas against the identified Planning Objectives.

Planning Objective	Risk Score	Scoring Method
PO1 – Internal Flood Risk	0	Normalised PO1 risk per 10,000 connected properties within the drainage area is in the lower quartile. The quartile values are to be calculated using the 2020 model results.
	1	Normalised PO1 risk per 10,000 connected properties within the drainage area is between the upper and lower quartile values. The quartile values are to be calculated using the 2020 model results.
	2	Normalised PO1 risk per 10,000 connected properties within the drainage area is in the upper quartile. The quartile values are to be calculated using the 2020 model results.
PO2 – External Flood Risk	0	Normalised PO2 risk per 10,000 connected properties within the drainage area is in the lower quartile. The quartile values are to be calculated using the 2020 model results.
	1	Normalised PO2 risk per 10,000 connected properties within the drainage area is between the upper and lower quartile values. The quartile values are to be calculated using the 2020 model results.
	2	Normalised PO2 risk per 10,000 connected properties within the drainage area is in the upper quartile. The quartile values are to be calculated using the 2020 model results.
PO3 – 1 in 50 Year Population at Risk	0	Normalised PO3 risk per 10,000 connected properties within the drainage area is in the lower quartile. The quartile values are to be calculated using the 2020 model results.
	1	Normalised PO3 risk per 10,000 connected properties within the drainage area is between the upper and lower quartile values. The quartile values are to be calculated using the 2020 model results.
	2	Normalised PO3 risk per 10,000 connected properties within the drainage area is in the upper quartile. The quartile values are to be calculated using the 2020 model results.
PO4 – Bathing Water Quality	0	Drainage area does not contain any storm overflows that are linked to bathing waters that require a spill frequency reduction scheme.
	1	Not applicable for this Planning Objective.
	2	Drainage area contains at least one storm overflow linked to bathing waters that requires a spill frequency reduction scheme.
PO5 – River Water Quality	0	Drainage area does not contain any storm overflows that are linked to inland watercourses that require a spill frequency reduction scheme.
	1	Drainage area only contains Low Priority storm overflows that are linked to inland watercourses that require a spill frequency reduction scheme.
	2	Drainage area contains High Priority storm overflows that are linked to inland watercourses that require a spill frequency reduction scheme.
PO6 – Pollution	0	Normalised PO6 risk per 1,000km of sewer within the drainage area is in the lower quartile. The quartile values are to be calculated using the 2020 model results.
	1	Normalised PO6 risk per 1,000km of sewer within the drainage area is between the upper and lower quartile values. The quartile values are to be calculated using the 2020 model results.
	2	Normalised PO6 risk per 1,000km of sewer within the drainage area is in the upper quartile. The quartile values are to be calculated using the 2020 model results.
PO8 – WwTW DWF Compliance	0	Drainage area is served by a WwTW that is compliant with the DWF permit.

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Planning Objective	Risk Score	Scoring Method
	1	Not applicable for this Planning Objective.
	2	Drainage area is served by a WwTW that is non-compliant with the DWF permit and requires an option.