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Drought Plan: Environmental Assessment Report – River Ouse

Final

Report for Yorkshire Water Services Ltd

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Glossary

Abstraction Licence

The authorisation granted by the Environment Agency (England) or Natural Resources Wales (for sites in Wales) to allow the removal of water from a source.

Biochemical Oxygen Demand (referred to as BOD)

The amount of oxygen that would be consumed if all the organic material in one litre of water were oxidised by bacteria and protozoa.

Compensation Releases

Water company licences that authorise abstractions from a reservoir may have conditions imposed, whereby specified amount of water has to be released into the watercourse, downstream of the reservoir in order to compensate the river for the abstraction.

Discharge Consent

A written consent issued by the Environment Agency permitting the discharge of specific pollutants into the aquatic environment. Discharge consents have conditions attached to them that limit the amount and concentration that can be discharged to ensure that there is no threat to the environment.

Drought Order

An authorisation granted by the Secretary of State (England) or Welsh Ministers (Wales) under drought conditions which imposes restrictions upon the use of water and/or allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.

Drought Permit

An authorisation granted by the Environment Agency (England) or Natural Resources Wales (for sites in Wales) under drought conditions which allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.

Environmental Drought

Environmental droughts arise from reduced water flows in rivers and streams. In the summer raised temperatures may further exacerbate drought conditions. Such conditions cause physiological stress to living organisms, the degree of stress increasing with drought severity and time.

Environmental Quality Ratio (EQR)

EQRs express the current condition of a biological quality element such as macroinvertebrates or fish. This is achieved by comparing the observed value of the appropriate metric (for example WHPTASPT) calculated from samples with the value of the same metric expected at WFD reference state.

Local Wildlife Sites (LWS)

Local Wildlife Sites are non-statutory designations. They are areas which are locally important for the conservation of wildlife. They are identified and selected for the significant habitats and species that they contain.

Lotic-Invertebrate Index Flow Evaluation (referred to as LIFE)

Is a method that allows the aquatic invertebrate community recorded at a site to be scored according to its dependence on current velocity. The LIFE value obtained can be compared to that predicted for the site under normal flow conditions and may show if the invertebrate community is experiencing flow related stress. Comparing observed and predicted scores for each gives an Environmental Quality Index (EQI) that is used as a measure of stress experienced at a site from low flow. A value of 1.0 indicates that the invertebrate community has the flow sensitivity predicted for the site. A value of less than 0.975 indicates the possibility of significant stress due to low flow.

Macroinvertebrate

Macroinvertebrates are small, but visible with the naked eye, animals without backbones (insects, worms, larvae etc.). Waterbodies have communities of aquatic macroinvertebrates. The species composition, species diversity and abundance in a given waterbody can provide valuable information on the relative health and water quality of a waterway.

Natural Environment and Rural Communities (NERC) Act Section 41

The Natural Environment and Rural Communities (NERC) Act came into force on 1 October 2006. Section 41 of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The NERC Act Section 41 list contains many of England's rarest and most threatened species. The lists are known as the Section 41 habitats of principal importance (also known as 'priority habitats') and the Section 41 species of principal importance (also known as 'priority species').

pH

A measure of the acidity of alkalinity of a liquid based on a logarithmic scale of concentration of hydrogen ions. < 7 is acidic, > 7 is alkaline.

Ramsar site

Internationally important wetland site.

Special Area of Conservation (SAC)

Special Area of Conservation – Designated under the European Habitats Directive (1991)

Special Protection Area (SPA)

Special Protection Area – Classified under the European Birds Directive (1979)

Site of Special Scientific Interest (SSSI)

A site given a statutory designation by Natural England or Natural Resources Wales because it is particularly important, on account of its nature conservation value.

Supply Drought

A supply drought occurs when water sources are at low levels due to a lack of rainfall. Water companies manage resources to ensure public supplies do not run out.

Walley Hawkes Paisley Trigg (referred to as WHPT)

Is a method that allows the aquatic invertebrate communities recorded at a site to be scored according to their tolerance to environmental pressures such as organic pollution. WHPT can be expressed as a score (the sum of values for each taxon in a sample), as an average score per taxon (ASPT) and as the number of scoring taxa (N-taxa). WFD status is based on ASPT and N-taxa. WHPT was introduced as the basis for the UK's river invertebrate status classification under the Water Framework Directive in the second River Basin Management Plans, published in 2015.

Abbreviations

AOD	–	Above Ordnance Datum
BOD	–	Biochemical Oxygen Demand
CIEEM	–	Chartered Institute of Ecology and Environmental Management
DPG	–	Environment Agency (2020) Drought Plan Guideline
EcIA	–	Ecological Impact Assessment
EMP	–	Environmental Monitoring Plan
EQR	–	Ecological Quality Ratio
JNCC	–	Joint Nature Conservation Committee
LIFE	–	Lotic-invertebrate Index for Flow Evaluation
LNR	–	Local Nature Reserve
LWS		Local Wildlife Site
Ml	–	Megalitres (1Ml is equivalent to 1000 cubic metres or 1,000,000 litres)
NERC	–	Natural Environment and Rural Communities (refers to Section 41 of the Act)
NNR	–	National Nature Reserve
RHS	–	River Habitat Survey
SAC	–	Special Area of Conservation
SPA	–	Special Protection Area
SSSI	–	Site of Special Scientific Interest
WFD		Water Framework Directive: Council of the European Communities 2000 Directive 2000/60/EC (OJ No L 327 22.12.2000) (establishing a framework for Community action in the field of water policy). As transposed into UK law by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. Statutory Instrument 2003 No. 3242
WHPT	–	Walley Hawkes Paisley Trigg (see Glossary)
WwTW	–	Wastewater Treatment Works

Executive summary

This Environmental Assessment Report (EAR) provides an independent and robust assessment of the potential environmental effects of the implementation of Yorkshire Water Services Ltd's (YWSL) River Ouse drought option. The report has been prepared in support of a drought order application by YWSL in late summer 2022.

The environmental assessment has been conducted in accordance with Government regulations and using the Environment Agency's 2020 Drought Plan Guideline (DPG)[1] and the Environment Agency's July 2020 'Environmental Assessment for Water Company Drought Plans- supplementary guidance'.

In accordance with the DPG, the environmental assessment comprises the following components:

- an assessment of the likely changes in hydrology (flow/level regime) due to implementing the proposed drought options;
- identification of the key environmental features that are sensitive to these changes and an assessment of the likely impacts on these features;
- identification of mitigation that may be required to prevent or reduce impacts on sensitive features; and
- recommendations for baseline, in-drought and post-drought order monitoring requirements.

The environmental assessment focuses on the potential changes to water availability (levels and flows) and any consequent implications for geomorphology, water quality, ecology and other relevant environmental receptors, for example, landscape, navigation, recreation and heritage.

This EAR considers the impacts of the River Ouse drought option in Appendix A and Appendix B, with a summary presented in Sections 5 and 6. Cumulative impacts with other drought options listed in YWSL's Drought Plan 2022 are considered. The assessments undertaken confirm the features requiring consideration of monitoring and mitigation; which are summarised in Section 6 and provided in full in the Drought Plan 2022 Environmental Monitoring Plan (EMP).

Throughout the environmental assessment process, YWSL have proactively engaged key stakeholders, including the Environment Agency and Natural England. Key stakeholders will be further consulted throughout the drought order application process.

[1] Environment Agency (2020) Water Company Drought Plan Guideline, April 2020.

Table of Contents

1 Introduction

1.1 Purpose of document

The Yorkshire Water Services Ltd (YWSL) Drought Plan 2022[2] was developed in line with the Environment Agency's Drought Plan Guideline (DPG) [3]. The DPG requires that water companies must demonstrate in their drought plan that they have met their responsibility to monitor, assess and where possible mitigate for the environmental impact of all their supply side drought options, including drought permits and drought orders.

Drought permits/orders are management actions that, if granted, can allow more flexibility to manage water resources and the effects of drought on public water supply and the environment. Ultimately, the environmental assessments should inform choices on when and how to use the different supply side drought options considered in a drought plan.

The objective of this Environmental Assessment Report (EAR) is to provide an independent and robust assessment of the potential environmental effects of the implementation of the River Ouse drought order. This EAR has been prepared in support of a drought order application in late summer 2022 to the Environment Agency, in accordance with the Water Resources Act 1991, as amended by the Environment Act 1995, the Water Act 2003 and subsequently the Water Act 2014.

The environmental assessment has been conducted in accordance with Government regulations and using the Environment Agency's 2020 DPG and the July 2020 'Environmental Assessment for Water Company Drought Plans - supplementary guidance'.

In accordance with the DPG, the environmental assessment comprises the following components:

1. an assessment of the likely changes in hydrology (flow/level regime) due to implementing the proposed drought options.
2. identification of the key environmental features that are sensitive to these changes and an assessment of the likely impacts on these features.
3. identification of mitigation that may be required to prevent or reduce impacts on sensitive features.
4. recommendations for baseline, in-drought and post-drought order monitoring requirements.

The methodology for this environmental assessment was developed during preparation of the 'shelf copy' environmental assessment[4] in consultation with the Environment Agency, and is documented separately in 'YWSL's Drought Plan 2022 Environmental Assessment Methodology'[5]. A summary of the assessment approach is provided in Section 3.

The assessments undertaken in this EAR confirm the features requiring consideration of mitigation and appropriate monitoring triggering mitigation. Appropriate mitigation actions identified are both available and practicable and reflect previous agreement with the Environment Agency (see Section 1.3). The methodologies and details for monitoring and mitigation requirements are documented in the standalone document 'YWSL's Draft Drought Plan 2022 Environmental Monitoring Plan (EMP)' which accompanies the drought order application. A summary of the monitoring and mitigation requirements are also included in Section 6 of this EAR.

This EAR should be read alongside the Methodology and EMP documents.

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2 Yorkshire Water (2022) Yorkshire water Final Drought Plan 2022. April 2022, Available at: https://www.yorkshirewater.com/about-us/resources/drought-plan/

3 Environment Agency (2020) Water Company Drought Plan Guideline, April 2020.

4 Ricardo Energy & Environment (2021). Drought Plan: Environmental Assessment Report – River Ouse. Report for Yorkshire Water Services Ltd. February 2021.

5 Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

1.2 Background to study

Water companies in England and Wales are required to prepare and maintain Statutory Drought Plans under Sections 39B and 39C of the Water Industry Act 1991, as amended by the Water Act 2003 (and subsequently the Water Act 2014), which set out the short operational steps a company will take before, during and after a drought. The Water Industry Act 1991 defines a Drought Plan as 'a plan for how the water undertaker will continue, during a period of drought, to discharge its duties to supply adequate quantities of wholesome water, with as little recourse as reasonably possible to drought orders or drought permits'.

The Drought Plan (England) Direction 2016 states that Drought Plans should be submitted within 4 years and 3 months after the date on which its Drought Plan, or its last revised Drought Plan, is published. Yorkshire Water Services Limited (YWSL) published their current statutory Drought Plan in April 2022.

The Drought Plan provides a comprehensive statement of the actions YWSL will consider implementing during drought conditions to safeguard essential water supplies to customers and minimise environmental impact.

Drought Plans encompass a number of drought options that will only be implemented if and when required. Each drought is different in terms of its severity, season, location and duration and each combination of these factors may require a bespoke reaction in terms of measures. In the context of drought planning, individual drought options are taken to constitute alternatives. YWSL's Final Drought Plan 2022 comprises a total of 63 drought options (49 ordinary supply-side actions, 9 long term supply-side options, 5 demand options).

This EAR has been prepared in support of a drought order application in late summer 2022. It provides an update to the 'shelf copy' report which was produced in support of YWSL's Drought Plan 2022.
Following agreement with the Environment Agency[6], the physical environment and environmental features assessments presented in the 'shelf copy' report have been retained for this application EAR. The assessments are considered suitable to support the current application as no significant dry weather events have been experienced in the Yorkshire region subsequent to the completion of the 'shelf copy' assessments in 2021. However, in order to provide sufficient evidence that no changes have occurred to the sensitivity of protected/notable species or the macroinvertebrate or fish communities within the impacted reaches, a full review and analysis of additional baseline monitoring data has been undertaken. This review had included incorporation of the available 2020-21 data from the YWSL and Environment Agency baseline monitoring programmes as well as review of updated Water Framework Directive (WFD) status of designated waterbodies which contain the impacted reaches. The results of this analysis are presented as accompanying spreadsheets in support of the drought order application. In addition, a review of water quality pressures has been undertaken following progression of the YWSL Storm Overflow Assessment Framework (SOAF) programme since the 'shelf copy' assessments were undertaken. Where applicable, changes have been made to the outcomes of the physical environment assessment to reflect this review.

1.3 Consultation

Throughout the preparation and submission of the Final Drought Plan 2019 YWSL proactively engaged with key stakeholders and regulators regarding the scope and outcomes of the environmental assessment, including with the Environment Agency and Natural England. Discussions were also held between YWSL and the Environment Agency on the scope of monitoring/mitigation in Autumn 2018 following a period of prolonged dry weather. These discussions identified certain issues around the appropriateness and practicality of YWSL's monitoring-led mitigation plan as set out in its Draft Drought Plan 2019 EMP. The outcome of these discussions and resulting agreements have informed the basis

[6] Email exchange between Yasmina Gallaher (Yorkshire Water), and Ineke Jackson (Environment Agency) on 20 July 2022.

of the approach for the update of the environmental assessments and EMP for the Draft Drought Plan 2021.

YWSL then held a number of meetings during the early stages of the preparation of the Draft Drought Plan 2021, including several meetings focused on the proposed approach to the environmental assessments which are documented in the Drought Plan 2022 Environmental Assessment Methodology[7]. Proactive consultation continued to be conducted for the Drought Plan 2022 submission, including on the outcomes of the environmental assessment process.

Further consultation with key stakeholders will be undertaken throughout the drought order application process.

1.4 Content of report

The structure of this EAR is provided below with reference to other relevant documents.

Section 1: **Introduction**

Section 2: **Drought management proposals** - including an overview of YWSL's water supply system, drought planning, the need for the applications, alternative options and proposed drought order details (to be completed at the time of a drought order application)

Section 3: **Approach to environmental assessment** - description of the approach to assessing environmental impacts and identification of mitigation and monitoring requirements, with reference to the details which are provided in YWSL's Drought Plan 2022 Environmental Assessment Methodology[8].

Section 4: **Drought options overview: River Ouse at Moor Monkton** - overview of drought order conditions.

Section 5: **Physical environment effects: River Ouse at Moor Monkton** - baseline assessment of physical environment and assessment of potential changes in the physical environment as a result of the drought option, and from cumulative operation with options described in other EARs. Detailed information is provided in **Appendix A** and summarised in Section 5.

Section 6: **Features assessment, monitoring and mitigation: River Ouse at Moor Monkton** - impact assessment on environmental features, identification of mitigation and monitoring requirements, including cumulative reaches. Detailed information is provided in **Appendix B** and in YWSL's Drought Plan 2022 EMP and summarised in Section 6. **Appendix C** summarises the full suite of monitoring and mitigation measures as detailed in the EMP.

Appendices

Appendix A Physical Environment

Appendix B Environmental Features

Appendix C Environmental Monitoring and Mitigation Measures

7 Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

8 Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

2 Drought management proposals

See YWSL drought order application supporting documentation.

3 Approach to environmental assessment

3.1 Overview

The environmental assessment of the drought options in this report has been prepared in accordance with Environment Agency's 2020 DPG; specifically the Environment Agency's July 2020 'Environmental Assessment for Water Company Drought Plans - supplementary guidance'. The approach to environmental assessment and the bespoke assessment methodologies used have been developed in consultation with the Environment Agency and are documented separately in YWSL's Drought Plan 2022 Environmental Assessment Methodology[9] ('the Methodology').

Depending on the particular ongoing water resources drought, different management options may be available and the full range of drought permits/orders may not be used by YWSL at the same time. This EAR considers the impacts of implementation of the River Ouse drought order.

The Environment Agency's 2020 DPG requires the completion of environmental assessment and production of an environmental monitoring plan for each of supply side actions included in a drought plan. The environmental assessments should also include any mitigation measures that could be implemented. The Methodology provides detailed approaches to the specific requirements of the DPG which are:

1. Setting out the likely changes to the hydrology (or hydrogeology) due to a proposed action (see Section 3.4 and Section 3.5 of the Methodology).
2. Identifying the key features of the environment which are likely to be affected by these changes and assess their sensitivity (see Section 3.6 of the Methodology).
3. Assess the likely impact on these features, allocate a level of confidence in your assessment and set out the actions you will take to reduce uncertainty (see Section 3.7 of the Methodology).
4. Mitigating against the potential impacts and where datasets are considered insufficient to undertake an environmental assessment it is the responsibility of the water company to implement environmental monitoring to generate the information required (see Section 3.8 of the Methodology).

The overall approach taken in completing the environmental assessment to demonstrate an understanding of the impact on the environment of implementing the proposed drought options is illustrated in **Figure 3.1**.

Results of the assessment have also informed the Habitats Regulations Assessment (HRA)[10] and Strategic Environmental Assessment (SEA)[11] which support YWSL's Draft Drought Plan 2022, and are documented separately.

The Environment Agency's 2020 DPG also requires water companies to 'consider the combined environmental effects of your supply side drought options, and where relevant, the combination effects of your actions with those of neighbouring water companies and other abstractors'. The SEA and HRA for a drought plan as a whole has informed these combined assessments.

3.2 Limitations of assessment

Details on the quality of the data collected and used in the assessment, limitations and any assumptions made, are included in the relevant technical appendices (**Appendix A** and **B**).

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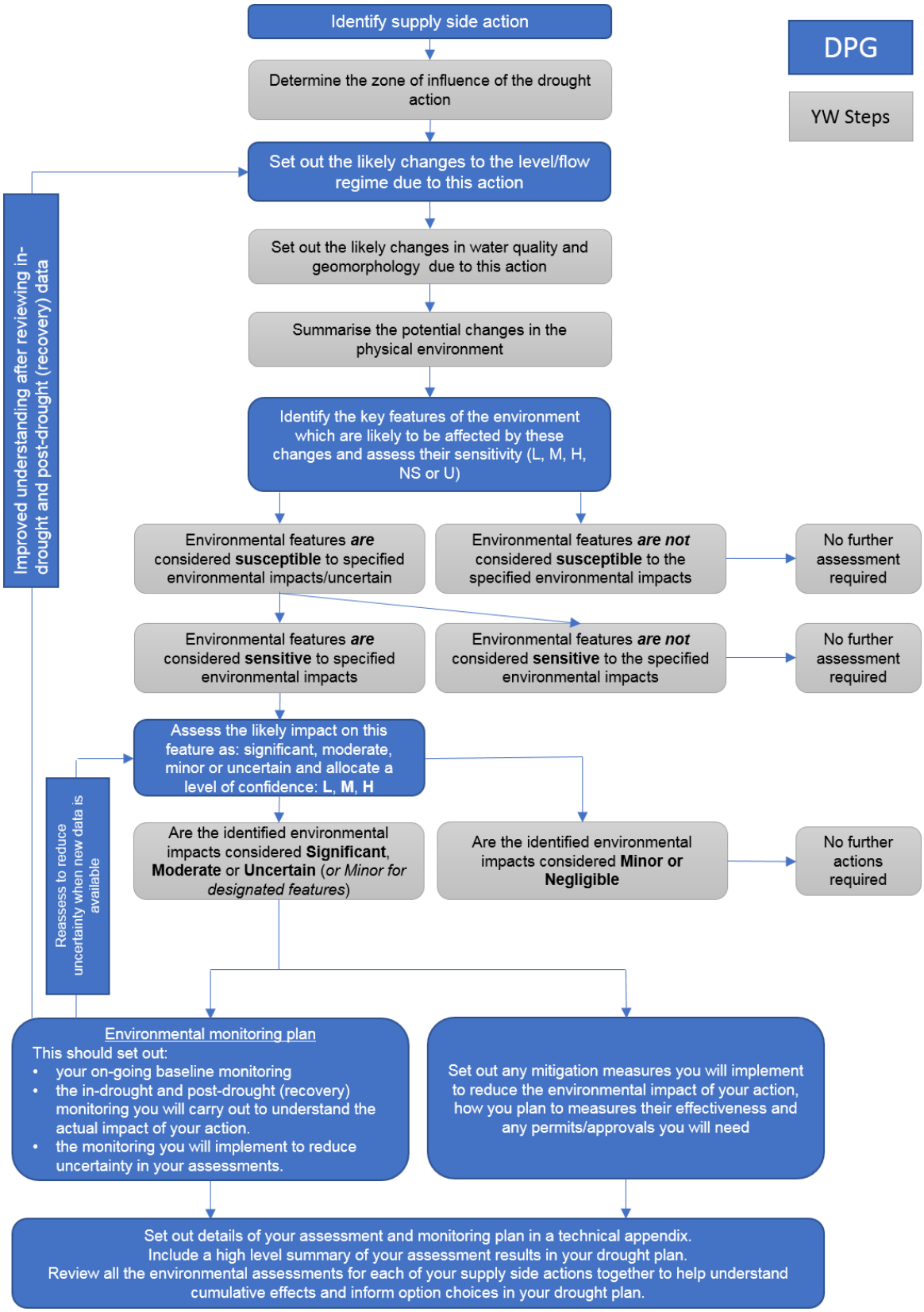
9 Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

10 Yorkshire Water (2022) Yorkshire Water Drought Plan 2022 Habitats Regulation Screening Report, April 2022. Available at https://www.yorkshirewater.com/media/vzenyqzb/yorkshire-water-drought-plan-2022-hra.pdf.

11 Yorkshire Water (2022) Yorkshire Water Drought Plan 2022 SEA Environmental Report, April 2022. Available at https://www.yorkshirewater.com/media/c2qgvnsf/yorkshire-water-drought-plan-2022-sea-environmental-report.pdf.

For features where the assessment remains uncertain because of data limitation, the requirement for additional targeted monitoring has been considered and is documented in YWSL's Drought Plan 2022 EMP.

Figure 3.1 Approach to undertaking environmental assessments as identified in the 2020 DPG.
Steps in blue are 2020 DPG tasks. Tasks indicated in grey are YWSL tasks



4 Drought option overview

4.1 Drought order description

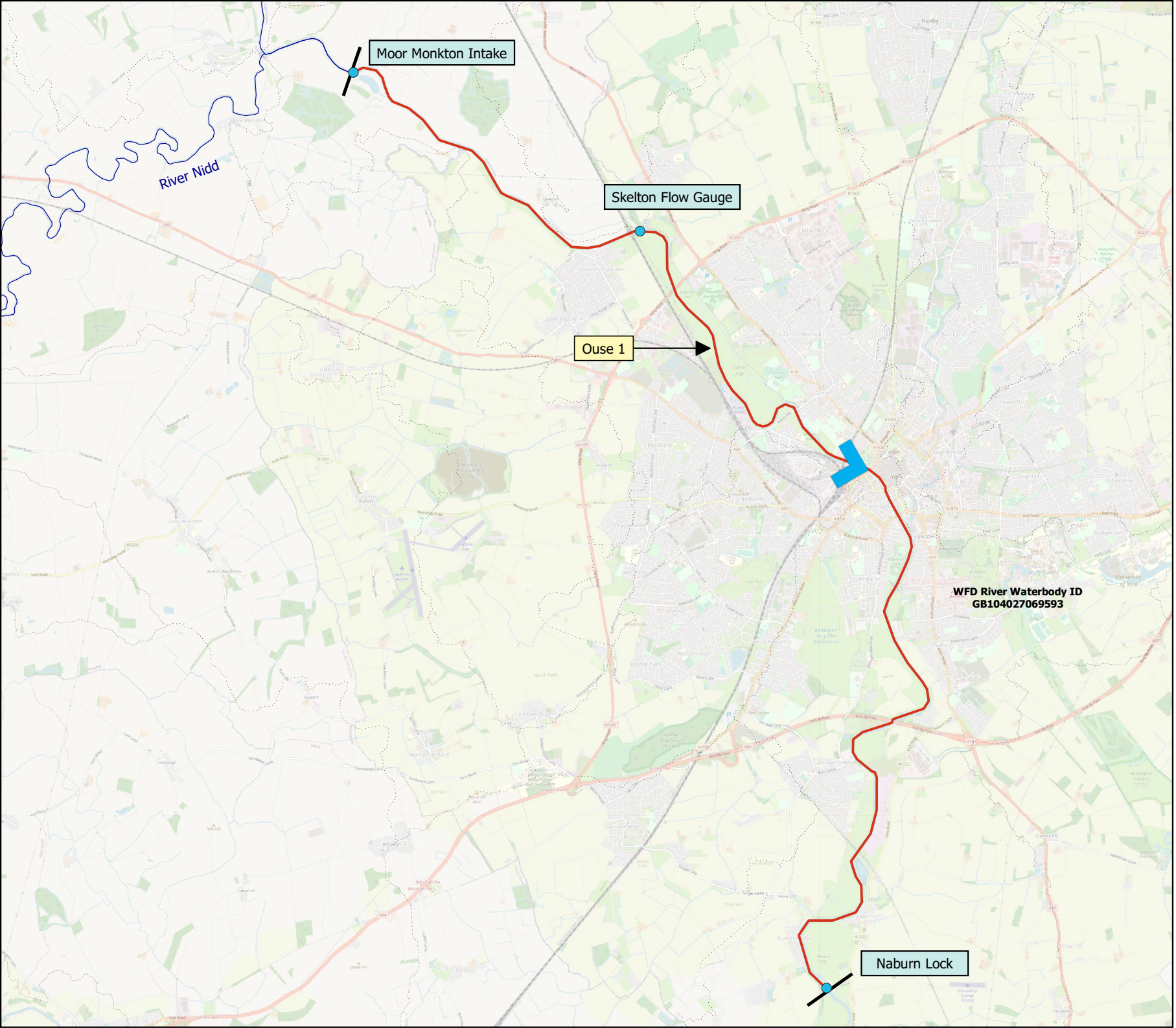
This EAR assesses the potential impacts on the environmental features of the River Ouse catchment during the period of implementation the River Ouse at Moor Monkton drought order as summarised in **Table 4.1**.

Further details on the existing arrangements at the site and the proposed drought option are found in **Appendix A**, Section A2. The study area is illustrated in **Figure 4.1**.

Table 4.1 River Ouse at Moor Monkton drought order description

Abstraction Water Source	NGR	Normal Abstraction Ml/d[12]	Proposed Drought Option Abstraction Ml/d	Benefit Ml/d
Ouse	SE525576 (Intakes 1 and 2) SE527576 (Intake 3)	300Ml/d when flows in Ouse (measured at Skelton downstream) are more than 1,000Ml/d 150Ml/d when flows in Ouse are between 650 and 1,000Ml/d 72Ml/d when flows in the Ouse are between 400 and 650Ml/d 10Ml/d when flows in the Ouse are less than 400Ml/d	300Ml/d when flows in Ouse (measured at Skelton downstream) are more than 1,000Ml/d (No change) 210Ml/d when flows in Ouse are between 650 and 1,000Ml/d 132Ml/d when flows in the Ouse are between 400 and 650Ml/d 70Ml/d when flows in the Ouse are less than 400Ml/d	Up to 60

12 1Ml/d is 1 million litres per day



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Legend

N

- Reach Divides
- River Reaches
- Points of Interest
- WFD Management Catchment
- Flow Direction

Project title:
Yorkshire Water Drought Plan
Environmental Assessment

Figure title:
River Ouse at Moor Monkton
Overview Map

Figure 4.1	**Date:** August 2020
NGR: SE 57796 51151	**Scale:** 1:70000

Note: All locations are approximate

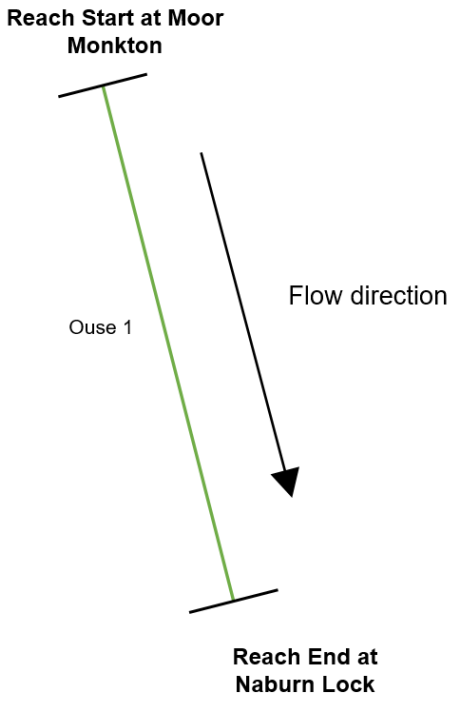
4.2 Potentially impacted reaches

The zone of influence associated for a drought option is defined through hydrological effects. Within the overall zone of influence, reaches are then defined on a hydrological basis. Section 3.4 of YWSL's Drought Plan 2022 Environmental Assessment Methodology[13] sets out this approach in detail. The reach for the River Ouse drought order has been defined previously during the environmental assessment of YWSL past drought plans. **Table 4.2** provides details of this reach, which is illustrated in **Figure 4.1**, and in a schematic below in **Figure 4.2**.

Table 4.2 River Ouse drought order reach details

Reach name	Watercourse name	Reach start	Reach end	Down-stream reach	Drought option
					River Ouse at Moor Monkton
Ouse 1	River Ouse	Moor Monkton	Naburn Lock	N/A	✓

Figure 4.2 River Ouse drought order reach schematic



13 Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

4.3 WFD waterbodies in study area

The study area and focus of the environmental assessment covers the WFD waterbodies listed in **Table 4.3.** The WFD waterbodies are also illustrated on **Figure 4.1**.

Table 4.3 WFD waterbodies considered in the assessment

Drought Option	Reach	WFD Waterbody
River Ouse at Moor Monkton	Ouse 1	River Ouse from River Nidd to Stillingfleet Beck (GB104027069593)

5 Physical environment effects: River Ouse at Moor Monkton

Potential impacts on the physical environment due to the River Ouse drought order are summarised below in **Table 5.1**. Full details are provided in **Appendix A**.

Table 5.1 Summary of potential changes in the physical environment as a result of the River Ouse drought option

Reach	River flow impact	Flow depleted reaches and risks*	Risk to river habitats	Risk to water quality
Ouse 1	Minor impacts (summer) Negligible impacts (winter)	None	Minor	Moderate

* the length of flow depleted reach is indicated where appropriate. 'Flow depleted reach' refers to the length between the abstraction and discharge point of non-consumptive licences (e.g. aquaculture, hydro-power).

6 Features assessment, monitoring and mitigation: River Ouse

6.1 Summary of impacts

Potentially sensitive receptors (environmental features) have been identified within each impacted reach considering the level of impact on the physical environment identified in Section 5 and Appendix A. This sensitivity assessment has been used to identify features which have been considered for detailed assessment. Both these stages are documented in full in **Appendix B**.

Potential impacts on environmental features due to the River Ouse at Moor Monkton drought order are summarised below in **Table 6.1**.

Table 6.1 Summary of potential impacts to environmental features as a result of the River Ouse at Moor Monkton drought option

Reach	Ouse 1	Ouse 1 Cumulative
Drought Option	**River Ouse at Moor Monkton**	**River Ouse at Moor Monkton, Leighton Reservoir, Lumley Moor Reservoir, Haverah Park and River Ure at Kilgram Bridge drought options**
WFD Waterbody	GB104027069593 River Ouse from River Nidd to Stillingfleet Beck	GB104027069593 River Ouse from River Nidd to Stillingfleet Beck
WFD Waterbody WFD Status Receptors		
Fish	Minor	Minor
Invertebrates	Minor	Minor
NERC and Notable Species Receptors		
Chrysolina graminis	Negligible	Negligible
Water vole	Moderate	Moderate
Otter	Negligible	Negligible
Atlantic salmon	Negligible	Negligible
Brown / sea trout	Negligible	Negligible
River Lamprey	Minor	Minor
European eel	Negligible	Negligible
Sea lamprey	Moderate	Moderate
Barbel	Negligible	Negligible
Brook lamprey	Moderate	Moderate
Bullhead	Negligible	Negligible
Grayling	Negligible	Negligible
Statutory Designated Sites		
Naburn Marsh SSSI	Negligible	Negligible
Clifton Ings and Rawcliffe Meadows SSSI	Negligible	Negligible
Church Ings SSSI / LWS	Negligible	Negligible
Acaster South Ings SSSI	Negligible	Negligible
Fulford Ings SSSI	Negligible	Negligible
River Ouse LWS	Minor	Minor
Bishopthorpe Ings LWS	Negligible	Negligible
Gollie Ponds LWS	Minor	Minor
Middlethorpe Crematorium LWS (4-3)	Negligible	Negligible

Reach	Ouse 1	Ouse 1 Cumulative
Naburn Hall Meadow / Ings LWS	Negligible	Negligible
Clifton Ings LWS	Negligible	Negligible
Rawcliffe Ings Dyke LWS	Negligible	Negligible

6.2 Monitoring and mitigation

The Environment Agency's 2020 DPG requires YWSL to set out a monitoring plan following assessment of the sensitivity and impacts associated with drought options, as indicated in **Figure 3.1**. In particular the DPG indicates that any drought plan should be accompanied by an EMP that sets out:

- on-going baseline monitoring to inform sensitivity and impact assessments.
- the monitoring that will be implemented to reduce uncertainty identified in the assessment of either the sensitivity of the environment or impacts on features considered in the detailed assessment.
- the in-drought and post-drought (recovery) monitoring that will be carried out to understand the actual impact of drought options.

As indicated in **Figure 3.1**; the DPG also requires YWSL to set out a mitigation plan following the assessments of potential impacts associated with each drought management action. In particular the DPG indicates that any drought plan should be accompanied by an EMP that sets out:

- mitigation measures to reduce adverse impacts on the environment of supply side drought options; and
- compensation measures for adverse effects that remain after mitigation measures have been applied.

The DPG requires that this information is set out as a separate document alongside, and linked to, each environmental assessment.

The assessments undertaken in this EAR confirm the features requiring consideration of mitigation and appropriate monitoring triggering mitigation. YWSL's Drought Plan 2022 EMP provides a comprehensive description of the schedule of monitoring and trigger-based mitigation agreed as relevant and practicable based on the nature and timing of order implementation. The mitigation and monitoring proposals will act as a safeguard that responds and is responsive to both predicted and unpredicted drought impacts.

The monitoring and mitigation recommendations have been developed through agreement with the Environment Agency, in particular during 2018 and 2020 (see Section 1.3). Consultation between YWSL and the Environment Agency is ongoing, and the EMP will be updated as required to reflect future agreements.

The EMP also documents the baseline monitoring recommendations which have been identified as required following the completion of the environmental assessment. Baseline monitoring will ensure that sufficient baseline data is available to inform the sensitivity and impact assessment and to reduce any uncertainty in the assessment.

A summary of the monitoring and mitigation recommendations for the River Ouse drought order is provided in **Tables 6.2** and **6.3**. **Appendix C** provides a description of each monitoring and mitigation measure with reference to the codes used in **Tables 6.2** and **6.3**.

Table 6.2 Summary of recommended monitoring for the River Ouse at Moor Monkton drought option

River Reach		Ouse 1	Ouse 1 Cumulative
Drought Option		**River Ouse at Moor Monkton**	**River Ouse at Moor Monkton, Leighton Reservoir, Lumley Moor Reservoir, Haverah Park and River Ure at Kilgram Bridge drought options**
WFD Waterbody		GB104027069593 River Ouse from River Nidd to Stillingfleet Beck	GB104027069593 River Ouse from River Nidd to Stillingfleet Beck
Baseline Monitoring			
Routine baseline monitoring			
BMON_1	Routine flow/levels	✓	✓
BMON_2	Routine WQ	✓	✓
BMON_3	Macroinvertebrate	✓	✓
BMON_4	Fisheries	✓	✓
Targeted baseline monitoring			
BMON_7	Lamprey	✓	✓
On-set of Environmental Drought Monitoring			
ODMON_1	River condition walkover survey	✓	✓
In-Drought (During Drought Option Implementation) Monitoring			
IDMON_1	Surveillance walkover (habitat quality and ecological stress) prior and post flow reduction	✓	✓
IDMON_3	Storm intensity forecasting to predict likely CSO spill events and the need for pre-emptive mitigation:	✓	✓
Post-Drought (Drought Option Removed) Monitoring			
None			

Table 6.3 Summary of recommended mitigation measures for the River Ouse at Moor Monkton drought option

Reach		Ouse 1	Ouse 1 Cumulative
Drought Option		**River Ouse at Moor Monkton**	**River Ouse at Moor Monkton, Leighton Reservoir, Lumley Moor Reservoir, Haverah Park and River Ure at Kilgram Bridge drought options**
WFD Waterbody		GB104027069593 River Ouse from River Nidd to Stillingfleet Beck	GB104027069593 River Ouse from River Nidd to Stillingfleet Beck
In-drought (Drought Options Implemented)			
IDMIT_1	Third party abstraction	✓	✓
IDMIT_6	Gradual phase in of reduction	✓	✓
IDMIT_8	Temporary abstraction volume reduction/compensation increase	✓	✓
IDMIT_10	Refuges	✓	✓
IDMIT_11	In-stream structures	✓	✓
IDMIT_13	Bird scaring	✓	✓
IDMIT_15	Aeration of watercourse	✓	✓
IDMIT_16	Flow structure modification	✓	✓
IDMIT_19	Capture/re-locate over barriers	✓	✓
IDMIT_20	Fish/crayfish rescue and relocate	✓	✓
IDMIT_23	CSO prioritisation	✓	✓
Post-Drought (Drought Options Removed)			
PDMIT_1	Habitat enhancement	✓	✓
PDMIT_3	Barrier modification	✓	✓
PDMIT_4	Capture and relocate	✓	✓
PDMIT_5	Juvenile relocation	✓	✓
PDMIT_6	Lamprey restocking	✓	✓
PDMIT_7	Broodstock restocking	✓	✓
PDMIT_8	Coarse fish restocking	✓	✓

Appendices

Appendix A Physical Environment

Appendix B Environmental Features

Appendix C Environmental Monitoring and Mitigation Measures

Appendix A – Physical Environment

A1 Introduction

This appendix assesses the potential impacts on the physical environment of the catchment surrounding the River Ouse at Moor Monkton during the period of implementation of the associated drought option.

Details regarding the approaches/methodologies used for assessing susceptibility and sensitivity to drought options and the assessment of the impacts associated with drought options are presented in YWSL's Drought Plan 2022 Environmental Assessment Methodology[1].

This EAR has been prepared in support of a drought order application in late summer 2022. It provides an update to the 'shelf copy' report which was produced in support of YWSL's Drought Plan 2022. Following agreement with the Environment Agency, the physical environment and environmental features assessments presented in the 'shelf copy' report have been retained for this application EAR (see main EAR Section 1.2).

This appendix is set out in the following sections:

Section A.2 Drought option

Section A.3 Study area

Section A.4 Physical environment effects – this includes:

1. Introduction
2. Setting
3. River flow regime
4. River habitat
5. River water quality
6. Summary of potential changes in the physical environment as a result of the drought option.

Annex 1 provides a list of all regulated abstractions in the reach.

Annex 2 provides a list of all wastewater treatment works (WwTW) and combined sewer overflows (CSOs) considered in the assessment.

[1] Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

A2 Drought option

A2.1 River Ouse at Moor Monkton drought order

Yorkshire Water are authorised to abstract water from the River Ouse at Moor Monkton under licence serial number NE/027/0024/065 and 2/27/24/158. Under the terms of the licences the volume Yorkshire Water are permitted to take is dependent on the flow in the River Ouse as measured at Skelton gauging station (grid reference SE 568 554). The abstraction is limited to: 300 Ml/d when flow at Skelton gauging station is more than 1,000 Ml/d; 150 Ml/d when flow at Skelton gauging station is between 650 and 1,000 Ml/d; 72 Ml/d when flow at Skelton gauging station is between 400 and 650 Ml/d; and 10 Ml/d when flow at Skelton gauging station is less than 400 Ml/d.

In addition to the above the aggregate quantity of water authorised for abstraction from Moor Monkton under licence number NE/027/0024/065 and licence number 2/27/24/158 is limited to 12.5 Ml/hr ; 300 megalitres per day (Ml/d); and 73,000 megalitres per year (Ml/year). Abstraction must be taken at an instantaneous rate not exceeding 3,473 litres per second.

Yorkshire Water is currently operating within the terms and conditions of the licence agreements held with the Environment Agency to abstract from the River Ouse at Moor Monkton.

The drought order application is to temporarily amend the licences to allow an additional 60 Ml/d to be abstracted at Moor Monkton in the flow bands below 1,000 Ml/d. If granted the order will be in place for up to six months, from the date which the order is granted.

If Yorkshire Water receive sufficient refill for the regional reservoirs stocks to recover to a level Yorkshire Water refer to as ‘the normal control line’ and no individual reservoir group is below a level Yorkshire Water refer to as the ‘early warning trigger line’, Yorkshire Water will revert back to the conditions defined in the licence agreement.

The abstraction rates (daily maxima and combined annual maxima) specified in the licences are unchanged. This means that the total annual maximum from the River Ouse is unchanged, but that more will be able to be taken when the river is low. These conditions are set out in **Table A2.1**.

Table A2.1 Ouse at Moor Monkton licence data

Abstraction Water Source	NGR	Normal Abstraction Ml/d[2]	Proposed Drought Option Abstraction Ml/d	Benefit Ml/d
Ouse	SE525576 (Intakes 1 and 2) SE527576 (Intake 3)	300Ml/d when flows in Ouse (measured at Skelton downstream) are more than 1,000Ml/d 150Ml/d when flows in Ouse are between 650 and 1,000Ml/d 72Ml/d when flows in the Ouse are between 400 and 650Ml/d 10Ml/d when flows in the Ouse are less than 400Ml/d	300Ml/d when flows in Ouse (measured at Skelton downstream) are more than 1,000Ml/d (No change) 210Ml/d when flows in Ouse are between 650 and 1,000Ml/d 132Ml/d when flows in the Ouse are between 400 and 650Ml/d 70Ml/d when flows in the Ouse are less than 400Ml/d	Up to 60

[2] 1Ml/d is 1 million litres per day

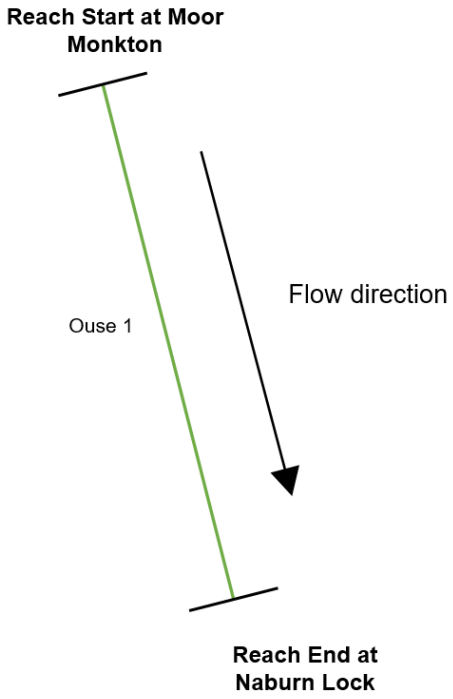
A3 Study area

The zone of influence associated with the drought option is defined through hydrological effects. Within the overall zone of influence, the reach is defined on a hydrological basis. YWSL's Drought Plan 2022 Environmental Assessment Methodology[3] sets out this approach in detail in Section 3.4. The zone of influence for assessment of impacts is set out in **Section A3.1** below. Information on the likely timing of the drought option is set out in **Section A3.2** below.

A3.1 Zone of influence of the drought options

The hydrological impact of the drought option was considered as part of the screening exercise. This determined what the timing, magnitude, zone of influence, nature of change and duration of the drought option would be. **Table A3.1** summarises this information, and the reach is illustrated in main EAR **Figure 4.1** and in a schematic below in **Figure A3.1**.

Figure A3.1 River Ouse schematic



[3] Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

Table A3.1 River Ouse at Moor Monkton reach details

Reach name	Watercourse name	Reach start	Reach end	Down-stream reach	Drought option
					Ouse at Moor Monkton
Ouse 1	River Ouse	Moor Monkton	Naburn Lock	N/A Study area end	✓

The end of each study area has been defined previously from review of hydrological information – either flow gauge data that corroborates that drought option hydrological impacts have reduced to negligible, or by simple review of contributing catchment area where there is an order of magnitude step change in this from confluence with a significantly larger river or joining tributary.

The study area extends until the point at which the River Ouse becomes tidal. The pass-forward flow to the Humber Estuary at the Naburn Lock at the tidal limit of the River Ouse with the drought order is a negligible reduction in freshwater contribution to the estuary and the zone of hydrological influence therefore ends at the tidal limit.

The tidal River Ouse ultimately joins the Humber Estuary which is designated as SAC/SPA. An 8.7% reduction in freshwater low flows (annual Q95) into the estuary (as would be likely considering the reductions identified in Section A4.2.3 as occurring higher up in the reach) is within the WFD standards[4] for main river freshwater inflows into transitional waterbodies such as that of the Humber Estuary. Assessment of the impacts of drought option implementation on the integrity of the Humber Estuary SAC/SPA concluded that there would be no significant effect of implementing one or all of the drought order on relevant features of the Humber Estuary SAC/SPA, i.e. there would be no adverse effect on the integrity of the interest features for which the Humber Estuary SAC/SPA is designated[5].

A3.2 Timing of drought measure effects

The drought order application is anticipated to be submitted by YWSL in late summer 2022 and the implementation period would therefore be likely to cover autumn/winter 2022.

A3.3 Cumulative reaches with other EARs

There is one cumulative hydrological impact foreseen as a result of simultaneous deployment of the drought option at the River Ouse at Moor Monkton.

Ouse 1 is also impacted by the effects of the Leighton, Lumley Moor, Haverah Park and River Ure at Kilgram Bridge drought options, which together account for a combined maximum flow reduction of 13.18 Ml/d in the Ure and Nidd tributaries of the Ouse catchment upstream of the Moor Monkton intakes. If all five drought options were simultaneously deployed the overall combined flow reduction would be 73.18 Ml/d which represents a reduction of 11.9% and 16.7% in the summer Q95 and Q99 flow statistics, which is assessed as a **moderate** hydrological impact on this reach in summer months. The reduction in year round Q95 and Q50 is 10.6% and 0.5% respectively, which is assessed as a **minor** hydrological impact during winter months. The drought order implementation period is anticipated to cover autumn/winter 2022 however on a precautionary basis as the late summer period may be affected, further consideration is given in **Appendix B** of cumulative impacts within the summer period.

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4 Entec (2007) Water Resource Standards for Freshwater Flows to Transitional Waterbodies *WFD 83* Table 7.5. The lower Ouse is poor ecological potential between Naburn and Stillingfleet, and moderate ecological potential from Stillingfleet until the Humber Estuary (note it is a heavily modified waterbody). All larger transitional water bodies for example the Thames, Severn and Humber fall into the low sensitivity category. Therefore, the appropriate proposed standard for main river inflows at low flow (<Q95) is a 50% change in flow.

5 Scott Wilson (2011). Yorkshire Water Drought Plan: Assessment of Possible Impact on Humber Estuary SPA/SAC. Final Report Revision 2 February 2011. Report for Yorkshire Water.

A4 Physical environment effects

A4.1 Introduction

This section provides a characterisation of the physical environment within the zone of influence (as defined above in **Section A3**) and includes the following information for each reach:

1. Reach setting
2. River flow regime (reference conditions and sensitivity)
3. River habitat (reference conditions and likely sensitivity)
4. River water quality, including water quality pressure (reference conditions and sensitivity).

An assessment of likely changes from drought option implementation for the zone of influence is then provided.

YWSL's Drought Plan 2022 Environmental Assessment Methodology[6] provides details of the approach in Section 3.5. The approach has been developed to ensure compliance with the Environment Agency's 2020 Drought Plan Guideline (DPG)[7] and Section 3 of the Environment Agency's July 2020 "Environmental Assessment for Water Company Drought Plans- supplementary guidance".

A4.2 Ouse 1

A4.2.1 Reach introduction

A summary of physical environment information for Ouse 1 is provided in **Figure A4.1**. The reach includes part of the following WFD river waterbody:

- River Ouse from River Nidd to Stillingfleet Beck (GB104027069593)

A4.2.2 Reach setting

The reach, located in main EAR **Figure 4.1,** comprises a 20.6km stretch of the River Ouse from Moor Monkton to Naburn Lock (**Table A2.1**). The reach has an additional catchment area of 302.5km^2 along its length.

A4.2.3 River flow regime

Daily mean flows at the upper end of the reach have been represented using the Ouse at Skelton flow gauge, a short distance downstream and without other significant flow inputs or reductions. The maximum reduction in compensation flow under the River Ouse drought option is 60Ml/d, when flow measured at the Skelton gauge is equal to or lower than 1,000 Ml/d. The flow reduction of 60 Ml/d represents a reduction of 9.7% and 13.7% in the summer Q95 and Q99 flow statistics, which is assessed as a **minor** hydrological impact on this reach in summer months. The reduction in year round Q95 and Q50 is 8.7% and 0% respectively, which is assessed as a **negligible** hydrological impact during winter months.

There is one significant flow pressures influencing flow in Ouse 1, a discharge licence leading to a significant flow addition from Naburn WwTW, with a dry weather flow of 45.1Ml/d. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.2.4 River habitats

River habitats have been characterised at a whole reach scale. No additional information for a representative 500m reach has been surveyed.

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6 Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

7 Environment Agency (2020) Water Company Drought Plan Guideline, April 2020.

Ouse 1 is moderately sinuous lowland river surrounded by extensive floodplains. RHS data indicates the presence of 2 river terraces in the upper and lower sections of the reach. The reach itself falls ~1m over 21.6km, a slope of 0.003°. There is semi-continuous to isolated riparian tree cover throughout the reach with some few areas of continuous cover in the upper sections of the reach. Channel widths vary throughout the reach, measuring 50.7m at the start of the reach to 60.3m at the end of the reach. Where the reach passes through York the width decreases to around 35-40m, in response to channel modification from engineering. Extant aerial imagery shows no visible in-channel features. Data from the RHS site 241 indicates the channel bed is predominantly clay, with the channel bed composed of silt at site 14056, silt at site 36997 and the channel bed not visible at site the other RHS survey sites. The RHS data indicate that there are either no channel features present or visible at each of the RHS sites. The flow surface was predominantly smooth and free of broken flow throughout the reach. RHS data indicate that smooth flow was solely observed at site 14056 and 34546, while rippled flow was dominant at sites 13940, 36997 and 36978.

Bank erosion is visible throughout much of the reach, and erosion is very frequent in the first 9.3km prior to when the river flows through York. Poaching was observed in RHS survey 36997. Data from RHS sites identify a range of bank forms. Left and right banks >45° were extensive at Site 241, with vertical and undercut banks noted as being present. Further down the reach, at site 14056, resectioned or reprofiled banks were noted as present to extensive, although the left banks were dominated by extensive composite banks. At site 34546, banks were undercut. At Site 13940, a mixture of bank forms was present, with left and right banks >45°, gentle and reinforced right banks and vertical or undercut and resectioned or reprofiled left banks. Towards the end of the reach bank slopes were steep (Survey sites 36997 and 36978). Bank vegetation types were noted as being predominantly simple to complex along the reach.

The surrounding land-use varies along the reach. In the upper reaches, prior to York, land use is a mixture of arable agricultural land and improved grassland with occasional urbanisation. Passing through York urbanisation and parkland is dominant, with a return to arable agricultural land and improved grassland south of York to the end of the reach. Urbanisation is greater in the lower sections of the reach after York compared to the upper sections of the reach. RHS data is in agreement but also identifies the presence of scrub and shrubs and tall herbs or rank vegetation along the reach.

Ouse 1 supports typical habitats of a lowland watercourse, with a moderately sinuous planform and extensive connectivity to the floodplain. As a result of the shallow slope, the flow structure present is relatively uniform along the reach and is dominated by low energy flows, however flow variation is expected, particularly in the more sinuous parts of the reach which will increase habitat diversity. The extensive presence of bank erosion throughout the reach suggests that the low energy environments have some force as a result of the volume of water, or high energy environments will become more apparent in spate. The uniformity of the watercourse is also highlighted by the absence of depositional features in the channel. The reach is likely to support adult fish, with cyprinid species likely to dominate and anadromous species will utilise the reach during the migratory period. Spawning habitat for fish species using unconsolidated gravels is unlikely to be present within the reach due to the absence of suitable substrate and habitat. The scattered presence of trees in the reach will provide some allochthonous energy to the watercourse and provide some, albeit limited, cover for fish. The weir present at the tidal limit may have an impact upon the movement of migratory species.

The drought options reduction in flow could lead to several potential impacts along Ouse 1:

- Minor risk of changes in the energy of the system associated with up to 14% reduction in flow for the duration of drought options.
- Potentially minor risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins for duration of drought option.
- Potentially minor risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for duration of drought option, with retention of smooth flow.
- Negligible risk to longitudinal connectivity.
- Minor risk of changes in sediment dynamics for duration of drought option. Reductions in discharge will lead to reductions in velocity and could lead to increased potential for the

deposition of any fine sediment in transport noting that sources will be largely dormant during environmental drought. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats in Ouse 1 from drought options is therefore assessed as minor.

A4.2.5 River water quality

The third water quality monitoring location present in Ouse 1: River Ouse at Nether Poppleton (Skelton) (NE-49100488) has been used due to its data quality. The average pH between 2010-2020 was 8.0 with a maximum temperature of 21.8ºC for the same period.

There are six frequently spilling CSOs potential presenting an environmental risk in the reach and seven additional CSOs which the EA consider to present an environmental risk to water quality in the reach. A summary description of the potential risks to water quality in the River Ouse as a result of drought option is presented in **Table A4.1**.

Table A4.1 Potential risks to water quality in Ouse 1 as a result of drought option

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were consistent with 'Good' WFD status (0.6 mg/l) throughout the monitoring period	Dissolved oxygen saturation (%) values were consistent with 'Good' WFD status (60%) throughout the monitoring period	Orthophosphate concentrations were inconsistent with 'Good' WFD status (0.079 mg/l) throughout the monitoring period with 49% of results achieving 'Moderate' status or lower.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	Strong
WwTW presenting increased risk	None	None	None
Intermittent pressures presenting risk	Risk of short term acute, infrequent, temporary water quality pressures (acute toxicity of ammonia, suffocation from oxygen sags) locally downstream of 7 listed and 7 additional CSOs during rainfall events.		None
Other point source pressures presenting risk	None	None	None
Summary	Moderate risk from drought options associated with CSO discharge	Moderate risk from drought options associated with CSO discharge	Moderate risk from drought options associated with change in dilution of diffuse pollution pressures

A4.2.6 Summary of potential changes in the physical environment as a result of drought option

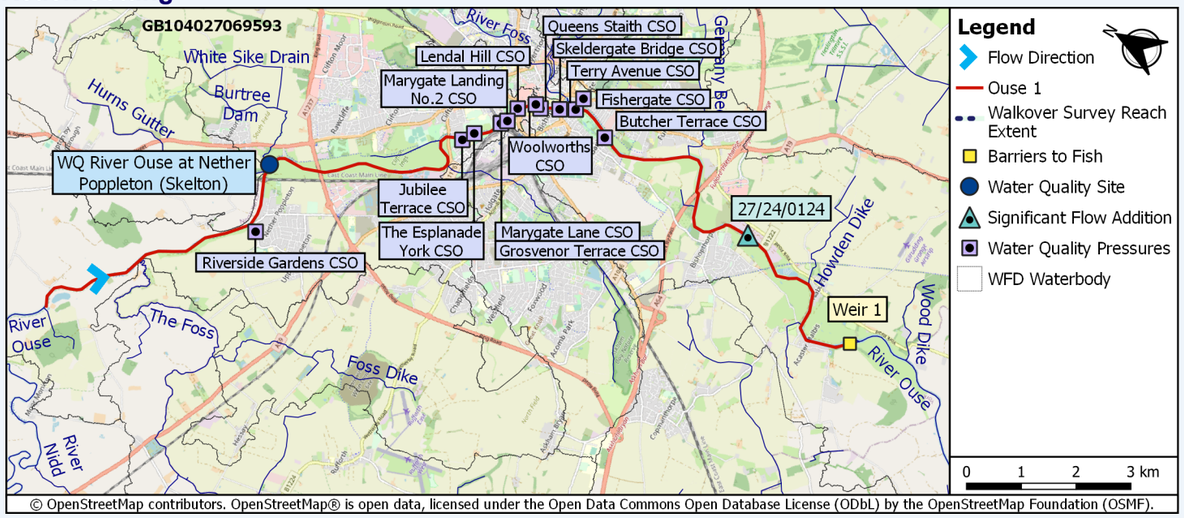
An overall summary of potential changes in the physical environment of the River Ouse as a result of drought option is presented in **Table A4.2**.

Table A4.2 Summary of potential changes in the physical environment to Ouse 1 as a result of drought option

Physical environment aspect reviewed	Assessment of risk from implementation of drought option
River flows *Minor impacts (summer)* *Negligible impacts (winter)*	• Reductions of up to 14% in river flows in summer and dry autumn conditions throughout the reach.
Flow depleted reaches *None*	• There are no flow depleted reaches within Ouse 1
River habitats *Minor risk*	• The minor reduction in flow will change the energy of the system • Potential minor risk of reduction in total wetted aquatic habitat in the reach, and minor risk of changes in available habitat for different species requirements – noting that dominant flow types will be retained. • Minor risk to longitudinal connectivity • Minor risk of change in sediment dynamics.

Water quality *Moderate risk*	• Risk of short term acute, infrequent, temporary water quality pressures locally downstream of seven listed and seven additional CSO during rainfall events. There are no continuous water quality pressures identified as presenting increased risk with drought options implemented. • Reported ammonia and DO % water quality is consistent with 'Good' status and no apparent flow sensitivity. SRP is predominantly not attaining 'Good' status with a strong flow sensitivity.

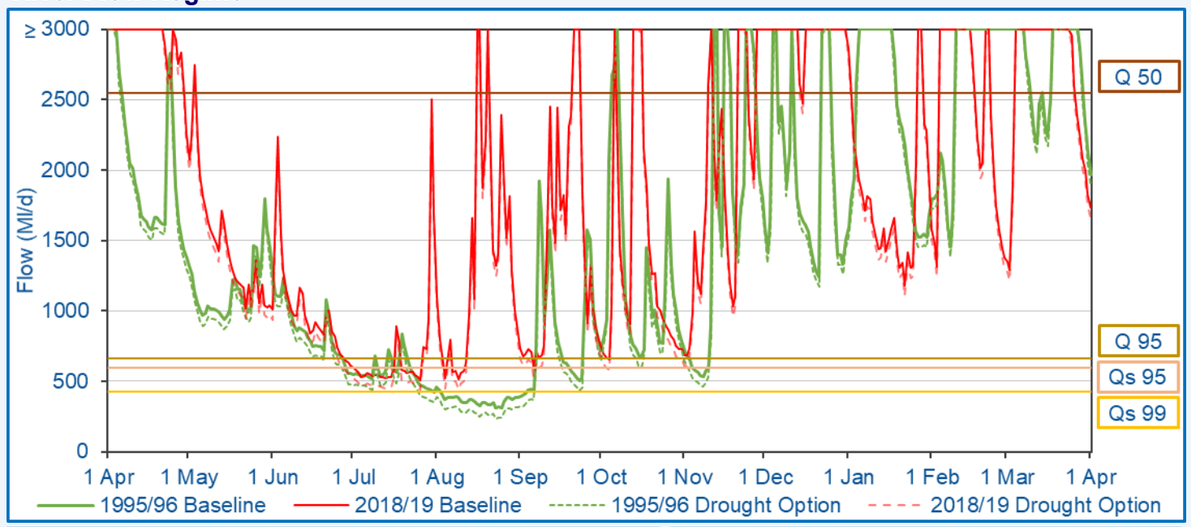
Reach Setting



Reach Setting Information:
The reach is underlain by Triassic rocks comprised of sandstone and conglomerate and alluvium. The reach is surrounded, predominantly, by glacio-lacustrine deposits of gravels and sand, clay and silt and moraine deposits. Some glacial tills are noted around York. Soil types beneath the reach are composed predominantly of loamy and clayey floodplain soils. A wide range of soil types surround the reach. Slowly permeable, seasonally wet slightly acid loamy and clayey soils characterise the upper portions of the reach prior to York. Naturally wet, acid sandy and loamy soils and loamy soils characterise the mid and lower sections of the reach. Prior to York the land use is a mix of arable agriculture and improved grassland. Urbanisation is high as the reach passes through York.

	Supplementary Information
Catchment Area at Assessment Point	3,217km^2
Mean Slope Gradient	0.01°
Length of Reach	20.6km
Additional Catchment Area	302.5km^2
Upstream Reach	N/A
Downstream Reach	N/A

River Flow Regime



-	Reference Conditions (Ml/d)	Drought Plan Conditions (Ml/d)	% Reduction	Impact
$Q_{s}95$	612.7	552.7	9.7	Summer Minor
$Q_{s}99$	437.7	377.7	13.7	
Q95	684.4	624.4	8.7	Winter Negligible
Q50	2627	2627	0	

Significant Flow Additions/Reductions	Flow Rate (Ml/d)	Abstraction / Discharge
Naburn STW 27/24/0124	45.1 DWF	Discharge

River Habitats

No walkover survey was carried out during the onset of drought in 2018 along this reach. This will be included in the EMP.

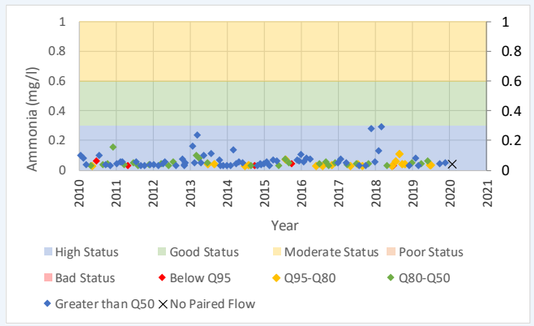
River Water Quality

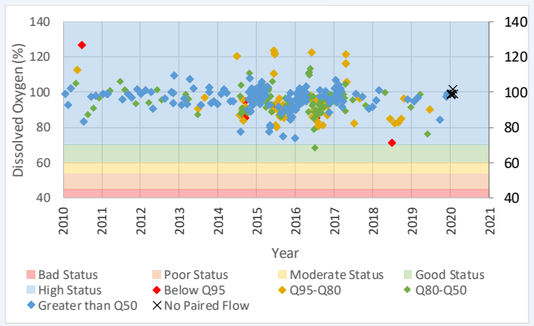
Significant Water Quality Pressures	Permit Conditions
Jubilee Terrace CSO / C4958 A1	Intermittent Discharge
Grosvenor Terrace CSO / 27/24/0452 A1	Intermittent Discharge
Terry Avenue CSO / 27/24/0427 A1	Intermittent Discharge
Fishergate CSO / 27/24/0421	Intermittent Discharge
Skeldergate Bridge CSO / 27/24/0426	Intermittent Discharge
Riverside Gardens CSO / 27/24/0465	Intermittent Discharge
Woolworths CSO / 27/24/0419-1	Intermittent Discharge
Queens Staith CSO / 27/24/0459	Intermittent Discharge
Marygate Lane CSO / 27/24/0449	Intermittent Discharge
Lendal Hill CSO / 27/24/0417	Intermittent Discharge
The Esplanade, York CSO / 27/24/0205	Intermittent Discharge
Marygate Landing No 2 CSO / C4957	Intermittent Discharge
Butcher Terrace CSO / 27/24/0428	Intermittent Discharge

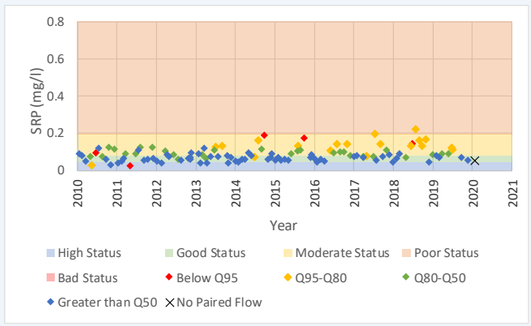
In the River Ouse at Nether Poppleton (Skelton) (NE-49100488) the average pH between 2010-2020 was 8.0 with a maximum temperature of 21.8°C

YorkshireWater RICARDO

Figure A4.1
Ouse 1
Physical Environment Information







Annex 1 – Regulated abstractions in the Ouse 1 reach

DP reach	Licence No.	Use Description	NGR 1	Max Annual Quantity	Max Daily Quantity
Ouse 1	2/27/24/212	General Agriculture	SE6006946887	30450	436
Ouse 1	NE/027/0024/061	Industrial, Commercial And Public Services	SE6006151883	273500	848

Annex 2 – Water quality pressures considered in the assessment

Name	Permit Reference	Outfall NGR	Significant Water Quality Pressure	Intermittent/ Continuous
Naburn STW	27/24/0124	SE6009047150	No	Continuous
Rawcliffe (York) STW	27/24/0129	SE5876052900	No	Continuous
Rufforth WPC Works	27/24/0337	SE5360052200	No	Continuous
Long Marston WPC Works Storm Tanks	E779	SE5090051100	No	Continuous
Nun Monkton STW	27/21/0142	SE5119057580	No	Continuous
Riverside Gardens/CSO	27/24/0465	SE5569654982	Yes	Intermittent
Jubilee Terrace CSO	C4958	SE58995254	Yes	Intermittent
Grosvenor Terrace CSO	27/24/0452	SE5997252840	Yes	Intermittent
Skeldergate Bridge CSO	27/24/0426	SE6032851287	Yes	Intermittent
Terry Avenue CSO	27/24/0427	SE6048351022	Yes	Intermittent
Fishergate/ CSO	27/24/0421	SE60745451000	Yes	Intermittent
The Esplanade York CSO	27/24/0205	SE59195240	Yes	Intermittent
Lendal Hill CSO	27/24/0417	SE6001551986	Yes	Intermittent
Common Hall Lane CSO	27/24/0418	SE6008051888	No	Intermittent
Woolworths CSO	27/24/0419	SE6022051700	Yes	Intermittent
Skeldergate Bridge CSO	27/24/0420	SE6041251320	No	Intermittent
Hartoft Street CSO	27/24/0422	SE6061250656	No	Intermittent
Farndale Street CSO	27/24/0423	SE6059050612	No	Intermittent
New Walk CSO	27/24/0424	SE6045450368	No	Intermittent
Butcher Terrace CSO	27/24/0428	SE6032350307	Yes	Intermittent
Marygate Lane CSO	27/24/0449	SE5973352285	Yes	Intermittent
Portland Street CSO	27/24/0450	SE6011752498	No	Intermittent
Bootham Hospital CSO	27/24/0451	SE6000552809	No	Intermittent
Grosvenor Terrace CSO	27/24/0452	SE5997252840	No	Intermittent
Queen Street Bridge CSO	27/24/0453	SE5995451632	No	Intermittent
Station Road CSO	27/24/0454	SE5966751664	No	Intermittent
Royal York Hotel No.2 CSO	27/24/0455	SE5995051914	No	Intermittent
Royal York Hotel No.1 CSO	27/24/0457	SE5995051914	No	Intermittent
Landing Lane CSO	27/24/0458	SE5825352406	No	Intermittent
Queens Staith CSO	27/24/0459	SE6019251592	Yes	Intermittent
Marygate Landing CSO (No2)	C4957	SE5974352059	Yes	Intermittent
Castle Mills CSO	WA6109	SE6049551299	No	Intermittent
Longfield Terrace/CSO	151 / 1 / 1	SE5960652082	No	Intermittent
Clifton Hospital/CSO	YWUCD1/78	SE5821453350	No	Intermittent
Marble Arch/CSO	2908	SE5970452016	No	Intermittent
Millfield Lane York/CSO	27/24/0466	SE56615391	No	Intermittent
Lower Poppleton/CSO	NPSWQD006095	SE56905358	No	Intermittent
Shipton Road/No 2 CSO	2075	SE5800254403	No	Intermittent
Clifton Hospital/CSO	YWUCD1/78	SE5821453350	No	Intermittent
Plantation Drive/CSO	C4158	SE5752052730	No	Intermittent
Tadcaster Road/CSO	27/24/0245	SE49134861	No	Intermittent
Fulford Main Street/CSO	952	SE6109248703	No	Intermittent

Appendix B – Environmental Features

B1. Introduction

This appendix assesses the potential impacts on the environmental features of the River Ouse during the period of implementation of associated drought option.

Details regarding the approaches/methodologies used for assessing susceptibility and sensitivity to drought management actions and the assessment of the impacts associated with drought management actions are presented in Sections 3.6 and 3.7 of YWSL's Drought Plan 2022 Environmental Assessment Methodology[1].

The environmental preferences within which a species can successfully exist and the relationship between populations in stressed river conditions remains subject to debate. The prediction of impacts of hydrological and water quality changes on aquatic ecology remains subject to significant uncertainty and this may be exacerbated where data are limited. This assessment has, therefore, adopted a precautionary approach, with potential impacts highlighted where doubt exists.

The assessment of environmental features is informed by the assessment of the physical environment (which includes hydrology and hydrodynamics; geomorphology; and water quality), this is summarised in Section 5 presented in full in **Appendix A**.

Points of interest referred to throughout the text are indicated in **Figure B1.1**.

This EAR has been prepared in support of a drought order application in late summer 2022. It provides an update to the 'shelf copy' report which was produced in support of YWSL's Drought Plan 2022. Following agreement with the Environment Agency, the physical environment and environmental features assessments presented in the 'shelf copy' report have been retained for this application EAR (see main EAR Section 1.2).

This appendix is set out in the following sections:

Section B.2 Baseline and sensitivity– this includes for each reach:

1. Statutory designated sites
2. NERC and local wildlife sites
3. NERC and other protected species
4. WFD features
5. Invasive non-native species (INNS)
6. Landscape, navigation, recreation and heritage.

Section B.3 Environmental features screening.

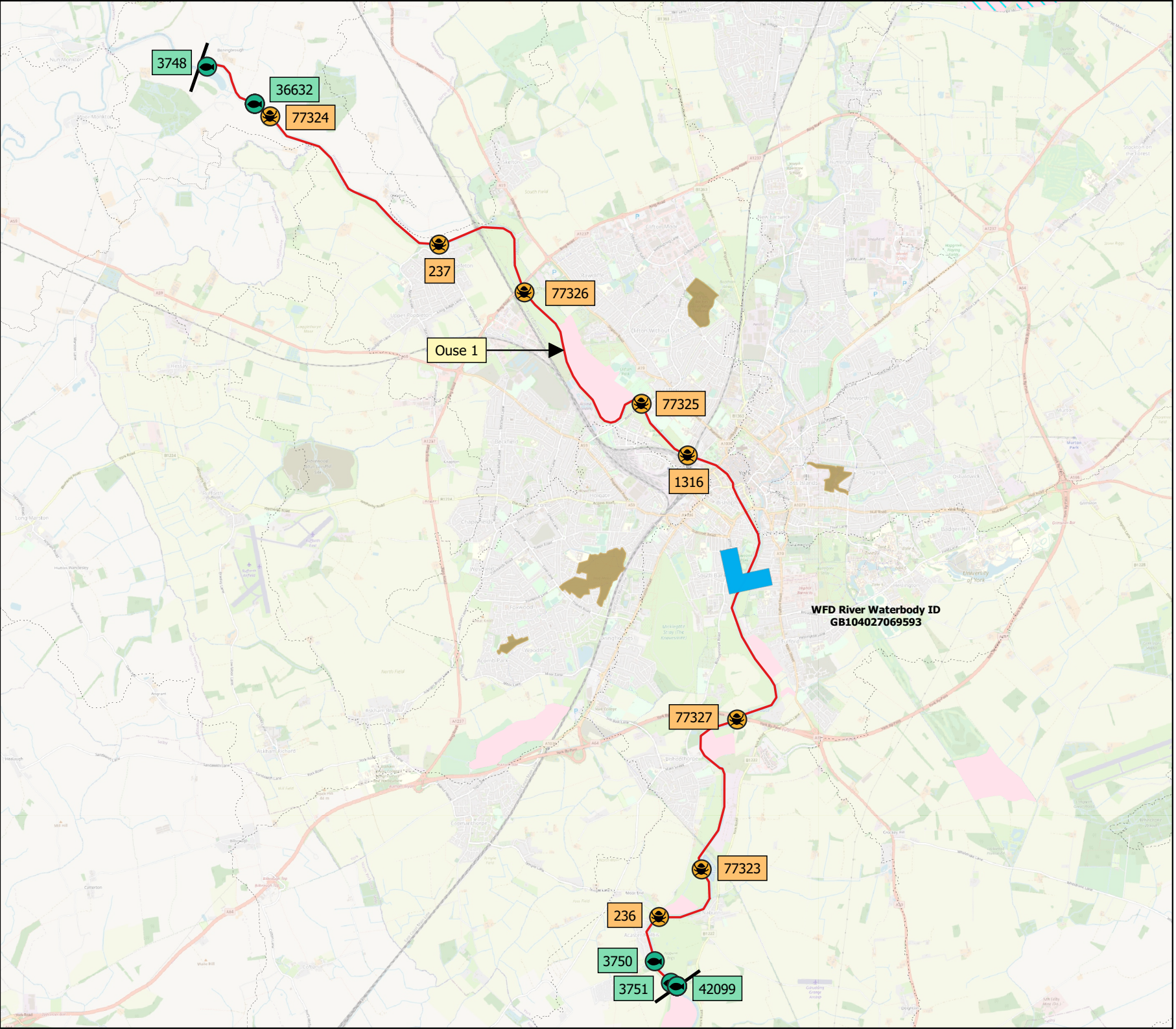
Section B.4 Features assessment, monitoring and mitigation – this includes for each reach:

1. Features assessment
2. Summary of impacts.

Section B.5 Cumulative impacts features assessment.

Section B.6 Monitoring and mitigation

[1] Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.



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Legend

N

- River Reaches
- Reach Divides
- Reservoirs
- Flow Direction
- Macroinvertebrate Site
- Fish Site
- Local Nature Reserves
- Sites of Special Scientific Interest
- WFD Management Catchment

Project title:
Yorkshire Water Drought Plan Environmental Assessment

Figure title:
River Ouse at Moor Monkton Ecology

Figure B1.1	**Date:** August 2020
NGR: SE 57796 51151	**Scale:** 1:70000

Note: All locations are approximate

B2. Baseline & Sensitivity

Details regarding the approaches/methodologies used for assessing susceptibility and sensitivity to drought option implementation are presented in Section 3.6 YWSL's Drought Plan 2022 Environmental Assessment Methodology[2].

B2.1 River Ouse at Moor Monkton

B2.1.1 Statutory designated sites

Table B2.1 summarises the sites of international/national importance (SSSI, SAC, SPA, Ramsar, Marine Conservation Zone, NNR, LNR) which are in hydrological connectivity with the impacted reach.

Five statutory designated sites that are sensitive or susceptible to drought order impacts have been identified for detailed assessment (see **Table B2.1**).

Table B2.1Statutory designated sites

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
Naburn Marsh SSSI	Minor	The site comprises a mosaic of species-rich flood meadow grassland with swamp and inundation communities. This type of flood meadow grassland is now nationally rare. The lower lying central area is covered in water for longer periods during winter floods and also remains damper during the summer months.	Low	Yes
Clifton Ings and Rawcliffe Meadows SSSI	Minor	The site comprises species rich neutral grassland, predominantly of the rare National Vegetation Classification (NVC) types MG4 meadow foxtail and MG8 crested dogs-tail which form part of NERCs lowland meadow habitats. Additionally, the Tansy beetle (*Chrysolina graminis)* which is of principle importance for the conservation of biodiversity under NERC. The site extends across two alluvial floodplain fields to the east of the River Ouse, which are subject to seasonal flooding.	Low	Yes
Church Ings SSSI	Minor	Church Ings comprises two unimproved alluvial flood meadows, adjacent to the River Ouse at Acaster Malbis in the Vale of York. These meadows are of particular importance for their neutral grassland plant community which is an increasingly rare habitat type, threatened nationally as a result of drainage and agricultural	Low	Yes

[2] Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
		improvement. The nature conservation interest is dependent upon the maintenance of a high water-table.		
Acaster South Ings SSSI	Minor	Acaster South Ings consist of two large alluvial flood meadows adjacent to the River Ouse, near Acaster Malbis and approximately four miles to the south of the City of York. These grasslands represent an increasingly rare habitat type which is threatened nationally as a result of drainage.	Low	Yes
Fulford Ings SSSI	Minor	Fulford Ings is an important example of flood plain mire located on low lying land between the River Ouse and Fulford village. It supports a sequence of plant communities which reflect the topography and hydrology, with alluvial grassland on higher ground, adjacent to the flood bank, a transitional zone of rich fen meadow and swamp in the most low lying areas furthest from the river. This sequence of plant communities is now uncommon as such Fulford Ings is of particular importance.	Low	Yes

B2.1.2 NERC and local wildlife sites

summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 100m of the impacted reach.

Eight NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought order impacts have been identified for detailed assessment (see **Table B2.2**).

Table B2.2 NERC habitats and local wildlife sites

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
River Ouse LWS	Minor	This substrate is predominantly sandy silt. There is little submerged, and limited emergent vegetation. Riparian vegetation is dominated by willow shrub and ash trees. Migratory species such Atlantic salmon, Sea lamprey, River lamprey and eel use the river. Otter and bats are present throughout and around the river, and the river provides a critical foraging ground for both. The	Medium	Yes

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
		riparian zone is nationally important for Tansy Beetle.		
Rawcliffe Ings Dyke LWS	Minor	The site is predominantly floodplain hay meadow. A series of pools are present the flood basin, hosting different communities depending on time of creation. Scrub is present on the slopes of the flood basin, but neutral grassland is dominant. Tansy and tansy beetle are present. Rawcliffe Ings Drain is an extension of the Ings Dyke. Predominantly agriculturally-improved pasture land. Shallow mudded areas and reedbeds are present.	Medium	Yes
Archbishops Palace Grounds LWS	Minor	Lowland acid grassland. Mosaic of semi-natural habitats including grassland and wetland. Parkland landscape with exotic specimen and veteran trees. Acid grassland and open water are present. Flora indicates the woodland is long-established. The woodlands are of interest to bats and birds.	Not sensitive	No
Bishopthorpe Ings LWS	Minor	Predominantly flood meadow grassland grading to wet grassland and swamp. Areas of inundation grassland are present. The bankside area of the site hosts tansy and small populations of Tansy Beetle	Low	Yes
Church Ings LWS	Minor	Predominantly unmanaged tall herb fen and wet meadows. Tansy plants are abundant and most a large tansy beetle population.	Low	Yes
Clifton Bridge LWS	Minor	The cavities between pillars and the underside of the bridge is a nursery for bats.	Not sensitive	No
Clifton Ings LWS	Minor	An occasional storage reservoir, the site is an ancient unenclosed flood meadow. A broad drain runs through the centre of the site and is important for wetland flora Tansy Beetle is locally abundant on the riverbank and banks of the central drain.	Low	Yes
Fulford Ings Village Green LWS	Minor	Small area of riverbank and bank top with extensive Tansy and a very good a long-established population of Tansy Beetle.	Not sensitive	No
Gollie Ponds LWS	Minor	Complex of small ponds surround by scrub, including wet woodland. The land around the ponds was once pasture and has been	Low	Yes

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
		reverted back to grassland with several flood meadow species regenerating, due to increased summer flooding.		
Middlethorpe Crematorium LWS (4-3)	Minor	Middlethorpe Crematorium is comprised of an upper field with herb rich neutral grassland and a lower section of swamp. There are a number of nationally rare species present.	Low	Yes
Middlethorpe Ings LWS (4-1)	Minor	An area of relict area of flood meadow grassland improved by low levels of reseeding and herbicide treatment. A third of the site retains reasonably rich sward derived from the original flood meadow grassland. Tansy and Tansy beetle is frequent	Not sensitive	No
Naburn Hall Meadow / Ings LWS	Minor	Naburn Hall Ings/Meadow is a flood meadow reverting to grassland from arable land. Flood meadow species and meadow species are recorded in the grassland. Tansy is frequent.	Low	Yes
Poppleton Ings South – Ditch LWS	Minor	The site is a relict flood meadow grassland that has been damaged by herbicide. Tansy beetles have been recorded on site.	Not sensitive	No
NERC Priority Habitats - 68975	Minor	*Alopecurus pratensis–Sanguisorba officinalis* grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - 455959, 455960, 455965, 455963, 455964	Minor	*Alopecurus pratensis–Sanguisorba officinalis* grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - 148697, 149455, 149307, 149337	Minor	Coastal and floodplain grazing marsh. Unlikely to be in connectivity with impacted reach	Not sensitive	No
NERC Priority Habitats - 458364	Minor	Coastal and floodplain grazing marsh. Unlikely to be in connectivity with impacted reach	Not sensitive	No
NERC Priority Habitats - 458812	Minor	Coastal and floodplain grazing marsh, Lowland fens. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats	Minor	Fens. Unlikely to be in connectivity with impacted reach.	Not sensitive	No

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
- 444940, 455363				
NERC Priority Habitats - 39054, 39390	Minor	*Lolium perenne–Cynosurus cristatus* grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - 434625, 434694	Minor	Lowland fens. Unlikely to be in connectivity with impacted reach	Not sensitive	No
NERC Priority Habitats - 69601	Minor	Lowland meadows and pastures. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - 438829, 439392	Minor	Lowland meadows and pastures. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - 421743	Minor	Lowland meadows and pastures, Lowland neutral grassland, Lowland hay meadows, Maintenance of species-rich, semi-natural grassland, Coastal and Floodplain Grazing Marsh. Unlikely to be in connectivity with impacted reach	Not sensitive	No
NERC Priority Habitats - 358262	Minor	Maintenance of grassland for target features. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - 359365	Minor	Restoration of grassland for target features. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - 45120, 45123, 45130, 45132, 45133, 45215, 45299, 45325, 45331, 45580, 45585, 45586, 52737, 52986, 53006, 53487, 53585, 61014, 61105, 61225, 68550, 68746, 68889, 69287, 69293, 69474, 69533	Minor	Coastal and floodplain grazing marsh. Unlikely to be in connectivity with impacted reach	Not sensitive	No

B2.1.3 NERC and other protected species

Table B2.3 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

Data obtained from the Environment Agency, YWSL and a review of available data from NBN gateway was used inform the assessment of otter in the impacted reach. Review of Environment Agency records indicate the presence of otter within impacted reach. The data identifies that suitable habitat is present in the impacted reach. The distribution of information and survey data for the species was considered to be limited, Therefore, absence cannot be confirmed. It was considered appropriate, following the precautionary principle, to consider otters likely to be present in the reach at the time of the implementation of a droughtorder. Based on the limited available information otters considered to be susceptible to drought order impacts and have an **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Data obtained from the Environment Agency and a review of available data from NBN gateway was used inform the assessment of water vole in the impacted reach. The data showed no surveys or records have been recorded in the impacted reach. Therefore, absence cannot be confirmed. It was considered appropriate, following the precautionary principle, to consider water vole likely to be present in the reach at the time of the implementation of a drought option. Based on the limited available information water vole are considered to be susceptible to drought option impacts and have an **uncertain** sensitivity to the physical environment impacts identified in **Appendix A.**

Six NERC act section 41 and notable fish species have been identified as present in the impacted reach, including seven NERC Act Section 41 fish species (Atlantic salmon, brown trout and European eel, Twaite shad, Allis shad, river and sea lamprey) and four notable fish species (bullhead, brook lamprey, barbel and grayling).

The nationally scarce species of tansy beetle, *Chrysolina graminis* has been identified as being present in Ouse 1. The species know to be present along the River Ouse, as its range is currently restricted to about 45 km of the banks of the River Ouse centred on York, North Yorkshire[3]. Based on the available information this feature is not considered to be susceptible to drought order impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Several NERC act section 41 and notable bird species have been identified as present in water dependent habitats which rely on the impacted reach. Based on the available information these species are considered not to be susceptible to drought order impacts and **not sensitive** to the physical environment impacts identified in **Appendix A.**

Table B2.3 NERC Act Section 41 and other protected species

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
NERC Species – mammals Otter *Lutra lutra*	Minor	Otters are known to use the impacted reaches. Further consideration would be necessary to determine to what extent or how they may be impacted by reduced flows caused by the drought option.	Low	Yes
NERC Species – mammals	Minor	Limited data is available for the impacted reach. Changes in water level are the most important factor influencing water vole populations, with species readily inhabiting	Uncertain	Yes

[3] Chapman, D.S.; Sivell, D.; Oxford, G.S.; Dytham, C. (2006). "Ecology of the tansy beetle (Chrysolina graminis) in Britain". The Naturalist. 131: 41–54.

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
Water vole (*Arvicola amphibious)*		areas of slow flowing and standing water. As such hydrological and associated impacts as a result of this drought option may reduce habitat availability and alter the species food supply.		
NERC Species – Fish -Atlantic salmon (*Salmo salar*) - Brown trout *(Salmo trutta)* -European Eel *(Anguilla anguilla)* -sea lamprey (*Petromyzon marinus*) -river lamprey *(Lampetra fluviatilis)* *- Twaite shad* (Alosa fallax) -Allis shad *(A. alosa)*	Minor	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. The potential impacts on migrations, freshwater attractant flows in tidal reach, elevated temperatures in the non-tidal reach where little flow would be present could cause thermo-barrier to migration of fish and reduction in dissolved oxygen.	High	Yes
Notable Species – Fish Grayling (*Thymallus thymallus)* Bullhead *(Cottus gobio)* Brook lamprey *(Lampetra planeri)* Barbel (*Barbus barbus)* [4]	Minor	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. The potential impacts on migrations, freshwater attractant flows in tidal reach, elevated temperatures in the non-tidal reach where little flow would be present could cause thermo-barrier to migration of fish and reduction in dissolved oxygen.	Medium	Yes
Notable Species - Invertebrate -Tansy beetle *(Chrysolina graminis)*	Minor	The tansy beetle was once widespread in the UK, but now has a severely restricted and declining distribution. The beetle is threatened due to reduction in suitable wetland habitat and food plants, including tansy *tanacetum vulgare*. Until 2014, the last remaining UK population was thought to be on the River Ouse in York. The species are restricted to areas of the tansy plant on the banks of the River Ouse. The tansy plant is drought tolerant and are not expected to be severely impacted by implementation of the drought	Low	Yes

[4] Barbel is listed in Annex V of the Habitats Directive as a species of Community interest whose taking in the wild and exploitation may be the subject of management measures.

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
		option against a baseline of reduced flows characteristic of drought.		
NERC Species – Birds There are many birds species present across the region	Minor	The following bird species to varying extents rely on water dependent habitats. However, they are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought: - Eurasian Curlew (*Numenius arqauta*) -Reed Bunting (*Emberiza schoeniclus)*	Not sensitive	No
Notable Species – Birds There are many birds species present across the region	Minor	The following bird species to varying extents rely on water dependent habitats. However they are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought: - House Martin (*Delichon urbica*) - Swallow (*Hirundo rustica*) - Grey Wagtail (*Motacilla cinerea*) - Redshank (*Tringa tetanus*) - Mute Swan (*Cygnus solor*) - Dipper (*Cinclus cinclus*)	Not sensitive	No

B2.1.4 WFD features

B2.1.4.1 Macroinvertebrates

The WFD waterbody GB104027069593 Ouse from River Nidd to Stillingfleet Beck classifies as 'high' for macroinvertebrates in 2016, Cycle 2. Baseline macroinvertebrate data is provided by seven Environment Agency monitoring sites, Ouse (Dales) (ID 236, 237, 1316, 77323, 77324, 77325, 77326, and 77327). Ouse (Dales) had baseline survey data for seasonal samples from 2009 to 2011, 2013 to 2014, and 2017 to 2019.

The WFD status of the macroinvertebrate community in the Ouse (Dales) may be impacted by the implementation of this droughtorder. However, low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only), and therefore impacts of the drought order must be considered in the context of environmental drought.

Assessment of the sensitivity of the macroinvertebrate community was undertaken by analysis of recorded LIFE scores. Baseline data indicates that under present conditions, the macroinvertebrate community in the Ouse 1 has a low to medium sensitivity to reduced flows (**Figure B** 2.1). See **Table B2.4** for guidance in interpreting raw LIFE scores.

Table B2.4 LIFE score sensitivities

LIFE score	Invertebrate community flow sensitivity
7.26 and above	High sensitivity to reduced flows
6.51 – 7.25	Medium sensitivity to reduced flows
6.5 and below	Low sensitivity to reduce flows

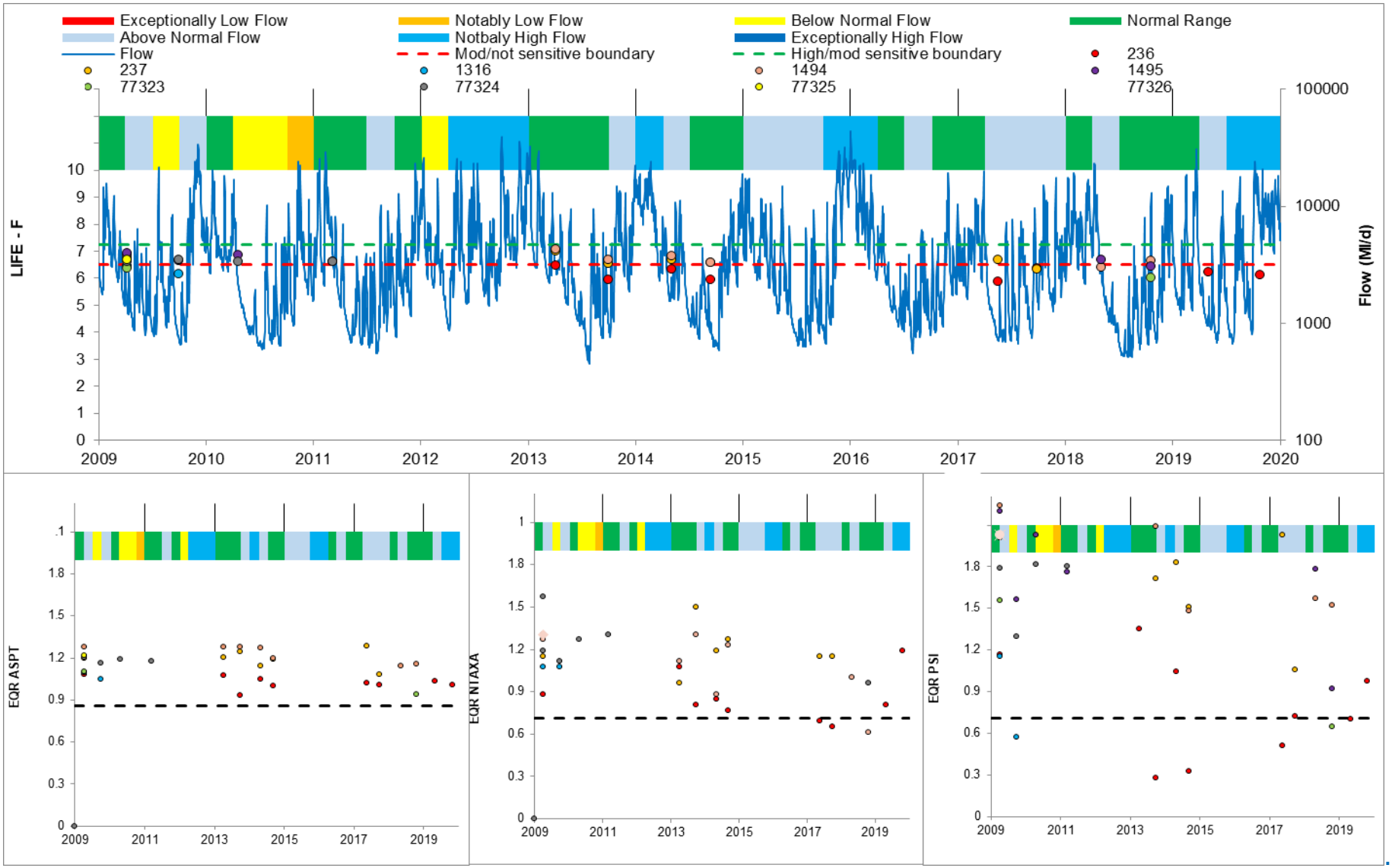
$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B** 2.1

Data from the monitoring site shows variation in $WHPT_{ASPT}$ scores over the period 2009 to 2019 but remain consistent with the standard to achieve good or high WFD status over the monitoring period. $WHPT_{ASPT}$ scores from the site identifies macroinvertebrate communities which are composed of a proportion of taxa which are sensitive to pressures including water quality, $WHPT_{ASPT}$ scores ranging between 4.19 and 5.78. There are no instances of deterioration to this standard during the monitoring period.

In the Ouse 1 data from the site identifies macroinvertebrate communities which significantly vary in terms of diversity, with $WHPT_{NTAXA}$ ranging between 17 and 41 indicative of poor to high ecological status.. This suggests that pressures which impair macroinvertebrate diversity such as habitat loss or/and low or high flows may influence the baseline community.

Based on the available information the macroinvertebrate community is considered to be susceptible to drought order impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A**.

Figure B 2.1 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



*PSI EQR scores are not used to inform the WFD status of macroinvertebrates, instead these values are used to provide supplementary information to the assessment

B2.1.4.2 Fish

Waterbody GB104027069593 Ouse from River Nidd to Stillingfleet Beck is not classified under Cycle 2 (2016). Baseline fisheries data within the impacted reach is informed by five Environment Agency monitoring sites: Linton-on-Ouse u/s weir (ID 3746), Beningborough Village (ID 3748), Acaster Malbis (ID 3750), Naburn Weir (ID 3751) and Overton Ings Fyke nets (36632). Fry surveys were also conducted at Acaster (ID 42066), Beningborough (ID 42070) and Naburn (ID 42099). Data from at least one of these sites has been recorded every year from 2009 to 2019. **Table B2.5** sets out the available fish survey data from these sites.

The WFD status of the fish community in Ouse from River Nidd to Stillingfleet Beck may be impacted by drought order implementation. However, low flow impacts of the drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only), and therefore impacts of drought order implementation must be considered in the context of environmental drought.

Fry surveys at Acaster (ID 42066), Beningborough (ID 42070) and Naburn (ID 42099) observed a high abundance and diversity of coarse fish across all sites, with bleak, chub, dace, gudgeon, perch and roach caught at consistent recorded with varied numbers of individuals annually. A low abundance of flounder were recorded at Naburn - Fry Survey, with the exception of the 2013 and 2016 surveys. A low abundance of minnow and a single sliver bream were only observed at one fry survey site (Naburn - Fry Survey) in 2013. Additionally, a single bullhead was only observed at one fry survey site (Naburn - Fry Survey) in 2017. No Atlantic salmon, trout, European eel, grayling or lamprey *Spp*. were observed during any of the fry surveys, noting that this method of survey is not the optimal method for recording these species.

Beningbrough Village is the most upstream site in the impacted reach, and was surveyed each year from 2009 to 2019 with the exception of 2013 and 2018. A low to moderate abundance of bleak, chub, minnow, dace, gudgeon, perch, pike, ruffe and roach were recorded during most of the surveys at the site. A single barbel was observed at the site during the 2019 surveys. Rudd, sliver bream and stone loach were also recorded at single survey at a low abundance in varied years. A single bullhead was observed at the site in 2011, with an estimated 1 to 9 individuals recorded in 2012. Similarly, a single European eel was observed at the site in 2010, with an estimated 1 to 9 individuals recorded in 2012. No Atlantic salmon, trout, grayling or lamprey *Spp*. were observed during any of the surveys at the site.

Acaster Malbis and Naburn Weir are located at the southern extend of the impacted reach. Naburn Weir was surveyed each year from 2010 to 2019 with the exception of 2012, while Acaster Malbis was surveyed in 2009 to 2011, 2013, 2016 and 2019.

Acaster Malbis observed a low to moderate abundance of bleak, chub, gudgeon, perch, pike, and roach during the surveys. Trout, grayling and salmon were not observed to be present of the site, although these species are present further downstream at Naburn Weir. Two European eel were observed at the site in 2010 and 2019, a low abundance is therefore likely present at the site.

While Naburn Weir observed slightly more coarse fish species with a low to moderate abundance of bleak, chub, dace, perch, pike, and roach. Gudgeon were intermittently recorded at Naburn Weir with a high estimated number of individuals in 2010, and only 5 individuals in both 2011 and 2018.Other species intermittently recorded in an abundance at Naburn Weir included grayling, bullhead, roach x common bream hybrid, rudd, ruffe, sea lamprey, Lamprey *Spp.*, silver bream, stone loach, minnow and three spined- stickleback. European eel were observed at the site intermittently in 2012, 2013, 2015 and 2018, with a low abundance expected to present at the site. A low abundance of Atlantic salmon were recorded at Naburn weir, with the exception of the 2013 survey. Two trout were observed in both 2015 and 2016 with only single individual recorded in 2017, a low abundance is therefore likely present at the site.

Fisheries survey information from the River Ouse (provided by the Environment Agency), presented in **Table B2.5,** indicates the presence of European eel within the reach, with lamprey species, Atlantic salmon, brown/sea trout, common bream, and barbel present in relatively low abundances. However, this fits in with the habitat availability, which suggests the reach is of importance for migration only. Two species of shad have been recorded in the reach, though there have only been two individuals (1 allis and 1 twaite) caught in the Ouse since records began, discussion with Tim Stone (Yorkshire Water) identified that these individuals are not likely to be representative of the River Ouse and have therefor been screened out for further assessment.

Based on the available information the fish community is considered to be susceptible to drought order impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2.5 Fish survey data from Ouse 1

SITE ID	SITE NAME	EVENT DATE	Method	3-spined stickleback	Atlantic salmon	Barbel	Bleak	Brown / sea trout	Bullhead	Chub	Common bream	Dace	European eel	Flounder	Grayling	Gudgeon	Lampetra sp.	Minnow	Perch	Pike	Roach	Roach x common bream hybrid	Rudd	Ruffe	Sea lamprey	Silver bream	Stone loach
3746	Linton-on-Ouse u/s weir (single anode)	01/07/09	Single Catch Sample (Part Width)													1			11	7	70					1	
		24/06/10	Single Catch Sample (Part Width)				3				1	2				1			4	5	192					3	
		21/06/13	Single Catch Sample																7	3	85						
		27/06/16	Single Catch Sample				10			17	7	10						28	2	2	140		1				
		25/06/19	Single Catch Sample				2			2		2						2	6	1	17						
3748	Beningborough Village (single anode)	26/06/09	Single Catch Sample (Part Width)				3			3	1	21				23			10	10	91			2		2	
		25/06/10	Single Catch Sample (Part Width)				26			10		14	1			52		100 to 999 †	7	18	183						
		27/07/11	Single Catch Sample				12		1	15		71				111		1 to 9 *	12	11	191						
		21/06/13	Single Catch Sample						1 to 9 *	10		5	1 to 9 *			41		1 to 9 *	9	10	105						
		16/07/14	Single Catch Sample				12			11		26				10			13	5	79			2			
		08/07/15	Single Catch Sample				94			41		22				36		1	4	4	82					1	
		28/06/16	Single Catch Sample				32			14		8				32		3	5	2	402		3	2			1

SITE ID	SITE NAME	EVENT DATE	Method	3-spined stickleback	Atlantic salmon	Barbel	Bleak	Brown / sea trout	Bullhead	Chub	Common bream	Dace	European eel	Flounder	Grayling	Gudgeon	Lampetra sp.	Minnow	Perch	Pike	Roach	Roach x common bream hybrid	Rudd	Ruffe	Sea lamprey	Silver bream	Stone loach
		13/07/17	Single Catch Sample				16			8		6				39		4	8	5	59			2			
		25/06/19	Single Catch Sample			1	8			3						3		1	7	2	16			3			
3750	Acaster Malbis (single anode)	29/06/09	Single Catch Sample (Part Width)				14				1								8		120						
		24/06/10	Single Catch Sample				1			2			2			14			2	3	84						
		27/07/11	Single Catch Sample				15			2						5			12	1	150						
		28/06/13	Single Catch Sample							2				1					4	4	31			2			
		27/06/16	Single Catch Sample				35			1	2					23			3	2	38						
		26/06/19	Single Catch Sample				9					1	2						4	1	48						
3751	Naburn Weir (single anode)	07/07/10	Single Catch Sample	2	7	3	24			7		44		1		100 to 999 †			6	1	92				1 to 9 †		
		21/08/11	Single Catch Sample	6			1			10		3	2	20		5		2	28	9	60						
		28/06/13	Single Catch Sample	1 to 9 *	6	5	8					12	1 to 9 *					10 to 99 *	4	2	15						
		15/07/14	Single Catch Sample		4	1	56			16		7		3	1			1 to 9 *	2	8	169	1			1	1	1
		10/07/15	Single Catch Sample		9	3	243	2		4		18	3	1					4	4	108						

SITE ID	SITE NAME	EVENT DATE	Method	3-spined stickleback	Atlantic salmon	Barbel	Bleak	Brown / sea trout	Bullhead	Chub	Common bream	Dace	European eel	Flounder	Grayling	Gudgeon	Lampetra sp.	Minnow	Perch	Pike	Roach	Roach x common bream hybrid	Rudd	Ruffe	Sea lamprey	Silver bream	Stone loach
		11/07/16	Single Catch Sample		13	3	507	2		1		8		3					6	6	469			1			
		17/07/17	Single Catch Sample		9		9	1				1		6					4		26						
		21/06/18	Single Catch Sample		6		45			4		6	9	5		5	4		13		99			1		2	
		28/06/19	Single Catch Sample		4	1	120		3	2		7							5	3	91						
36632	Overton Ings Fyke nets	16/06/10	Single Catch Sample																								
		17/06/14	Catch Depletion Sample																2					8	1	17	
		09/06/16	Catch Depletion Sample										2			7			2					32			
		20/06/18	Catch Depletion Sample													4								4			
42066	Acaster - Fry Survey	01/09/09	Single Catch Sample (Part Width)							122											233						
		21/08/12	Single Catch Sample							4						4		2	7		65						
		15/08/13	Single Catch Sample				435			452	2	30				5		7	5		1485						
		19/08/14	Single Catch Sample				438			528		123				231		123	5		126						

SITE ID	SITE NAME	EVENT DATE	Method	3-spined stickleback	Atlantic salmon	Barbel	Bleak	Brown / sea trout	Bullhead	Chub	Common bream	Dace	European eel	Flounder	Grayling	Gudgeon	Lampetra sp.	Minnow	Perch	Pike	Roach	Roach x common bream hybrid	Rudd	Ruffe	Sea lamprey	Silver bream	Stone loach
		20/08/15	Single Catch Sample			4	8			32		32				252		4			526						
		22/08/16	Single Catch Sample				9			148						41			2		137			1			
		14/08/17	Single Catch Sample							94		18				38		6	1		176						
		10/08/18	Single Catch Sample	12		8	681			1518		96				407			4		1968						
		12/08/19	Single Catch Sample				34				5	15				95			8		117			8			
42070	Beningborough - Fry Survey	01/09/09	Single Catch Sample (Part Width)			1	108			129		32				119		20			99			15			
		15/08/13	Single Catch Sample	5			185			705		135				5		10	10		1930					1	
		19/08/14	Single Catch Sample							1				4													
		20/08/15	Single Catch Sample	4			2					6		1		5			1		132						
		22/08/16	Single Catch Sample				1			3											6						
		14/08/17	Single Catch Sample						1	5				10		7					81						
42099	Naburn - Fry Survey	11/08/18	Single Catch Sample	6			1			6		186		4		10			1		24						

*Best Run, †Survey

B2.1.4.3 WFD waterbody status

Table B2.6 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2.6** also displays the objective status for 2016 (Cycle 2) or the predicted status in 2021 where objective to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2016 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2.6 WFD classifications

Waterbody ID & Name		GB104027069593 Ouse from River Nidd to Stillingfleet Beck	Sensitivity (Uncertain, High, Medium, Low, Not Sensitive)
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Minor	
RBMP Cycle 2 Status/ Potential	Overall	Moderate	
	Fish	-	Low
	Macroinvertebrates	High	Low
Hydro-morph designation		Heavily modified	
RBMP2 Waterbody Objective	Overall	Moderate	
	Fish	-	
	Macroinvertebrates	High	
Waterbody Measures		None	

B2.1.5 Invasive non-native species (INNS)

Table B2.7 summarises the wider features which should be taken into account in determining the potential impacts of drought option implementation.

No INNS features that are sensitive or susceptible to drought order impacts have been identified (see **Table B2.7**).

Table B2.7 INNS Features

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
Invasive non-native species – macroinvertebrates Caspian Mud Shrimp *Chelicorophium curvispinum* New Zealand Mud Snail *Potamopyrgus antipodarum*	Minor	The implementation of this drought order is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – Terrestrial plants Giant Hogweed *Heracleum mantegazzianum* Himalayan balsam *Impatiens glandulifera* Japanese knotweed *Fallopia japonica*	Minor	The implementation of this drought order is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.1.6 Landscape, navigation, recreation and heritage

Table B2.8 summarises the wider features which should be taken into account in determining the potential impacts of drought option implementation.

No features that are sensitive or susceptible to drought order impacts have been identified (see **Table B2.8**).

Table B2.8 Landscape, navigation, recreation and heritage features

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
Ebor Way – National Trail	Minor	The route of the trail runs alongside the River Ouse. The river forms part the landscape setting of the trail.	Not sensitive	No
Trans Pennine Trail – National Trail	Minor	The route of the trail runs alongside the River Ouse. The river forms part the landscape setting of the trail.	Not sensitive	No
Nether Poppleton medieval moated site, fishponds and earthworks around and associated with St Everilda's church – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
St Mary's Abbey – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
City Walls, gates, posterns (not including the section from Bootham Bar to Monk Bar, N of the Minster, now part of SM 13280), moats, mounds, Bayle (or Baile) Hill, St Leonard's Hospital and Merchant Taylor's Hall, Aldwark – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
York Minster Cathedral precinct – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Moated site, 50m north west of Red House – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
South Angle Tower of Roman Fortress – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Merchants Hall, Fossgate – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Y/N)
York Castle – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
St. George's Medieval Chapel, 120m south of York Castle – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Fulford Cross	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
St. Peter's Hospital, part of the undercroft beneath Theatre Royal – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Medieval Stone Town House known as Norman House – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Angling in River Ouse	Minor	Angling is unlikely to be impacted by the flow reduction	Low	No

B3. Environmental features screening summary

Table B3.1 Environmental features summary of the River Ouse

Reach	Ouse 1
Associated Drought Options	**River Ouse at Moor Monkton**
WFD Waterbody	**GB104027069593**
Designated Sites	
Naburn Marsh SSSI	✓
Clifton Ings and Rawcliffe Meadows SSSI	✓
Church Ings SSSI / LWS	✓
Acaster South Ings SSSI	✓
Rawcliffe Ings Dyke LWS	✓
Clifton Ings LWS	✓
Fulford Ings SSSI	✓
River Ouse LWS	✓
Bishopthorpe Ings LWS	✓
Gollie Ponds LWS	✓
Middlethorpe Crematorium LWS (4-3)	✓
Naburn Hall Meadow / Ings LWS	✓
NERC and Notable Species Receptors	
Otter	✓
Water vole	✓
Tansy beetle *Chrysolina graminis*	✓
Atlantic salmon	✓
Brown / sea trout	✓
River lamprey	✓
European eel	✓
Sea lamprey	✓
Allis shad	*x*
Twaite shad	*x*
Barbel	✓
Bullhead	✓
Grayling	✓
WFD Waterbody WFD Status Receptors	
Fish	✓
Invertebrates	✓

Further assessment required = ✓ No further assessment required = *x*

B4. Features assessment

Details regarding the approaches/methodologies used for the assessment of the impacts associated with drought option implementation are presented in Section 3.7 of YWSL's Drought Plan 2022 Environmental Assessment Methodology[5]. The potential changes to the physical environment as a result of drought option implementation are described in **Appendix A**.

B4.1 Ouse 1

B4.1.1 Feature assessment

B4.1.1.1 Statutory designated sites

Naburn Marsh SSSI and Naburn Hall Meadow / Ings LWS

Main habitat is neutral grassland (lowland). The flood meadows at Naburn marsh are contained within a bend of the River Ouse about 4 km south of the centre of the City of York. The site comprises a mosaic of species-rich flood meadow grassland with swamp and inundation communities. This type of flood meadow grassland is nationally rare and further threatened by conversion to arable land or more intensive grassland. The special interest of the site is augmented by the presence of a sequence of grassland and inundation communities which reflect the variations in topography and hydrology of the site. The site serves as a natural floodplain for the River Ouse as the site periodically floods with increased flows in the river. The variation is flows during flood and drought conditions exerts a strong influence on river and riparian ecosystem function, with floodplain habitats and the sustainability of the high biodiversity observed along river systems.

The site is identified by Natural England as in unfavourable recovering condition. The site and its habitats are dependent on flooding from the Ouse. However, the drought option will not significantly affect the flooding regime of the sites, which occurs at flows in the order of 1000s of Ml/d. The implementation of the drought option will not significantly affect the hydrological functioning of the meadow habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Naburn Marsh SSSI and Naburn Hall Meadow / Ings LWS is deemed to be **negligible**.

Clifton Ings and Rawcliffe Meadows SSSI/ Clifton Ings LWS and Rawcliffe Ings Dyke LWS

The floodplain covers 25 acres of the Clifton Ings and Rawcliffe Meadows SSSI, this area of the ings are flood banks/barrier banks built up in the late 20th century to try to contain and control the Ouse when it floods. The 25.13ha of MG4 grassland in Clifton Ings and Rawcliffe Meadows SSSI is 1.67% of the National resource. The site serves as a natural floodplain for the River Ouse as the site periodically floods with increased flows in the river. The variation is flows during flood and drought conditions exerts a strong influence on river and riparian ecosystem function, with floodplain habitats and the sustainability of the high biodiversity observed along river systems. Wetlands are ecosystems characterised by periods of saturation or inundation. Because they are not all constantly wet, the species occurring in wetlands are adapted to periods of dryness. River-fed wetland ecosystems are more resilient to drought than rain-fed wetlands. The implementation of the drought option will not significantly affect the hydrological functioning of the meadow habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Clifton Ings and Rawcliffe Meadows SSSI/ Clifton Ings LWS and Rawcliffe Ings Dyke LWS is deemed to be **negligible**.

[5] Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

Church Ings SSSI and Church Ings LWS

The main habitats of the SSSI are listed in the Citation as neutral grassland (lowland). The site is identified by Natural England as in favourable condition. Church Ings comprises two unimproved alluvial flood meadows, adjacent to the River Ouse at Acaster Malbis in the Vale of York. These meadows are of particular importance for their neutral grassland plant community which is an increasingly rare habitat type, threatened nationally as a result of drainage and agricultural improvement. The site serves as a natural floodplain for the River Ouse as the site periodically floods with increased flows in the river. The variation is flows during flood and drought conditions exerts a strong influence on river and riparian ecosystem function, with floodplain habitats and the sustainability of the high biodiversity observed along river systems. Wetlands are ecosystems characterised by periods of saturation or inundation. Because they are not all constantly wet, the species occurring in wetlands are adapted to periods of dryness. River-fed wetland ecosystems are more resilient to drought than rain-fed wetlands. The implementation of the drought option will not significantly affect the hydrological functioning of the meadow habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Church Ings SSSI and Church Ings LWS is deemed to be **negligible.**

Acaster South Ings SSSI

Acaster South Ings consist of two large alluvial flood meadows adjacent to the River Ouse. Grasslands represent an increasingly rare habitat type which is threatened nationally as a result of drainage. The meadows are characterised by two main features; regular flooding in spring and the impact of mowing, whether discontinued or still ongoing. Flood sediments form the substrate for the vegetation, and silt transported by river water is the main nutrient source. The site is dependent on flooding from the Ouse. Alluvial soils beneath meadows tend to be rich in carbon so carbon sequestration is a valuable benefit provided by the habitat. Alluvial soils are naturally very well-structured, providing plenty of pore space for air and water to move through the soil. However, such soils are susceptible to compaction when wet. The implementation of the drought option will not significantly affect the hydrological functioning of the meadow habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Acaster South Ings SSSI is deemed to be **negligible**.

Fulford Ings SSSI

The main habitats of the SSSI are listed in the Citation[18] as neutral grassland (lowland) with fen, marshes and swamps. The site is identified by Natural England as in unfavourable (75% recovering and 25% declining) recovering condition. Fulford Ings is an important example of flood plain mire located on low lying land between the River Ouse and Fulford village. Mires occur typically on deep peat (over 0.5 m thick) with the water table at or just below the water table at or just below the surface. The site is dependent on flooding from the Ouse. The implementation of the drought option will not significantly affect the hydrological functioning of the floodplain mire habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Fulford Ings SSSI is deemed to be **negligible**.

River Ouse LWS

The site encompasses the river and its banks and immediate area. The banks contain areas of semi-natural woodland with ancient woodland indicator species, tall herbs. Sections of the river are canalised with access to the banks in various locations. The River Ouse flows through the River Ouse LWS, with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a potential minor risk of reduction in total wetted aquatic habitat in the reach, and minor risk of changes in available habitat for different species requirements – noting that dominant flow types will be retained. As such, the risk from the implementation of the drought option to River Ouse LWS is deemed to be **minor**.

Bishopthorpe Ings LWS

Bishopthorpe Ings LWS includes bank of the River Ouse, with the site predominantly flood meadow grassland grading to wet grassland and swamp. The bankside area of the site hosts tansy and small populations of Tansy Beetle. Tansy can tolerate a little shade and once established it can cope with drought too. Because they are not all constantly wet, the species occurring in flood meadows are

adapted to periods of dryness. The implementation of the drought option will not significantly affect the hydrological functioning of the meadow habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Bishopthorpe Ings LWS is deemed to be **negligible**.

Gollie Ponds LWS

Based on the available information the pond may be hydrologically connected to the River Ouse. A reduction in flows within the River Ouse may result in a disconnection of the ponds with the impacted reach, however satellite imagery of the pond during summer periods shows limited aquatic habitat to be present. Therefor the risk from the implementation of the drought option to Gollie Ponds LWS is deemed to be **minor**, based on a precautionary approach where connectivity to the main river is thought to be lost during natural drought conditions**.**

Middlethorpe Crematorium LWS (4-3)

Middlethorpe Crematorium LWS (4-3) is predominantly old, established semi-natural neutral grassland. The site is separated from the River Ouse by a public footpath and does not encompass the river bank. Middlethorpe Crematorium is also comprised of an upper field with herb rich neutral grassland and a lower section of swamp, which is likely to relay on periodic flooding on the River Ouse to replenish water levels within the swamp areas. Swamp, wetland ecosystem characterised by mineral soils with poor drainage and by plant life dominated by trees. The implementation of the drought option will not significantly affect the hydrological functioning of the predominant habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Middlethorpe Crematorium LWS is deemed to be **negligible**.

B4.1.1.2 NERC and other protected species

Tansy beetle

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4.1**.

Table B4.1 Impacts on Tansy beetle in Ouse 1

Feature	Impact	Ecological Value of Feature	Impact Magnitude	Significance of Impact
Chrysolina graminis	• The beetle is threatened due to reduction in suitable wetland habitat and food plants, including tansy *tanacetum vulgare*. • The species are restricted to areas of the tansy plant on the banks of the River Ouse. The tansy plant is drought tolerant and are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought. • The species vulnerable to environmental and habitat change	Regional	Negligible	Negligible

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Ouse 1 as a result of the implementation of the drought option is not feasible. However, as suitable habitat is present within the reach, in particular suitable habitat in the banks, burrows may potentially become exposed leading to an increased susceptibility to predators such as stoat and weasels.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4.2.** The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are considered to be short-term and reversible.

Table B4.2 Impacts on water vole in Ouse 1

Feature	Impact	Ecological Value of Feature	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as minor and will not impact on this feature • Species has a preference for waterbodies that do not have extreme fluctuations in water level[6]. Water levels will be mostly retained for navigation • Increased predation as a result of decreased water width and exposure of burrows. • The reduction in wetted width could result in an increased distance between water vole food source and the burrows, but this is likely to be limited to the reaches upstream of Acomb where the banks have not been altered. • Impacts could occur throughout the breeding season for this species. • Alteration to food supply could occur although the species has been known to feed upon crayfish at times[7] and the potentially increased density of this species could lead to increased predation efficiency • Although the impacts are restricted to the reach, the effects of increased predation upon the species could have long-term impacts. • There are uncertainties relating to the presence of this species with the impacted reach.	National	Low	Moderate

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4.3**.

Table B4.3 Impacts on otter in Ouse 1

Feature	Impact	Ecological Value of Feature	Impact Magnitude	Significance of Impact
Otter	• Increased efficiency in predation as a result of higher densities of prey species (fish and white-clawed crayfish) as species are forced into smaller areas. • Species could remain within the reach for longer. • Otter likely to move to unaffected reaches.	International	Negligible	Negligible

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4.4.**

6 English Nature, the Environment Agency and the 1998 Wildlife Conservation Research Unit Water vole Conservation Handbook. George Street Press Ltd.

7 Strachan, R. and Moorhouse, T. (2006) Water Vole Conservation Handbook. 2nd Edition. Wildlife Conservation Research Unit, Oxford.

Table B4.4 Impacts on NERC and notable fish species in Ouse 1

NERC/ notable Feature	Impact	Ecological Value of Feature	Impact Magnitude	Significance of Impact
Atlantic salmon	• The River Ouse is level controlled for navigation for much of the impacted reach and reduced flows are unlikely to result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Migratory species are unlikely to be impacted by flows (in terms of velocity), as the impacts are likely to occur outside the main migration periods for Atlantic salmon (adults and smolt), European eel (elvers and adults). • The risk to siltation of spawning gravels is considered minor • Stranding of individuals is unlikely as longitudinal connectivity will not be impacted and level controlled for navigation for much of the impacted reach. • It is noted that depth of water is not critical to bullhead[8] and the species is also widespread within the catchment • Juvenile lamprey are known to be poor swimmer and require flows for downstream movements to find suitable habitat for burrowing and feeding. Reduced flow velocity could impacted the movement on individuals to spawning and nursery grounds in the upstream sections of the impacted reach.	National	Negligible	Negligible
Brown / sea trout		Regional	Negligible	Negligible
River lamprey		Regional	Low	Minor
European eel		National	Negligible	Negligible
Sea lamprey		National	Medium	Moderate
Barbel		County	Negligible	Negligible
Brook lamprey		National	Medium	Moderate
Bullhead		National	Negligible	Negligible
Grayling		Regional	Negligible	Negligible

B4.1.1.3 WFD features

Invertebrates

The potential changes to river flows is likely to result in major reduction in flow and will lead to a moderate reduction in wetted width and depth which will directly reduce the overall habitat availability within the reach. As indicated by the $WHPT_{NTAXA}$ EQRs, the macroinvertebrate community shows a poor to high level of diversity, and consequently, loss of habitat may reduce the diversity of the community as a result of habitat loss for certain species. Furthermore, the increased friction between flow and channel bed may reduce flow velocity, as the macroinvertebrate community is sensitive to flow velocity reductions, as indicated by low to medium LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to have a low to medium sensitivity to water quality pressures as indicated by low to medium $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a moderate risk. Water quality deterioration as a result of the drought option may potentially have a short-term acute impact on invertebrate community, associated with additional temporary water quality pressures locally downstream of thirteen listed CSO during rainfall events. Furthermore, there are no significant flow pressures, either abstractions or discharges, influencing flow in Ouse 1, as indicated in **Appendix A**.

The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are predicted to present a moderate risk to the macroinvertebrate component of the WFD GB104027069593 Ouse from River Nidd to Stillingfleet Beck. The duration of impacts could be up to 6 months. However, the macroinvertebrate community recovery

[8] Tomlinson, M. L. and Perrow, M. R. (2003) Ecology of the Bullhead. Conserving Natura 2000 Rivers Ecology Series No. 4. English Nature, Peterborough.

is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[9'10]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **minor**.

Fish

The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are predicted to present a minor risk to the fish component of the WFD GB104027069593 Ouse from River Nidd to Stillingfleet Beck River. The reduction in flows of 9.7% and 13.7% in the summer Q95 and Q99, and reduction in year round Q95 and Q50 is 8.7% and 0% respectively. The summer reductions in flow are likely after the spawning period for the key coarse fish species and as the impacted reach is level controlled for navigation purposes, these reductions are likely to be associated with a reduction in velocity only and is unlikely impact on the coarse fish community. Supplementary data available throughout the TLL investigations[11] by the EA used a multi-method sampling technique to understand the trends in the fish communities at a number of sites. The results of investigations showed a clear long-term trend in which good coarse fish recruitment showed a positive correlation with hot, dry summer and a negative correlation with cooler, wetter summers. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **minor**.

B4.1.2 Summary of impacts

Table B4.5 summarises the outcomes of the environmental features assessment and includes deterioration to fish and invertebrate features within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 features and other significant receptors.

Table B4.5 Summary of impacts identified in Ouse 1 environmental features assessment

Reach	Ouse 1	
	Significance of Impact	**Mitigation Required (Y/N)**
Designated Sites		
Naburn Marsh SSSI	Negligible	No
Clifton Ings and Rawcliffe Meadows SSSI	Negligible	No
Church Ings SSSI / LWS	Negligible	No
Acaster South Ings SSSI	Negligible	No
Fulford Ings SSSI	Negligible	No
River Ouse LWS	Minor	No
Bishopthorpe Ings LWS	Negligible	No
Gollie Ponds LWS	Minor	No
Middlethorpe Crematorium LWS (4-3)	Negligible	No
Naburn Hall Meadow / Ings LWS	Negligible	No
Clifton Ings LWS	Negligible	No

9 Williams, D. D. (1977) Movements of benthos during the re-colonisation of temporary streams. *Oikos* 29, pp 306 – 312.

10 Mackay, R. J. (1992) Colonisation by lotic macroinvertebrates: a review of process and patterns. *Canadian Journal of Fisheries and Aquatic Science* 49, pp 617 – 628.

11 Environment Agency- North East Region. (1999) Environmental effects of drought and abstraction on River Ouse Fisheries,199 9. *Dales Area Fisheries, Fisheries Science Report D08/00.*

Reach	Ouse 1	
Rawcliffe Ings Dyke LWS	Negligible	No
NERC and Notable Species Receptors		
Chrysolina graminis	Negligible	No
Water vole	Moderate	Yes
Otter	Negligible	No
Atlantic salmon	Negligible	No
Brown / sea trout	Negligible	No
River lamprey	Minor	No
European eel	Negligible	No
Sea lamprey	Moderate	Yes
Barbel	Negligible	No
Brook lamprey	Moderate	Yes
Bullhead	Negligible	No
Grayling	Negligible	No
WFD Status Receptors	**Risk of Deterioration**	
WFD Waterbody	GB104027069593 Ouse from River Nidd to Stillingfleet Beck	
Fish	Minor	No
Invertebrates	Minor	No

B5. Cumulative Impacts

Desk-based assessments have been completed for each of the sensitive receptors where applicable in order to determine the magnitude of impact in Ouse 1 as a result of simultaneous deployment of the drought option at the River Ouse at Moor Monkton and three reservoirs of the North reservoir group (Leighton, Lumley Moor and Beaver Dyke), and the River Ure at Kilgram Bridge drought option could, if simultaneously deployed, impact flows downstream of the Moor Monkton abstraction until the tidal limit at Naburn. These impacts are however expected to be minor in winter and moderate in summer (see **Appendix A**). The drought order implementation period is anticipated to cover autumn/winter 2022 however on a precautionary basis as the late summer period may be affected, further consideration is therefore given below of cumulative impacts within the summer period. Each feature assessment comprises a background to the assessment, the methodology applied, reporting of the analyses carried out and a statement of the assessed impact.

B5.1.1 Feature assessment

B5.1.1.1 Statutory designated sites

Naburn Marsh SSSI and Naburn Hall Meadow / Ings LWS

Main habitat is neutral grassland (lowland). The flood meadows at Naburn marsh are contained within a bend of the River Ouse about 4 km south of the centre of the City of York. The site comprises a mosaic of species-rich flood meadow grassland with swamp and inundation communities. This type of flood meadow grassland is nationally rare and further threatened by conversion to arable land or more intensive grassland. The special interest of the site is augmented by the presence of a sequence of grassland and inundation communities which reflect the variations in topography and hydrology of the site. The site serves as a natural floodplain for the River Ouse as the site periodically floods with increased flows in the river. The variation is flows during flood and drought conditions exerts a strong influence on river and riparian ecosystem function, with floodplain habitats and the sustainability of the high biodiversity observed along river systems.

The site is identified by Natural England as in unfavourable recovering condition. The site and its habitats are dependent on flooding from the Ouse. However, the drought option will not significantly affect the flooding regime of the sites, which occurs at flows in the order of 1000s of Ml/d. The implementation of the drought option will not significantly affect the hydrological functioning of the meadow habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Naburn Marsh SSSI and Naburn Hall Meadow / Ings LWS is deemed to be **negligible**.

Clifton Ings and Rawcliffe Meadows SSSI/ Clifton Ings LWS and Rawcliffe Ings Dyke LWS

The floodplain covers 25 acres of the Clifton Ings and Rawcliffe Meadows SSSI, this area of the ings are flood banks/barrier banks built up in the late 20th century to try to contain and control the Ouse when it floods. The 25.13ha of MG4 grassland in Clifton Ings and Rawcliffe Meadows SSSI is 1.67% of the National resource. The site serves as a natural floodplain for the River Ouse as the site periodically floods with increased flows in the river. The variation is flows during flood and drought conditions exerts a strong influence on river and riparian ecosystem function, with floodplain habitats and the sustainability of the high biodiversity observed along river systems. Wetlands are ecosystems characterised by periods of saturation or inundation. Because they are not all constantly wet, the species occurring in wetlands are adapted to periods of dryness. River-fed wetland ecosystems are more resilient to drought than rain-fed wetlands. The implementation of the drought option will not significantly affect the hydrological functioning of the meadow habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Clifton Ings and Rawcliffe Meadows SSSI/ Clifton Ings LWS and Rawcliffe Ings Dyke LWS is deemed to be **negligible**.

Church Ings SSSI and Church Ings LWS

The main habitats of the SSSI are listed in the Citation as neutral grassland (lowland). The site is identified by Natural England as in favourable condition. Church Ings comprises two unimproved alluvial

flood meadows, adjacent to the River Ouse at Acaster Malbis in the Vale of York. These meadows are of particular importance for their neutral grassland plant community which is an increasingly rare habitat type, threatened nationally as a result of drainage and agricultural improvement. The site serves as a natural floodplain for the River Ouse as the site periodically floods with increased flows in the river. The variation is flows during flood and drought conditions exerts a strong influence on river and riparian ecosystem function, with floodplain habitats and the sustainability of the high biodiversity observed along river systems. Wetlands are ecosystems characterised by periods of saturation or inundation. Because they are not all constantly wet, the species occurring in wetlands are adapted to periods of dryness. River-fed wetland ecosystems are more resilient to drought than rain-fed wetlands. The implementation of the drought option will not significantly affect the hydrological functioning of the meadow habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Church Ings SSSI and Church Ings LWS is deemed to be **negligible.**

Acaster South Ings SSSI

Acaster South Ings consist of two large alluvial flood meadows adjacent to the River Ouse. Grasslands represent an increasingly rare habitat type which is threatened nationally as a result of drainage. The meadows are characterised by two main features; regular flooding in spring and the impact of mowing, whether discontinued or still ongoing. Flood sediments form the substrate for the vegetation, and silt transported by river water is the main nutrient source. The site is dependent on flooding from the Ouse. Alluvial soils beneath meadows tend to be rich in carbon so carbon sequestration is a valuable benefit provided by the habitat. Alluvial soils are naturally very well-structured, providing plenty of pore space for air and water to move through the soil. However, such soils are susceptible to compaction when wet. The implementation of the drought option will not significantly affect the hydrological functioning of the meadow habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Acaster South Ings SSSI is deemed to be **negligible**.

Fulford Ings SSSI

The main habitats of the SSSI are listed in the Citation[18] as neutral grassland (lowland) with fen, marshes and swamps. The site is identified by Natural England as in unfavourable (75% recovering and 25% declining) recovering condition. Fulford Ings is an important example of flood plain mire located on low lying land between the River Ouse and Fulford village. Mires occur typically on deep peat (over 0.5 m thick) with the water table at or just below the water table at or just below the surface. The site is dependent on flooding from the Ouse. The implementation of the drought option will not significantly affect the hydrological functioning of the floodplain mire habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Fulford Ings SSSI is deemed to be **negligible**.

River Ouse LWS

The site encompasses the river and its banks and immediate area. The banks contain areas of semi-natural woodland with ancient woodland indicator species, tall herbs. Sections of the river are canalised with access to the banks in various locations. The River Ouse flows through the River Ouse LWS, with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a potential minor risk of reduction in total wetted aquatic habitat in the reach, and minor risk of changes in available habitat for different species requirements – noting that dominant flow types will be retained. As such, the risk from the implementation of the drought option to River Ouse LWS is deemed to be **minor**.

Bishopthorpe Ings LWS

Bishopthorpe Ings LWS includes bank of the River Ouse, with the site predominantly flood meadow grassland grading to wet grassland and swamp. The bankside area of the site hosts tansy and small populations of Tansy Beetle. Tansy can tolerate a little shade and once established it can cope with drought too. Because they are not all constantly wet, the species occurring in flood meadows are adapted to periods of dryness. The implementation of the drought option will not significantly affect the hydrological functioning of the meadow habitat, against a baseline of reduced flows characteristic of

drought. As such, the risk from the implementation of the drought option to Bishopthorpe Ings LWS is deemed to be **negligible**.

Gollie Ponds LWS

Based on the available information the pond may be hydrologically connected to the River Ouse. A reduction in flows within the River Ouse may result in a disconnection of the ponds with the impacted reach, however satellite imagery of the pond during summer periods shows limited aquatic habitat to be present. Therefor the risk from the implementation of the drought option to Gollie Ponds LWS is deemed to be **minor**, based on a precautionary approach where connectivity to the main river is thought to be lost during natural drought conditions**.**

Middlethorpe Crematorium LWS (4-3)

Middlethorpe Crematorium LWS (4-3) is predominantly old, established semi-natural neutral grassland. The site is separated from the River Ouse by a public footpath and does not encompass the river bank. Middlethorpe Crematorium is also comprised of an upper field with herb rich neutral grassland and a lower section of swamp, which is likely to relay on periodic flooding on the River Ouse to replenish water levels within the swamp areas. Swamp, wetland ecosystem characterised by mineral soils with poor drainage and by plant life dominated by trees. The implementation of the drought option will not significantly affect the hydrological functioning of the predominant habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Middlethorpe Crematorium LWS is deemed to be **negligible**.

B5.1.1.2 NERC and other protected species

Tansy beetle

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4.1**.

Table B5.1 Impacts on Tansy beetle in Ouse 1

Feature	Impact	Ecological Value of Feature	Impact Magnitude	Significance of Impact
Chrysolina graminis	• The beetle is threatened due to reduction in suitable wetland habitat and food plants, including tansy *tanacetum vulgare*. • The species are restricted to areas of the tansy plant on the banks of the River Ouse. The tansy plant is drought tolerant and are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought. • The species vulnerable to environmental and habitat change	Regional	Negligible	Negligible

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Ouse 1 as a result of the implementation of the drought option is not feasible. However, as suitable habitat is present within the reach, in particular suitable habitat in the banks, burrows may potentially become exposed leading to an increased susceptibility to predators such as stoat and weasels.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4.2.** The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are considered to be short-term and reversible.

Table B5.2 Impacts on water vole in Ouse 1

Feature	Impact	Ecological Value of Feature	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as minor and will not impact on this feature • Species has a preference for waterbodies that do not have extreme fluctuations in water level[12]. Water levels will be mostly retained for navigation • Increased predation as a result of decreased water width and exposure of burrows. • The reduction in wetted width could result in an increased distance between water vole food source and the burrows, but this is likely to be limited to the reaches upstream of Acomb where the banks have not been altered. • Impacts could occur throughout the breeding season for this species. • Alteration to food supply could occur although the species has been known to feed upon crayfish at times[13] and the potentially increased density of this species could lead to increased predation efficiency • Although the impacts are restricted to the reach, the effects of increased predation upon the species could have long-term impacts. • There are uncertainties relating to the presence of this species with the impacted reach.	National	Low	Moderate

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4.3**.

Table B5.3 Impacts on otter in Ouse 1

Feature	Impact	Ecological Value of Feature	Impact Magnitude	Significance of Impact
Otter	• Increased efficiency in predation as a result of higher densities of prey species (fish and white-clawed crayfish) as species are forced into smaller areas. • Species could remain within the reach for longer. • Otter likely to move to unaffected reaches.	International	Negligible	Negligible

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4.4.**

12 English Nature, the Environment Agency and the 1998 Wildlife Conservation Research Unit Water vole Conservation Handbook. George Street Press Ltd.

13 Strachan, R. and Moorhouse, T. (2006) Water Vole Conservation Handbook. 2nd Edition. Wildlife Conservation Research Unit, Oxford.

Table B5.4 Impacts on NERC and notable fish species in Ouse 1

NERC/ notable Feature	Impact	Ecological Value of Feature	Impact Magnitude	Significance of Impact
Atlantic salmon	• The River Ouse is level controlled for navigation for much of the impacted reach and reduced flows are unlikely to result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Migratory species are unlikely to be impacted by flows (in terms of velocity), as the impacts are likely to occur outside the main migration periods for Atlantic salmon (adults and smolt), European eel (elvers and adults). • The risk to siltation of spawning gravels is considered minor • Stranding of individuals is unlikely as longitudinal connectivity will not be impacted and level controlled for navigation for much of the impacted reach. • It is noted that depth of water is not critical to bullhead[14] and the species is also widespread within the catchment • Juvenile lamprey are known to be poor swimmer and require flows for downstream movements to find suitable habitat for burrowing and feeding. Reduced flow velocity could impacted the movement on individuals to spawning and nursery grounds in the upstream sections of the impacted reach.	National	Negligible	Negligible
Brown / sea trout		Regional	Negligible	Negligible
River Lamprey		Regional	Low	Minor
European eel		National	Negligible	Negligible
Sea lamprey		National	Medium	Moderate
Barbel		County	Negligible	Negligible
Brook lamprey		National	Medium	Moderate
Bullhead		National	Negligible	Negligible
Grayling		Regional	Negligible	Negligible

B5.1.1.3 WFD features

Invertebrates

The potential changes to river flows is likely to result in major reduction in flow and will lead to a moderate reduction in wetted width and depth which will directly reduce the overall habitat availability within the reach. As indicated by the $WHPT_{NTAXA}$ EQRs, the macroinvertebrate community shows a poor to high level of diversity, and consequently, loss of habitat may reduce the diversity of the community as a result of habitat loss for certain species. Furthermore, the increased friction between flow and channel bed may reduce flow velocity, as the macroinvertebrate community is sensitive to flow velocity reductions, as indicated by low to medium LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to have a low to medium sensitivity to water quality pressures as indicated by low to medium $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a moderate risk. Water quality deterioration as a result of the drought option may potentially have a short-term acute impact on invertebrate community, associated with additional temporary water quality pressures locally downstream of thirteen listed CSO during rainfall events. Furthermore, there are no significant flow pressures, either abstractions or discharges, influencing flow in Ouse 1, as indicated in **Appendix A**.

The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are predicted to present a moderate risk to the macroinvertebrate component of the WFD GB104027069593 Ouse from River Nidd to Stillingfleet Beck. The duration of impacts could be up to 6 months. However, the macroinvertebrate community recovery

[14] Tomlinson, M. L. and Perrow, M. R. (2003) Ecology of the Bullhead. Conserving Natura 2000 Rivers Ecology Series No. 4. English Nature, Peterborough.

is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[15'16]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **minor**.

Fish

The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are predicted to present a minor risk to the fish component of the WFD GB104027069593 Ouse from River Nidd to Stillingfleet Beck River. The reduction in flows of 9.7% and 13.7% in the summer Q95 and Q99, and reduction in year round Q95 and Q50 is 8.7% and 0% respectively. The summer reductions in flow are likely after the spawning period for the key coarse fish species and as the impacted reach is level controlled for navigation purposes, these reductions are likely to be associated with a reduction in velocity only and is unlikely impact on the coarse fish community. Supplementary data available throughout the TLL investigations[17] by the EA used a multi-method sampling technique to understand the trends in the fish communities at a number of sites. The results of investigations showed a clear long-term trend in which good coarse fish recruitment showed a positive correlation with hot, dry summer and a negative correlation with cooler, wetter summers. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **minor**.

B5.1.2 Summary of impacts

Table B4.5 summarises the outcomes of the environmental features assessment and includes deterioration to fish and invertebrate features within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 features and other significant receptors.

Table B5.5 Summary of impacts identified in Ouse 1 environmental features assessment

Reach	Ouse 1	
	Significance of Impact	**Mitigation Required (Y/N)**
Designated Sites		
Naburn Marsh SSSI	Negligible	No
Clifton Ings and Rawcliffe Meadows SSSI	Negligible	No
Church Ings SSSI / LWS	Negligible	No
Acaster South Ings SSSI	Negligible	No
Fulford Ings SSSI	Negligible	No
River Ouse LWS	Minor	No
Bishopthorpe Ings LWS	Negligible	No
Gollie Ponds LWS	Minor	No
Middlethorpe Crematorium LWS (4-3)	Negligible	No
Naburn Hall Meadow / Ings LWS	Negligible	No
Clifton Ings LWS	Negligible	No

15 Williams, D. D. (1977) Movements of benthos during the re-colonisation of temporary streams. *Oikos* 29, pp 306 – 312.

16 Mackay, R. J. (1992) Colonisation by lotic macroinvertebrates: a review of process and patterns. *Canadian Journal of Fisheries and Aquatic Science* 49, pp 617 – 628.

17 Environment Agency- North East Region. (1999) Environmental effects of drought and abstraction on River Ouse Fisheries,1999. Dales Area Fisheries, Fisheries Science Report D08/00.

Reach	Ouse 1	
Rawcliffe Ings Dyke LWS	Negligible	No
NERC and Notable Species Receptors		
Chrysolina graminis	Negligible	No
Water vole	Moderate	Yes
Otter	Negligible	No
Atlantic salmon	Negligible	No
Brown / sea trout	Negligible	No
River lamprey	Minor	No
European eel	Negligible	No
Sea lamprey	Moderate	Yes
Allis shad	Negligible	No
Twaite shad	Negligible	No
Barbel	Negligible	No
Brook lamprey	Moderate	Yes
Bullhead	Negligible	No
Grayling	Negligible	No
WFD Status Receptors	**Risk of Deterioration**	
WFD Waterbody	GB104027069593 Ouse from River Nidd to Stillingfleet Beck	
Fish	Minor	No
Invertebrates	Minor	No

B6. Monitoring and mitigation

Onset of drought, in-drought and post-drought monitoring and mitigation has been specified for all impacted reaches following identification of environmental features within in the reaches susceptible to the drought option(s) implementation. Where applicable YWSL have undertaken onset monitoring in advance of the drought order application.

The baseline monitoring programme to inform the susceptibility, sensitivity and assessment of environmental features has been specified and requirements have been included in YWSL's ongoing baseline monitoring programme.

On the assumption that otter and water vole can be potentially be present in all impact reaches, no further baseline monitoring surveys have been included for these species. Mitigation measures and protection for sensitive species such as brown trout which are screened in should provide adequate protection where required of water levels and flows to ensure that riparian species such as water vole and otter are adequately protected for the duration of the drought order in the impacted reaches.

Walkover surveys and non-invasive techniques are the preferred method to establish the impacts of drought options and to target mitigation. Where appropriate this will be supplemented by quantitative survey during the on-set of drought and post-drought; but in the interests of avoiding further distress to the riverine ecology, not in-drought. Existing long-term monitoring of the physical environment will continue (flow gauging and water quality monitoring).

The onset of drought, in-drought and post-drought monitoring would establish the need for and appropriate type of mitigation for drought option impacts.

Full details of monitoring and mitigation requirements for all impacted reaches can be found in Appendix A.5 of YWSL's Drought Plan 2022 EMP and a summary is provided in the main EAR Section 6.2.

YWSL have identified that for the period of implementation of the drought option, sewage treatment can be enhanced, reducing the water quality pressure on the impacted features from ammonia, and oxygen balance. Further information can be found in the YWSL WwTW optimisation plan[18] which provides details on enhancement for WwTW that discharge into rivers where compensation flows may be reduced under drought order implementation.

During any future on-set of drought periods (14 weeks before drought control lines are crossed) YWSL will consult with the Environment Agency regarding any WwTWs not identified as significant water quality pressures at the time of the writing of this EAR, but which may be a cause for concern. Additional sites will be added to the priority list of sites for optimisation as required.

A 'Combined Sewer Overflows Optimisation and Maintenance for Drought Plan' has also been developed by YWSL and in consultation with the Environment Agency. This has been updated in 2022 in support of the drought order application[19] and includes all significant intermittent water quality pressures identified in this EAR.

18 YWSL (2022) Wastewater Treatment Works Optimisation and Maintenance for Drought Plan.
19 YWSL (2022) Combined Sewer Overflows (CSOs) Optimisation and Maintenance for Drought Plan.

Appendix C Monitoring and ecological mitigation measures

Table C1.1 Monitoring and mitigation measures included in the YWSL Draft Drought Plan 2021 EMP

Baseline Monitoring - to ensure an adequate baseline dataset exists to describe non-drought conditions for those receptors likely to be impacted by drought permit/order implementation and to fill any data gaps and reduce uncertainty identified during the environmental assessment	
Routine baseline monitoring	
BMON_1	EA/YWSL to continue monitor river flows and levels/reservoir levels and spill at key monitoring sites
BMON_2	EA to continue routine water quality monitoring at existing network of sites on current monthly programme, which includes those on un-impacted reaches suitable as control sites.
BMON_3	Macroinvertebrate monitoring at a number of locations, including rivers potentially affected by drought measures; to continue in low flow/drought years pending agreement with the EA regarding aquatic species welfare.
BMON_4	Fish monitoring at a number of locations, including rivers potentially affected by drought measures; to continue in low flow/drought years pending agreement with the EA regarding aquatic species welfare.
Targeted baseline monitoring	
BMON_5	White-clawed crayfish surveys to determine distribution and abundance in reaches under serious (i.e. moderate or major) hydrological stress
BMON_6	Fine-lined pea mussel survey to determine distribution and abundance in reaches under serious hydrological stress
BMON_7	Targeted juvenile lamprey surveys to identify distribution of habitat and an indicative population status within reaches subject to serious hydrological stress
On-set of Environmental drought – monitoring leading to selection and implementation of appropriate mitigation measures	
ODMON_1	Walkover surveys of habitat quality and identification of drought sensitive habitats such as areas of riffle, pools and artificial features such as weirs and sluices that may be isolated or impassable during low flows. Results to be captured by annotated walkover maps and completion of a ‘River Conditions Observation Form - Low Flows’ form.
In-Drought (during drought option implementation) – monitoring leading to selection and implementation of appropriate mitigation measures	
IDMON_1	Surveillance walkover surveys of habitat quality and ecological stress, recording signs of environmental problems (reaches to match those in OMON_1)
IDMON_2	Targeted surveillance walkover surveys of water quality and ecological stress local to 'significant' water quality pressures', to include water quality spot sampling in priority areas such as pools and weirs where aquatic species may become isolated during low flows.
IDMON_3	Storm intensity forecasting to predict likely CSO spill events and the need for pre-emptive mitigation
In-Drought (During Drought Option Implementation) – Mitigation	
IDMIT_1	Negotiation with the licence holder of a temporary reduction of third party abstractions presenting ‘significant’ impacts to sensitive features, including financial compensation by Yorkshire Water.
IDMIT_2	At identified SSSIs, mitigation would comprise the temporary cessation of impacting drought options by Yorkshire Water.
IDMIT_3	Improving the effluent quality from Yorkshire Water WwTWs presenting ‘significant’ impacts to sensitive features, thereby reducing the water quality pressure (ammonia and oxygen balance) on the impacted features.
IDMIT_4	Artificial freshet release to dilute/displace water quality reduction
IDMIT_5	Negotiation with permit holder and aeration of discharge from third party facility identified as a 'significant' water quality pressure
IDMIT_6	Gradual phase-in of reduction in water volume/flow to avoid stranding of individuals (fish, white-clawed crayfish, fine-lined pea mussel)
IDMIT_7	Gradual phase-in of compensation release increases to avoid stranding or displacement of individuals (macroinvertebrates, fish, white-clawed crayfish, fine-lined pea mussel)

IDMIT_8	Temporary reduction in volume of abstraction or increase in compensation release (fish)
IDMIT_9	Artificial freshet release to provide temporary variation in the flow regime (fish, white-clawed crayfish, fine-lined pea mussel, water vole, otter)
IDMIT_10	Creation of alternative refuges in deeper water where walkover surveys identify the loss of important deep water habitat or high densities of fauna in refuges (fish, white-clawed crayfish, water vole)
IDMIT_11	Provision of in-stream structures and flow baffles to create functional refuges to support flow sensitive species where walkover surveys identify a projected loss of habitat inundation (macroinvertebrates, fish, white-clawed crayfish, water vole, otter)
IDMIT_12	Artificial channel narrowing to provide functional refuges and support habitat requirement for species, enabling a quick natural recolonisation of the reach post-drought (fish, macroinvertebrates, white-clawed crayfish, fine-lined pea mussel, otter, water vole)
IDMIT_13	Provision of piscivorous “visual” bird scaring measures (e.g. using streamers in riparian trees) to control predation upon species using refuges (fish). These visual measures would only be implemented following consultation with the EA, Natural England and bird specialists, particularly taking account of protected species under the 1981 Wildlife and Countryside Act. Implementation would follow best practice guidance.
IDMIT_14	Gravel washing of spawning habitats where walkover surveys and routine monitoring identifies likely habitat degradation as a result of sedimentations (fish)
IDMIT_15	Aeration of watercourse where significant mortality or change in species abundances are likely to be attributed to water quality deterioration
IDMIT_16	Modification of flow structure across barriers to retain favourable conditions to facilitate the movement/migration of species (fish)
IDMIT_17	Provision of freshet releases to enable migration of fish across significant obstacles (fish)
IDMIT_18	Regular inspection and clearing of screens to ensure they retain their correct working function (fish, white-clawed crayfish)
IDMIT_19	Capture and relocate individuals across significant barriers, taking into account migratory periods (immigration and emigration) (fish) and ensuring biosecurity measures are in place at all times.
IDMIT_20	Rescue of individuals or groups, in consultation with the EA or NE as appropriate, and relocation to suitable habitat where they are seen to be in distress or where artificially high densities are likely to result in significant impacts (fish, white-clawed crayfish). Measures will be taken to ensure biosecurity at all times. It should be noted that movement of crayfish requires licensing which can take up to 8 weeks. Movement of crayfish would only take place after consultation agreeing that this was the best course of action.
IDMIT_21	Rescue of individuals or groups, in consultation with the EA or NE as appropriate, and retention for later release where they are seen to be in distress or where artificially high densities are likely to result in significant impacts (fish, white-clawed crayfish). Measures will be taken to ensure biosecurity at all times. It should be noted that movement of crayfish requires licensing which can take up to 8 weeks. Movement of crayfish would only take place after consultation agreeing that this was the best course of action
IDMIT_22	Implementation of navigation controls in the channel to reduce disturbance damage upon vulnerable species and/or populations.
IDMIT_23	For CSOs identified as significant water quality, prioritise planned maintenance work on and reactive pollution prevention work, including visits by operators.
IDMIT_24	Cessation of water transfer should it be identified that fish disease has been spread between catchments and notify the EA and Cefas
Post-Drought (Drought Options Removed) – Monitoring	
PDMON_1	White-clawed crayfish sampling to monitor recovery of their distribution and abundance
PDMON_2	Fine-lined pea mussel sampling to monitor recovery of their distribution and abundance
Post-Drought (Drought Options Removed) – Mitigation	
PDMIT_1	Enhancement of habitat beyond the impacted reach (macroinvertebrates, fish, fine-lined pea mussel, white-clawed crayfish, water vole)

PDMIT_2	Provision of artificial freshets to ensure fish are capable of migrating where survey identifies insufficient water depth or volume across structures to facilitate migration (fish)
PDMIT_3	Modification to barriers and/or flows to improve passage where walkover survey identifies insufficient water depth or volume at obstacles (fish)
PDMIT_4	Capture and relocate across barrier (taking migratory period into account) where significant numbers of migratory fish congregate at obstacles (fish)
PDMIT_5	Relocation of juveniles where walkover surveys identify the likely desiccation of marginal habitats or loss of water depth at important habitats (fish, fine-lined pea mussel)
PDMIT_6	Restocking using juvenile lamprey ammocoetes within the catchment where monitoring indicates loss of fish abundance or recruitment (fish)
PDMIT_7	Restocking using offspring from broodstock from the catchment where monitoring indicates loss of fish abundance or recruitment (fish)
PDMIT_8	Restocking of coarse fish from the catchment where monitoring indicates loss of fish abundance or recruitment (fish)
PDMIT_9	Removal/treatment of giant hogweed where monitoring indicates an increase in abundance or distribution

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