DROUGHT PLAN: ENVIRONMENTAL ASSESSMENT REPORT

South Area Reservoirs

Report for: Yorkshire Water Services Ltd

Ricardo ref. ED19593 Issue: 3 05/08/25

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Yorkshire Water Services Ltd

Customer reference:
YW Drought Plan 2026 Environmental Support

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Ricardo reference:
ED19593

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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 Habitats Regulations 2018

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
CSO		Combined Sewer Overflow
DPG	–	Environment Agency (2025) Drought Plan Guideline
EAR		Environmental Assessment Report
EcIA	–	Ecological Impact Assessment
EMP	–	Environmental Monitoring Plan
EQR	–	Ecological Quality Ratio
HoF		Hands off Flow
JNCC	–	Joint Nature Conservation Committee
LIFE	–	Lotic-invertebrate Index for Flow Evaluation
LNR	–	Local Nature Reserve
LWS		Local Wildlife Site
MCZ		Marine Conservation Zone
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
PSI		Proportion of Sediment-sensitive Invertebrates
PyWR		Python Water Resources: an open-source water resources simulation model
RBMP		River Basin Management Plan
RHS	–	River Habitat Survey
RICT		River Invertebrate Classification Tool
SAC	–	Special Area of Conservation
SPA	–	Special Protection Area
SRP		Soluble Reactive Phosphorous
SSSI	–	Site of Special Scientific Interest
TUB		Temporary Use Ban
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) South Area reservoir drought options. The report has been prepared in support of YWSL's Drought Plan 2027.

The environmental assessment has been conducted in accordance with Government regulations and using the Environment Agency's draft 2024 Drought Plan Guideline (DPG)[1] and the Environment Agency's 2024 '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 receptors that are sensitive to these changes and an assessment of the likely impacts on these receptors;
- identification of mitigation that may be required to prevent or reduce impacts on sensitive receptors; 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 South Area reservoir drought options 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 2027 are considered. The assessments undertaken confirm the receptors requiring consideration of monitoring and mitigation; which are summarised in **Section 6** and provided in full in the Draft Drought Plan 2027 Environmental Monitoring Plan (EMP).

Throughout the environmental assessment process, YWSL have proactively engaged key stakeholders, including the Environment Agency and Natural England.

This EAR will form the basis of an application specific EAR should an application for a drought permit/order be required in the future and will be reviewed annually and updated at the time of application.

This report will be periodically reviewed to ensure the conclusions and recommendations remain valid. Key stakeholders will be further consulted as part of the overall drought permit/order application process.

[1] Environment Agency (2025) Water Company Drought Plan Guideline, March 2025.

CONTENTS

Appendices

1. INTRODUCTION

1.1 PURPOSE OF DOCUMENT

Yorkshire Water Services Ltd (YWSL) is updating its Statutory Drought Plan, last published in April 2022 (the 'Drought Plan 2022'). The Draft 2027 Drought Plan will reflect the guidance provided in the Environment Agency's Drought Plan Guideline (DPG). The Environment Agency shared an updated draft DPG with water companies in July 2024 along with an updated draft of the supplementary guidance on the environmental assessment for water company drought planning. The guidance was subsequently consulted on and a final version, DPG2025[2], was provided in March 2025. 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 South Area reservoir drought permits. This EAR has been prepared in support of a drought permit application in Summer 2025 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 DPG2025 and the '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 receptors that are sensitive to these changes and an assessment of the likely impacts on these receptors.
- identification of mitigation that may be required to prevent or reduce impacts on sensitive receptors.
- recommendations for baseline, in-drought and post-drought order monitoring requirements.

The methodology for this environmental assessment has been developed in consultation with the Environment Agency and is documented separately in 'YWSL's Drought Plan 2027 Environmental Assessment Methodology'[3]. A summary of the assessment approach is provided in **Section 3**.

The assessments undertaken in this EAR confirm the receptors that require consideration of mitigation and the appropriate monitoring triggering mitigation. Appropriate mitigation actions identified are both available and practicable and reflect previous agreement with the Environment Agency (see **Section 0**). The methodologies and details for monitoring and mitigation requirements are documented in the standalone document 'YWSL's Drought Plan Environmental Monitoring Plan (EMP)'. A summary of the monitoring and mitigation requirements are included in **Section 6** of this EAR.

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

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

[2] Environment Agency (2025) Water company drought plan guideline. March 2025.

[3] Ricardo (2025). Yorkshire Water Drought Plan 2027 Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. February 2025.

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'.

Yorkshire Water Services Limited (YWSL) published their current statutory Drought Plan in April 2022 (the 'DP 2022') which encompasses the period 2022-2027. Drought Plans are updated every five years to remain relevant and align with updated guidance. As a result, YWSL are now in the process of revising their statutory Drought Plan for the period 2027-2032. The Drought Plan (England) Directions set out the timescales for publication of the Drought Plans. The updated directions for draft Drought Plan 2027 were published in July 2025 and set out that water companies must submit their draft Drought Plan to the Secretary of State no later than 31 March 2026.

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.

1.3 CONSULTATION

The purpose of these studies, as well as informing any future assessment process and providing a generic template, is to allow a more considered consultation process and to encompass consultees' concerns in a timely manner, avoiding the time constraints necessary for an actual drought permit/order application.

Throughout the preparation and submission of the Final Drought Plan 2022, 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 informed the basis of the approach for the update of the environmental assessments and EMP for the Drought Plan 2022.

Throughout 2024 and to date, YWSL have held a number of meetings with the Environment Agency during the early stages of the preparation of the Draft Drought Plan 2027, including several meetings focused on the proposed approach to the environmental assessments which are documented in the Drought Plan 2027 Environmental Assessment Methodology[4]. Proactive consultation will continue to be conducted for the Draft Drought Plan 2027 submission.

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

1.4 CONTENT OF REPORT

This EAR reflects the environmental assessment reporting components described in the DPG as being required to ensure the South Area reservoir drought permits are 'application ready'. 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 permit/order details (to be completed at the time of a drought permit application)

Section 3: **Approach to environmental assessment** - description of the approach to assessing environmental impacts and identification of mitigation and monitoring requirements, with

[4] Ricardo (2025). Yorkshire Water Drought Plan 2027 Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. February 2025.

reference to the details which are provided in YWSL's Drought Plan 2027 Environmental Assessment Methodology[5].

Section 4: **Drought options overview: South Area options** - overview of drought permit conditions.

Section 5: **Physical environment effects: South Area options** - baseline assessment of physical environment and assessment of potential changes in the physical environment as a result of the drought options, and from cumulative operation with options described in other EARs. Detailed information is provided in **Appendix A** and summarised in **Section** Error! Reference source not found..

Section 6: **Receptors assessment, monitoring and mitigation: South Area reservoirs:** impact assessment on environmental receptors, identification of mitigation and monitoring requirements, including cumulative reaches. Detailed information is provided in **Appendix B** and in YWSL's Drought Plan EMP and summarised in **Section** Error! Reference source not found.. **Appendix C** summarises the full suite of monitoring and mitigation measures as detailed in the EMP

Appendices

Appendix A Physical Environment

Appendix B Environmental Receptors

Appendix C Environmental Monitoring and Mitigation Measures

[5] Ricardo (2025). Yorkshire Water Drought Plan 2027 Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. February 2025.

2. DROUGHT MANAGEMENT PROPOSALS

See Appendix A which provides details of the drought management proposals.

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 2025 DPG; specifically, the Environment Agency's '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 2027 Environmental Assessment Methodology[6] ('the Methodology').

Depending on the particular ongoing water resources drought, different management options may be available and the full range of drought permits may not be used by YWSL at the same time. This EAR considers the impacts of implementation of all South Area reservoir drought permits.

The Environment Agency's 2025 DPG requires the completion of environmental assessment and production of an environmental monitoring plan for each of the 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:

- Setting out the Zone of Influence (ZOI) and timing of the drought options (see **Section 3.4** of the Methodology) and the likely changes to the hydrology (or hydrogeology) due to a proposed action (**Section 3.5** of the Methodology).
- Identifying the key receptors of the environment which are likely to be affected by these changes and assess their sensitivity (see **Section 3.6** of the Methodology).
- Assess the likely impact on these receptors, 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).
- 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) and Strategic Environmental Assessment (SEA) which support YWSL's Draft Drought Plan 2027 and are documented separately. Outcomes of any subsequent assessment, i.e. as documented in this report, will be continually reviewed in terms of implications for SEA and HRA.

The Environment Agency's 2025 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 should inform 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**).

For receptors 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 EMP.

[6] Ricardo (2025). Yorkshire Water Drought Plan 2027 Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. February 2025.

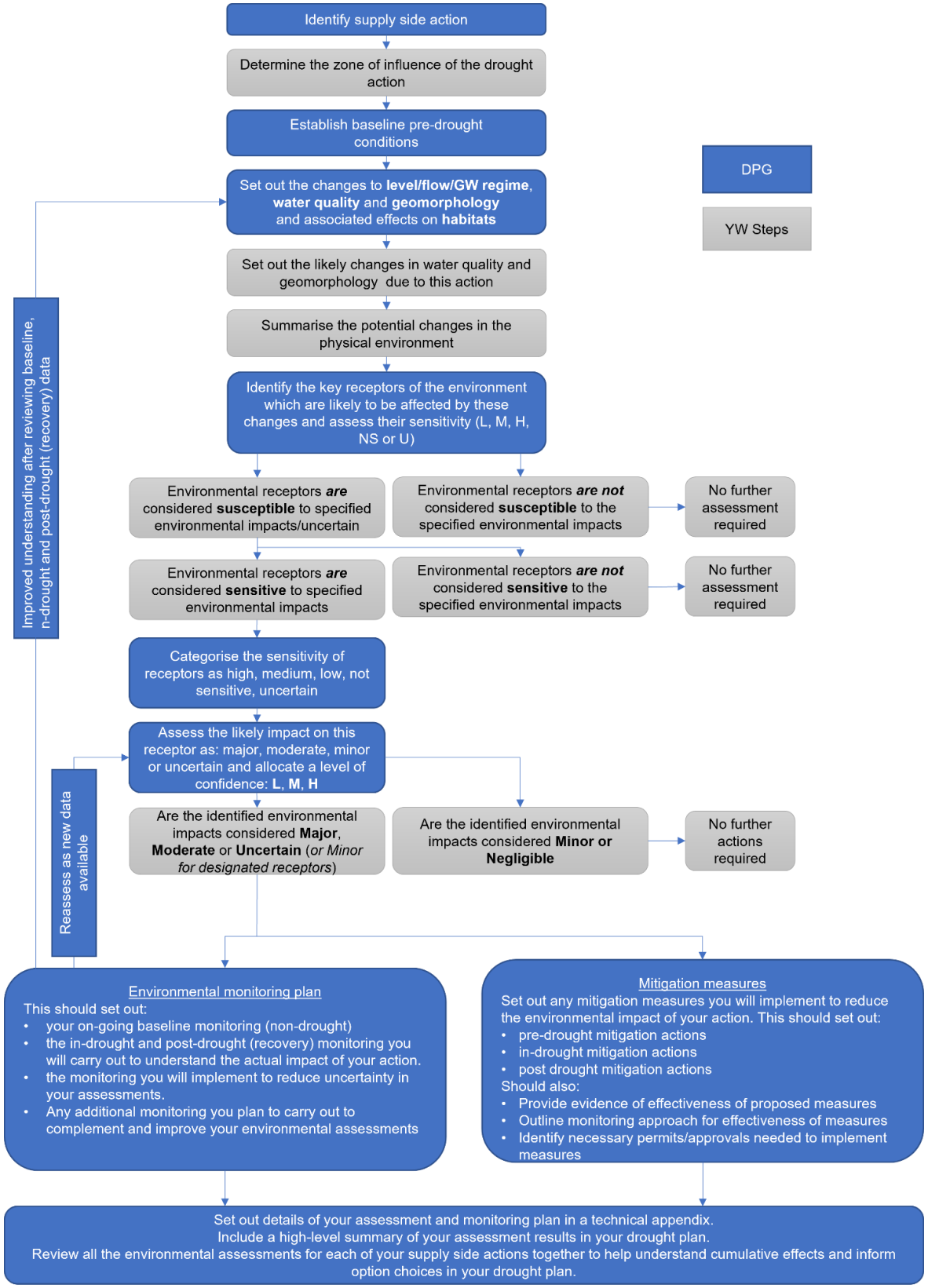


Figure 3-1: Approach to undertaking environmental assessments as identified in the 2025 DPG. Steps in blue are 2025 DPG tasks. Tasks indicated in grey are YWSL tasks

4. DROUGHT OPTIONS OVERVIEW

4.1 DROUGHT PERMIT DESCRIPTIONS

This EAR assesses the potential impacts on the environmental receptors of the South Area during the period of implementation of associated drought options.

The South Area reservoirs comprise eight drought options as summarised in **Table 4-1**:

1. Winscar/Windleden Lower Reservoirs drought permit
2. Scout Dike Reservoir drought permit
3. Langsett Reservoir drought permit
4. Underbank Reservoir drought permit
5. More Hall Reservoir drought permit
6. Dale Dike Reservoir compensation flow reduction
7. Damflask Reservoir drought permit
8. Rivelin Lower Reservoir drought permit.

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

Table 4-1: South Area reservoirs drought permit descriptions

Compensation Water Source	Receiving Watercourse	Normal Compensation Release Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Winscar/ Windleden Lower Reservoir drought permit						
Winscar/ Windleden Lower	River Don at the maintained flow point	Minimum compensation flow of 2.00 from Winscar and 1.00 from Windleden Lower as well a combined compensation flow of 7.00 or 9.00	Minimum flow of 1 from Winscar and 0.5 from Windleden Lower and combined compensation flow of 3.50 or 4.50	3.50 or 4.50	Minimum flow of 0.66 from Winscar and 0.33 from Windleden Lower and a group compensation flow of 2.33 or 3.00	4.69 or 6.00
Scout Dike Reservoir drought permit						
Scout Dike Reservoir	Scout Dike	2.70 or 4.00	1.35	1.35	0.89	1.81
Langsett Reservoir drought permit						
Langsett	Porter River (River Little Don)	If above Normal Control Line: 7.00 or 5.00 or 3.50 If below Normal Control Line 4.00 or 3.00 or 2.00	If above Normal Control Line: 3.50 or 2.50 or 1.75 If below Normal Control Line 2.00 or 1.50 or 1.00	If above Normal Control Line: 3.50 or 2.50 or 1.75 If below Normal Control Line 2.00 or 1.50 or 1.00	If above Normal Control Line: 2.33 or 1.66 or 1.17 If below Normal Control Line 1.33 or 1.00 or 0.67	If above Normal Control Line: 4.67 or 3.34 or 2.33 If below Normal Control Line 2.67 or 2.00 or 1.33

Compensation Water Source	Receiving Watercourse	Normal Compensation Release Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Underbank Reservoir drought permit						
Underbank	River Little Don	16.00 or 21.70	8.00	8.00	5.28	10.72
More Hall Reservoir drought permit						
More Hall	Ewden Beck	9.10 or 12.00	4.55	4.55	3.00	6.10
Dale Dike Reservoir compensation flow reduction						
Dale Dike Reservoir	Dale Dike	3.30	1.65	1.65	1.10	2.20
Damflask Reservoir drought permit						
Damflask	River Loxley	18.00 or 28.00	9.00	9.00	5.94	12.06
Rivelin Lower Reservoir drought permit						
Rivelin	River Rivelin	10.30	5.15	5.15	3.40	6.90

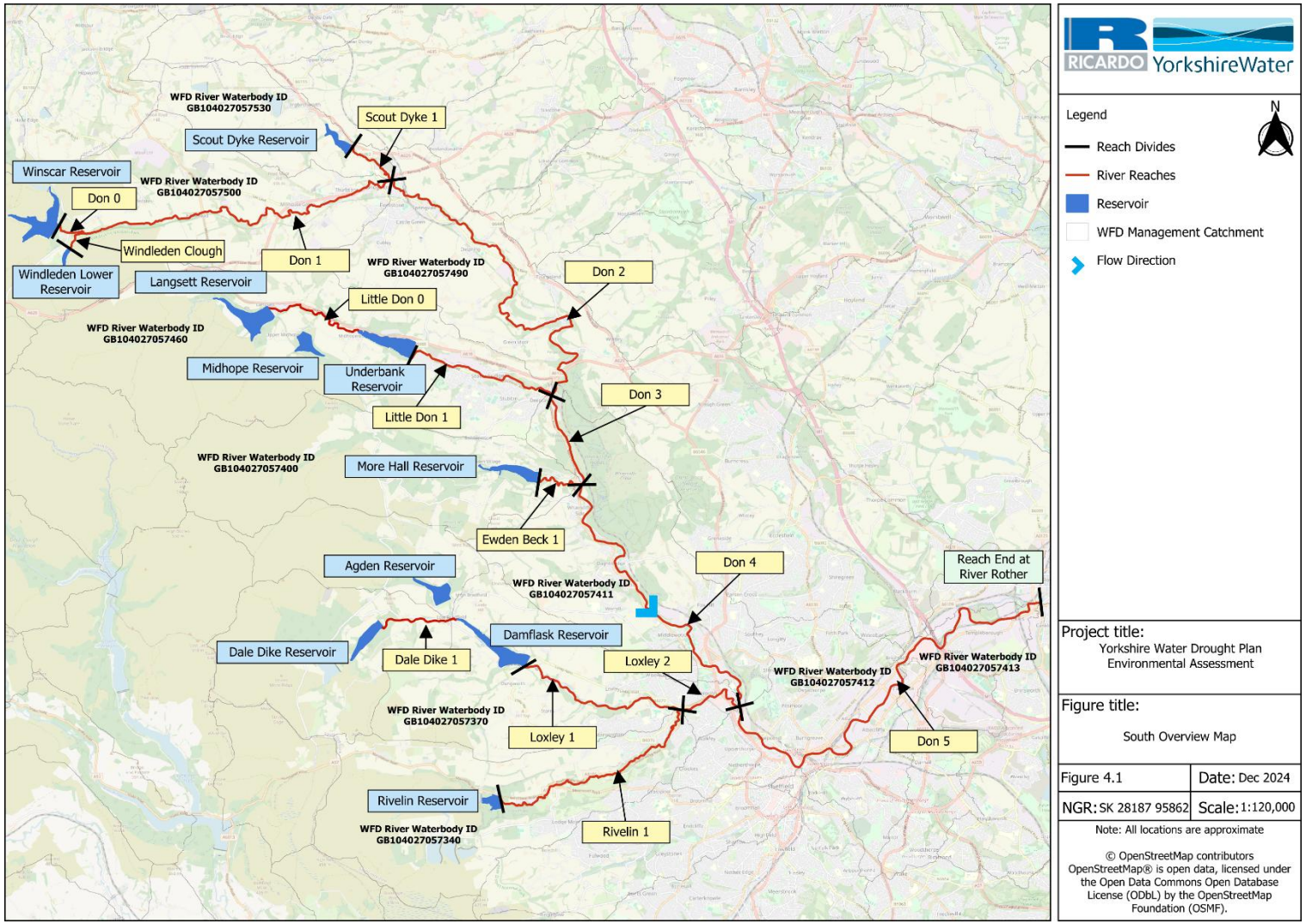
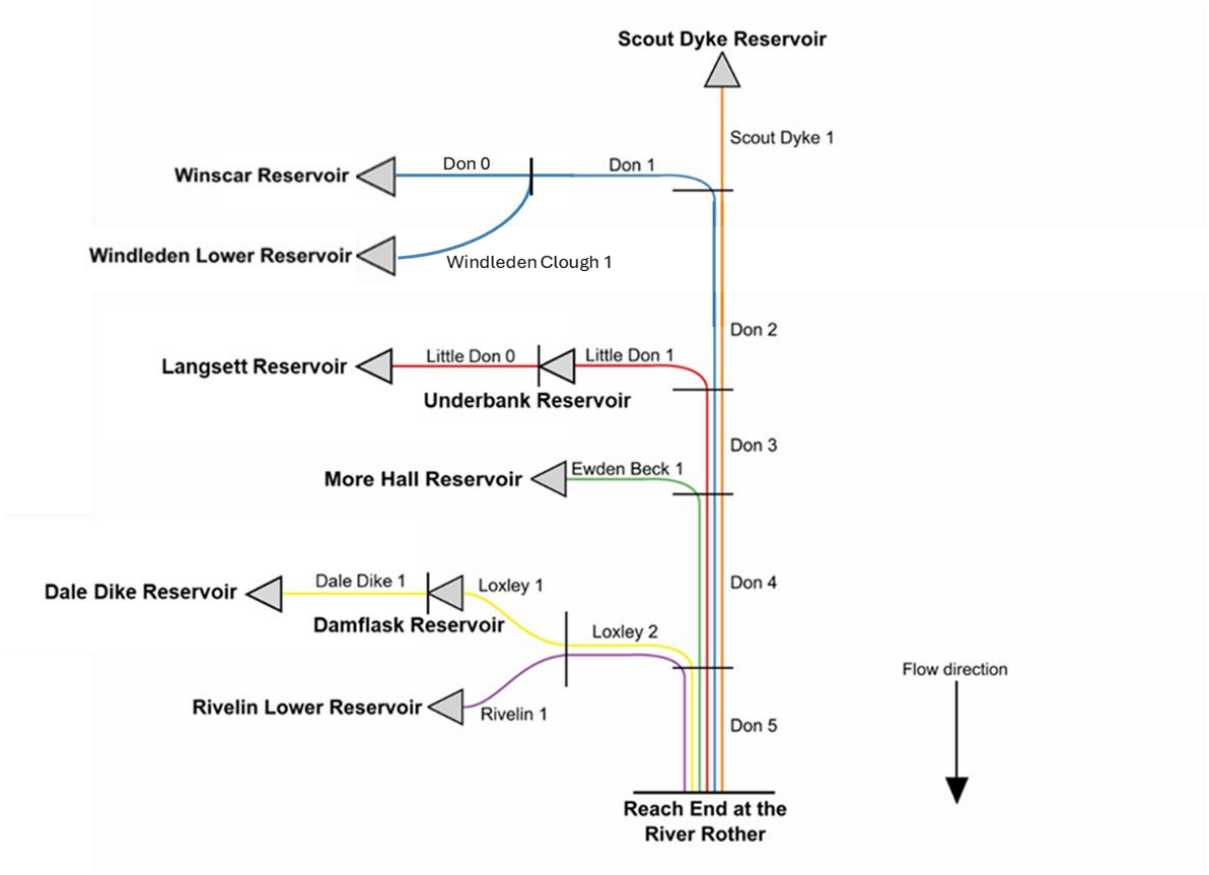


Figure 4-1: South Area Reservoirs Overview Map

4.2 POTENTIALLY IMPACTED REACHES

The zone of influence associated with each 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 2027 Environmental Assessment Methodology[7] sets out this approach in detail. The reaches for the South Area drought permits have been defined previously during the environmental assessment of YWSL past drought plans. **Table 4-2** provides details of these reaches, which are illustrated in **Figure 4-1**, and in a schematic in Error! Reference source not found.**.**

Figure 4-2: South Area reservoirs drought permits reach schematic



[7] Ricardo (2025). Yorkshire Water Drought Plan 2027 Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. February 2025.

Table 4-2: South Area reach details

Reach name	Watercourse name	Reach start	Reach end	Downstream reach	Drought measure							
					Winscar / Windleden Lower Reservoirs	Scout Dike Reservoir	Langsett Reservoir	Underbank Reservoir	More Hall Reservoir	Dale Dike Reservoir	Damflask Reservoir	Rivelin Reservoir
Don 0	River Don	Winscar Reservoir	Confluence with Windleden Clough	Don 1	✓							
Windleden Clough 1	River Don	Windleden Lower Reservoir	River Don	Don 1	✓							
Don 1	River Don	Confluence with Windleden Clough	Scout Dike	Don 2	✓							
Don 2	River Don	Scout Dike	Little Don	Don 3	✓	✓						
Don 3	River Don	Little Don River	Ewden Beck	Don 4	✓	✓		✓				
Don 4	River Don	Ewden Beck	River Loxley	Don 5	✓	✓		✓	✓			
Don 5	River Don	River Loxley	River Rother	N/A Study area end	✓	✓		✓	✓		✓	✓
Scout Dike 1	Scout Dike	Scout Dike Reservoir	River Don	Don 2		✓						
Little Don 0	Little Don River	Langsett Reservoir	Underbank Reservoir	N/A			✓					
Little Don 1	Little Don River	Underbank Reservoir	River Don	Don 3				✓				
Ewden Beck 1	Ewden Beck	More Hall Reservoir	River Don	Don 4					✓			
Dale Dike 1	Dale Dike	Dale Dike Reservoir	Damflask Reservoir	N/A						✓		
Loxley 1	River Loxley	Damflask Reservoir	River Rivelin	Loxley 2							✓	
Loxley 2	River Loxley	River Rivelin	River Don	Don 5							✓	✓
Rivelin 1	River Rivelin	Rivelin Lower Reservoir	River Loxley	Loxley 2								✓

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
Winscar/Windleden Lower	**Don 0**	River Don from Source to Scout Dike GB104027057500
Winscar/Windleden Lower	**Windleden Clough 1**	River Don from Source to Scout Dike GB104027057500
Winscar/Windleden Lower	**Don 1**	River Don from Source to Scout Dike GB104027057500
Scout Dike; Winscar/Windleden Lower	**Don 2**	River Don from Scout Dike to the Little Don GB104027057490
Scout Dike; Winscar/Windleden Lower; Underbank	**Don 3**	River Don from the Little Don to River Loxley confluence GB104027057411
Scout Dike; Winscar/Windleden Lower; Underbank; More Hall	**Don 4**	River Don from the Little Don to River Loxley confluence GB104027057411
Scout Dike; Winscar/Windleden Lower; Underbank; More Hall; Damflask; Rivelin	**Don 5**	River Don from River Loxley conf to River Don Works GB104027057412; River Don from River Don Works to River Rother GB104027057413
Scout Dike	**Scout Dike 1**	Scout Dike from Source to River Don GB104027057530
Langsett	**Little Don 0**	Little Don from Source to River Don GB104027057460
Underbank	**Little Don 1**	Little Don from Source to River Don GB104027057460
More Hall	**Ewden Beck 1**	Ewden Beck from Source to River Don GB104027057400
Dale Dike	**Dale Dike 1**	Strines Dyke from Source to River Loxley GB104027057380 Loxley from Strines Dyke to River Don GB104027057370
Damflask	**Loxley 1**	River Loxley from Strines Dyke to River Don GB104027057370
Damflask; Rivelin	**Loxley 2**	River Loxley from Strines Dyke to River Don GB104027057370
Rivelin	**Rivelin 1**	River Rivelin from Source to River Loxley GB104027057340

5. PHYSICAL ENVIRONMENT EFFECTS: SOUTH AREA RESERVOIRS

Potential impacts on the physical environment due to the South Area reservoir drought permits 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 South Area reservoirs drought options

Reach	River flow impact	Flow depleted reaches and risks*	Risk to river habitats	Risk to water quality
Don 0	Major	None	Major	Minor
Windleden Clough 1	Major	None	Major	Minor
Don 1	Major	Minor	Moderate	Minor
Don 2	Major	Major	Major	Moderate
Don 3	Major	None	Minor	Moderate
Don 4	Major	None	Moderate	Moderate
Don 5	Major	Major	Minor	Moderate
Scout Dike 1	Major	None	Minor	Moderate
Little Don 0	Major	None	Major	Uncertain
Little Don 1	Major	Major	Moderate	Moderate
Ewden Beck 1	Major	None	Major	Moderate
Dale Dike 1	Major	None	Major	Minor
Loxley 1	Major	Major	Moderate	Minor
Loxley 2	Major	None	Moderate	Minor
Rivelin 1	Major	None	Major	Moderate

6. RECEPTORS ASSESSMENT, MONITORING AND MITIGATION: SOUTH AREA RESERVOIRS

6.1 SUMMARY OF IMPACTS

Potentially sensitive receptors (environmental receptors) 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 receptors which have been considered for detailed assessment. Both these stages are documented in full in **Appendix B**.

Potential impacts on environmental receptors due to the South Area reservoir drought permits are summarised below in **Table 6-1**.

Table 6-1: Summary of potential impacts to environmental receptors as a result of the South Area reservoirs drought options

Reach	Don 0	Windleden Clough 1	Don 1	Don 2	Don 3	Don 4	Don 5	Scout Dike 1	Little Don 0	Little Don 1	Ewden Beck 1	Dale Dike 1	Loxley 1	Loxley 2	Rivelin 1
Hydrological Impact	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major
Associated Drought Options	**Winscar/ Windleden Lower Reservoirs**	**Winscar/ Windleden Lower Reservoirs**	**Winscar/ Windleden Lower Reservoirs**	**Winscar/ Windleden Lower Reservoirs / Scout Dike Reservoir**	**Winscar/ Windleden Lower Reservoirs / Scout Dike Reservoir / Langsett Reservoir / Underbank Reservoir**	**Winscar/Windleden Lower Reservoirs / Scout Dike Reservoir / Langsett Reservoir / Underbank Reservoir / More Hall Reservoir**	**Winscar/ Windleden Lower Reservoirs / Scout Dike Reservoir / Langsett Reservoir / Underbank Reservoir / More Hall Reservoir / Dale Dike Reservoir / Damflask Reservoir / Rivelin Reservoir**	**Scout Dike Reservoir**	**Langsett Reservoir**	**Underbank Reservoir**	**More Hall Reservoir**	**Dale Dike Reservoir**	**Dale Dike Reservoir / Damflask Reservoir**	**Dale Dike Reservoir / Damflask Reservoir / Rivelin Reservoir**	**Rivelin Reservoir**
WFD Waterbody	GB104027057500 Don from Source to Scout Dike	GB104027057500 Don from Source to Scout Dike	GB104027057500 Don from Source to Scout Dike	GB104027057490 Don from Scout Dike to the Little Don	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057412 Don from River Loxley conf to River Don Works; GB104027057413 Don from River Don Works to River Rother	GB104027057530 Scout Dike from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057400 Ewden Beck from Source to River Don	GB104027057380 Strines Dyke from Source to River Loxley	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057340 Rivelin from Source to River Loxley
Statutory designated sites															
Centenary Riverside LNR	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Salmon Pastures LNR	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NERC habitat and Local Wildlife Sites															
Romticle Viaduct & Thurgoland Tunnels LWS	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Forge Rocher and Tin Mill Rocher LWS	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower Ewden Beck LWS	N/A	N/A	N/A	N/A	Negligible	Negligible	N/A	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	N/A
Upper River Don: Station Road, Deepcar LWS	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Upper River Don: Deepcar to Hillsborough LWS	N/A	N/A	N/A	N/A	Minor	Moderate	N/A	N/A	N/A	Minor	Minor	N/A	N/A	N/A	N/A
NERC Habitats, Reedbeds, -452749, -447335	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kelham Island LWS	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Centenary Riverside LWS	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sandersons Mill Race LWS	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Salmon Pastures LWS	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower River Don: River Don (City Centre to Blackburn Meadows) LWS	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower Don Valley: Sheffield and Tinsley Canal LWS	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Middle River Don: Hillsborough to City Centre LWS	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blackburn Meadows LWS	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower Little Don, Stocksbridge LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A
Dam Flask to Rowel Bridge LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A
Acorn Hill and Little Matlock Wood LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A	N/A
Lower Rivelin Valley LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	Moderate
Broadhead Dam to Malin Bridge LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A
Malin Bridge to River Don LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A
Middle Rivelin Valley LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate

Reach	Don 0	Windleden Clough 1	Don 1	Don 2	Don 3	Don 4	Don 5	Scout Dike 1	Little Don 0	Little Don 1	Ewden Beck 1	Dale Dike 1	Loxley 1	Loxley 2	Rivelin 1
Hydrological Impact	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major
Associated Drought Options	**Winscar/ Windleden Lower Reservoirs**	**Winscar/ Windleden Lower Reservoirs**	**Winscar/ Windleden Lower Reservoirs**	**Winscar/ Windleden Lower Reservoirs / Scout Dike Reservoir**	**Winscar/ Windleden Lower Reservoirs / Scout Dike Reservoir / Langsett Reservoir / Underbank Reservoir**	**Winscar/Windleden Lower Reservoirs / Scout Dike Reservoir / Langsett Reservoir / Underbank Reservoir / More Hall Reservoir**	**Winscar/ Windleden Lower Reservoirs / Scout Dike Reservoir / Langsett Reservoir / Underbank Reservoir / More Hall Reservoir / Dale Dike Reservoir / Damflask Reservoir / Rivelin Reservoir**	**Scout Dike Reservoir**	**Langsett Reservoir**	**Underbank Reservoir**	**More Hall Reservoir**	**Dale Dike Reservoir**	**Dale Dike Reservoir / Damflask Reservoir**	**Dale Dike Reservoir / Damflask Reservoir / Rivelin Reservoir**	**Rivelin Reservoir**
WFD Waterbody	GB104027057500 Don from Source to Scout Dike	GB104027057500 Don from Source to Scout Dike	GB104027057500 Don from Source to Scout Dike	GB104027057490 Don from Scout Dike to the Little Don	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057412 Don from River Loxley conf to River Don Works; GB104027057413 Don from River Don Works to River Rother	GB104027057530 Scout Dike from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057400 Ewden Beck from Source to River Don	GB104027057380 Strines Dyke from Source to River Loxley	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057340 Rivelin from Source to River Loxley
Fox Hagg LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
Roscoe Plantation LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
NERC and Other Protected/ Notable Species Receptors															
White-clawed crayfish *Austropotamobius pallipe*	N/A	N/A	N/A	N/A	N/A	Moderate	Moderate	N/A	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	N/A
Otter *Lutra lutra*	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Water vole *Arvicola amphibious*	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Snipefly *Atherix ibis*	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A
Mayfly *Baetis digitatus*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A
Freshwater snail *Gyraulus laevis*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	Minor
Water beetle *Oreodytes davisii*	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A	N/A
Mayfly *Paraleptophlebia cincta*	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A
Caddisfly *Potamophylax rotundipennis*	Minor	N/A	Minor	N/A	N/A	N/A	N/A	N/A	Minor	N/A	Minor	N/A	N/A	Minor	N/A
Rhyacophila septentrionis	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Riffle beetle *Riolus subviolaceus*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A
Alderfly *Sialis nigripes*	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A
Spongefly *Sisyra terminalis*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor
Water beetle *Stictonectes lepidus*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A
Caddisfly *Tinodes assimilis*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A
Caddisfly *Wormaldia subnigra*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor
Atlantic salmon *Salmo salar*	N/A	N/A	N/A	N/A	N/A	N/A	Major	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Barbel *Barbus barbus*	N/A	N/A	N/A	N/A	Minor	N/A	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Brook lamprey *Lampetra planeri*	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	N/A	N/A	Moderate	Moderate	Major
Brown trout *Salmo trutta*	Moderate	Moderate	Moderate	Major	Moderate	Moderate	Major	Moderate	Moderate	Moderate	Major	Moderate	Major	Major	Major
Bullhead *Cottus gobio*	N/A	N/A	Minor	Moderate	Minor	Minor	Moderate	Minor	Minor	Minor	Moderate	Minor	Moderate	Moderate	Moderate
European eel *Anguilla anguilla*	Moderate	Moderate	Moderate	Major	Moderate	Moderate	Major	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
Grayling *Thymallus thymallus*	N/A	N/A	Moderate	Major	Moderate	Moderate	Moderate	N/A	N/A	Moderate	Moderate	N/A	N/A	Moderate	N/A
WFD Waterbody WFD Status Receptors															
Macroinvertebrates	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Fish	Moderate	Moderate	Moderate	Major	Moderate	Moderate	Major	Moderate	Moderate	Moderate	Moderate	Moderate	Major	Moderate	Major
Landscape, navigation, recreation and heritage receptors															
Angling	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Reach	Don 0	Windleden Clough 1	Don 1	Don 2	Don 3	Don 4	Don 5	Scout Dike 1	Little Don 0	Little Don 1	Ewden Beck 1	Dale Dike 1	Loxley 1	Loxley 2	Rivelin 1
Hydrological Impact	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major
Associated Drought Options	**Winscar/ Windleden Lower Reservoirs**	**Winscar/ Windleden Lower Reservoirs**	**Winscar/ Windleden Lower Reservoirs**	**Winscar/ Windleden Lower Reservoirs / Scout Dike Reservoir**	**Winscar/ Windleden Lower Reservoirs / Scout Dike Reservoir / Langsett Reservoir / Underbank Reservoir**	**Winscar/Windleden Lower Reservoirs / Scout Dike Reservoir / Langsett Reservoir / Underbank Reservoir / More Hall Reservoir**	**Winscar/ Windleden Lower Reservoirs / Scout Dike Reservoir / Langsett Reservoir / Underbank Reservoir / More Hall Reservoir / Dale Dike Reservoir / Damflask Reservoir / Rivelin Reservoir**	**Scout Dike Reservoir**	**Langsett Reservoir**	**Underbank Reservoir**	**More Hall Reservoir**	**Dale Dike Reservoir**	**Dale Dike Reservoir / Damflask Reservoir**	**Dale Dike Reservoir / Damflask Reservoir / Rivelin Reservoir**	**Rivelin Reservoir**
WFD Waterbody	GB104027057500 Don from Source to Scout Dike	GB104027057500 Don from Source to Scout Dike	GB104027057500 Don from Source to Scout Dike	GB104027057490 Don from Scout Dike to the Little Don	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057412 Don from River Loxley conf to River Don Works; GB104027057413 Don from River Don Works to River Rother	GB104027057530 Scout Dike from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057400 Ewden Beck from Source to River Don	GB104027057380 Strines Dyke from Source to River Loxley	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057340 Rivelin from Source to River Loxley
Nether Mill Fishery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A

6.2 MONITORING AND MITIGATION

The Environment Agency's 2025 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 receptors 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:

- measures to avoid, reduce or mitigate 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 receptors requiring consideration of mitigation and appropriate monitoring triggering mitigation. YWSL's Drought Plan 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 permit 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, 2020 and 2022 (see **Section 0**). Consultation between YWSL and the Environment Agency will be 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 mitigations recommendations for the South Area reservoir drought permits are provided in **Table 6-2** and **Table 6-3**. **Appendix C** provides a description of each monitoring and mitigation measure with reference to the codes used in **Table 6-2** and **Table 6-3**.

Table 6-2: Summary of recommended monitoring for the South Area reservoirs drought options

Reach		Don 0	Windleden Clough 1	Don 1	Don 2	Don 3	Don 4	Don 5	Scout Dike 1	Little Don 0	Little Don 1	Ewden Beck 1	Dale Dike 1	Loxley 1	Loxley 2	Rivelin 1
Hydrological Impact		Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major
Associated Drought Options		**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir / More Hall Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir / More Hall Reservoir / Damflask Reservoir / Rivelin Reservoir**	**Scout Dike Reservoir**	**Langsett Reservoir**	**Underbank Reservoir**	**More Hall Reservoir**	**Dale Dike Reservoir**	**Damflask Reservoir**	**Damflask Reservoir / Rivelin Reservoir**	**Rivelin Reservoir**
WFD Waterbody		GB104027057500	GB104027057500	GB104027057500	GB104027057490	GB104027057411	GB104027057411	GB104027057412, GB104027057413	GB104027057530	GB104027057460	GB104027057460	GB104027057400	GB104027057380	GB104027057370	GB104027057370	GB104027057340
Code	**Description**	Don from Source to Scout Dike	Don from Source to Scout Dike	Don from Source to Scout Dike	Don from Scout Dike to the Little Don	Don from the Little Don to River Loxley confluence	Don from the Little Don to River Loxley confluence	Don from River Loxley conf to River Don Works; Don from River Don Works to River Rother	Scout Dike from Source to River Don	Little Don from Source to River Don	Little Don from Source to River Don	Ewden Beck from Source to River Don	Strines Dyke from Source to River Loxley	Loxley from Strines Dyke to River Don	Loxley from Strines Dyke to River Don	Rivelin from Source to River Loxley
Baseline Monitoring																
BMON_H	Routine flow/levels	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BMON_WQ	Routine WQ	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BMON_E1	Macroinvertebrate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BMON_E2	Fisheries (including Lamprey)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BMON_E3	Habitat Walkover mapping	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
On-set of Environmental drought																
ODMON_WS	River condition walkover survey	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
In-Drought (during drought option implementation)																
IDMON_WSE	Surveillance walkover (habitat quality and ecological stress)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IDMON_WSWQ1	Surveillance walkover (water quality and ecological stress)	x	x	✓	✓	x	x	x	✓	x	x	x	x	✓	x	x
IDMON_WSWQ2	CSO Monitoring	x	x	x	✓	x	✓	✓	x	x	✓	x	x	x	x	✓
Post-Drought (Drought Options Removed)																
PDMON_E1	Macroinvertebrate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDMON_E2	Fisheries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 6-3: Summary of recommended mitigation measures for the South Area reservoirs drought options

Reach		Don 0	Windleden Clough 1	Don 1	Don 2	Don 3	Don 4	Don 5	Scout Dike 1	Little Don 0	Little Don 1	Ewden Beck 1	Dale Dike 1	Loxley 1	Loxley 2	Rivelin 1
Hydrological Impact		Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major
Associated Drought Options		**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir / More Hall Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir / More Hall Reservoir / Damflask Reservoir / Rivelin Reservoir**	**Scout Dike Reservoir**	**Langsett Reservoir**	**Underbank Reservoir**	**More Hall Reservoir**	**Dale Dike Reservoir**	**Damflask Reservoir**	**Damflask Reservoir / Rivelin Reservoir**	**Rivelin Reservoir**
WFD Waterbody		GB104027057500	GB104027057500	GB104027057500	GB104027057490	GB104027057411	GB104027057411	GB104027057412, GB104027057413	GB104027057530	GB104027057460	GB104027057460	GB104027057400	GB104027057380	GB104027057370	GB104027057370	GB104027057340
Code	**Description**	Don from Source to Scout Dike	Don from Source to Scout Dike	Don from Source to Scout Dike	Don from Scout Dike to the Little Don	Don from the Little Don to River Loxley confluence	Don from the Little Don to River Loxley confluence	Don from River Loxley conf to River Don Works; Don from River Don Works to River Rother	Scout Dike from Source to River Don	Little Don from Source to River Don	Little Don from Source to River Don	Ewden Beck from Source to River Don	Strines Dyke from Source to River Loxley	Loxley from Strines Dyke to River Don	Loxley from Strines Dyke to River Don	Rivelin from Source to River Loxley
In–Drought (During Drought Option Implementation)																
IDMIT_H1	Third-party abstraction	x	x	x	x	x	x	✓	x	x	✓	x	x	✓	x	x
IDMIT_H2	Temporary cessation for SSSI's	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
IDMIT_WQ1	Improving the effluent quality	x	x	x	x	x	x	x	✓	x	x	x	x	x	x	x
IDMIT_WQ2	Short–term relaxation of drought permit / order flow reduction	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IDMIT_E1	Gradual or temporary adjustments to abstraction or compensation flows	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IDMIT_E2	Aeration of watercourse	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IDMIT_E3	Refuges	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IDMIT_E4	In-stream structures	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IDMIT_E5	Inspection and clearing of screens	x	x	x	✓	x	✓	✓	x	x	✓	x	x	x	x	✓
IDMIT_E6	Fish/crayfish rescue and relocate	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	✓
Post–Drought (Drought Options Removed)																
PDMIT_E1	Habitat enhancement	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDMIT_E2	Freshets	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDMIT_E3	Barrier modification	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDMIT_E4	Coarse fish restocking	x	x	x	x	x	x	✓	x	x	x	x	x	x	x	x

APPENDICES

Appendix A Physical Environment

Appendix B Environmental Receptors

Appendix C Environmental Monitoring and Ecological Mitigation Measures

APPENDIX A PHYSICAL ENVIRONMENT

Insert Appendix A – Physical Environment

APPENDIX B ENVIRONMENTAL RECEPTORS

Insert Appendix B – Environmental Receptors

APPENDIX C MONITORING AND ECOLOGICAL MITIGATION MEASURES

Table C1-1: Monitoring and mitigation measures included in the YWSL Drought Plan 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 implementation and to fill any data gaps and reduce uncertainty identified during the environmental assessment	
BMON_H	EA/YWSL to continue monitor river flows and levels/reservoir levels and spill at key monitoring sites
BMON_WQ	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_E1	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_E2	Fish (including Lamprey) 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_E3	Walkover surveys of to map habitat distribution and quality, identifying drought sensitive habitats such as areas of riffle, pools and artificial features as well as features relevant to key ecological receptors like lamprey and salmonids. Results to be captured by annotated walkover maps.
On-set of Environmental drought – monitoring leading to selection and implementation of appropriate mitigation measures	
ODMON_WS	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, photography 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_WSE	Surveillance walkover surveys of habitat quality and ecological stress, recording signs of environmental problems (reaches to match those in ODMON_WS)
IDMON_WSWQ1	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_WSWQ2	Discharge validation at key outfalls and downstream, where triggered by review of monitoring data. On site walkover will validate whether key CSOs are spilling, or have been recently, observe for signs of fish stress and take spot water quality sampling at additional locations including at locations of potential fish stress.
In-Drought (During Drought Option Implementation) – Mitigation	
IDMIT_H1	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_H2	At identified SSSIs, mitigation would comprise the temporary cessation of impacting drought options by Yorkshire Water.

Baseline Monitoring - to ensure an adequate baseline dataset exists to describe non-drought conditions for those receptors likely to be impacted by drought permit implementation and to fill any data gaps and reduce uncertainty identified during the environmental assessment	
IDMIT_WQ1	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_WQ2	Short–term relaxation of drought permit flow reduction to dilute/disperse a build up of water quality pressures identified during walkover surveys IDMON_WSWQ1.
IDMIT_E1	Gradual or temporary adjustments to abstraction or compensation flows to prevent stranding, displacement, or stress in sensitive aquatic species (e.g. fish, macroinvertebrates, white–clawed crayfish).
IDMIT_E2	Aeration of watercourse where significant mortality or change in species abundances are likely to be attributed to water quality deterioration.
IDMIT_E3	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_E4	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_E5	Regular inspection and clearing of screens to ensure they retain their correct working function (fish, white–clawed crayfish)
IDMIT_E6	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.
Post-Drought (Drought Options Removed) – Monitoring	
PDMON_E1	Macroinvertebrate monitoring at a number of locations, including rivers following implementation of drought measures; pending agreement with the EA regarding aquatic species welfare.
PDMON_E2	Fish (including Lamprey) monitoring at a number of locations, including rivers following implementation of drought measures; pending agreement with the EA regarding aquatic species welfare.
Post-Drought (Drought Options Removed) – Mitigation	
PDMIT_E1	Enhancement of habitat beyond the impacted reach (macroinvertebrates, fish, fine-lined pea mussel, white-clawed crayfish, water vole)
PDMIT_E2	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_E3	Modification to barriers and/or flows to improve passage where walkover survey identifies insufficient water depth or volume at obstacles (fish)
PDMIT_E4	Restocking of coarse fish from the catchment where monitoring indicates loss of fish abundance or recruitment (fish)

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APPENDIX A – PHYSICAL ENVIRONMENT

A1 INTRODUCTION

This appendix assesses the potential impacts on the physical environment of the South Area river catchment during the period of implementation of associated drought options.

The South Area reservoirs comprise eight drought options as reported in this appendix:

1. Winscar/Windleden Lower Reservoirs drought permit
2. Scout Dike Reservoir drought permit
3. Langsett Reservoir drought permit
4. Underbank Reservoir drought permit
5. More Hall Reservoir drought permit
6. Dale Dike Reservoir compensation flow reduction
7. Damflask Reservoir drought permit
8. Rivelin Lower Reservoir drought permit.

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 2027 Environmental Assessment Methodology[1].

This appendix is set out in the following sections:

Section A.2 Drought options

Section A.3 Study area

Section A.4 Physical environment effects – this includes for each reach:

1. Reach introduction
2. Reach setting
3. River flow regime
4. River habitats
5. River water quality
6. Summary of potential changes in the physical environment as a result of the drought options.

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

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

Annex 3 maps the intermittent water quality pressures associated with the Don 5 reach (with the number of pressures in this reach making their presentation in **Figure A4.7**).

Annex 4 documents the flow transposition in the absence of measured data (for illustrative time series) approach for those reaches where flow transposition has been utilised.

[1] Ricardo (2025). Yorkshire Water Drought Plan 2027. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. February 2025.

A2 DROUGHT OPTIONS

The South Area river catchment comprise eight drought options at compensation flow reservoirs as reported in this appendix:

- Winscar/Windleden Lower Reservoirs
- Scout Dike Reservoir
- Langsett Reservoir
- Underbank Reservoir
- More Hall Reservoir
- Dale Dike Reservoir
- Damflask Reservoir
- Rivelin Lower Reservoir.

The licence conditions and drought permit conditions of each are introduced below.

A2.1 WINSCAR/WINDLEDEN LOWER RESERVOIRS DROUGHT PERMIT

Under the terms of the Winscar Impoundment licence (2/27/5/152) and the Winscar Flow Trial Local Enforcement Position (LEP)[2], YWSL must continuously discharge a combined compensation flow of not less than 7.00 Ml/d during summer (From May to September inclusive) or a flow of not less than 9.00 Ml/d during Winter (from November to April Inclusive), the compensation flow in October will be 7.00 Ml/d if Winscar Reservoir stocks are below the control line or will be 9.00 Ml/d if Winscar Group stocks are above the control line. In addition to the combined compensation flow, there is a minimum flow of 1.00 Ml/d from Windleden Lower and a minimum flow of 2.00 Ml/d from Winscar.

The Drought permit application for the Winscar group option is to reduce the group compensation release by 50% to a combined compensation flow of 3.50 Ml/d during summer (May to October) and 4.50 Ml/d during Winter (November to April) from the date the permit is granted. Under a 50% reduction the minimum flows from Winscar will reduce to 1.00 Ml/d and the minimum flow from Windleden Lower will reduce to 0.50 Ml/d. from the date the permit is granted. A further reduction of the combined compensation flow will be to 2.33 Ml/d in summer (May to October) or 3.00 in Winter (November to April) and a reduction in the minimum flow from Winscar to 0.66 Ml/d and from Windleden Lower to 0.33 Ml/d if regional reservoir stocks are below the Regional Drought Control Line, as defined in the YWSL Drought Plan for more than four consecutive weeks.

The drought permit condition relates to a reduction in compensation flow from Winscar/Windleden Lower Reservoirs to meet the minimum flow and combined compensation flow. These conditions are set out in **Table A2.1**.

[2] The flow trial commenced in October 2023 and will run through to April 2027 at which point YWSL expect to formalise the compensation flow into a new licence

Table A2.1 Winscar/Windleden Lower Reservoirs licence data

Compensation Water Source	Receiving Watercourse	NGR	Normal Compensation flow Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Winscar/ Windleden Lower	River Don	SE 15654 02460 / SE 15849 02029	Minimum compensation flow of 2.00 Ml/d from Winscar and 1.00 Ml/d from Windleden Lower as well a combined compensation flow of 7.00 Ml/d or 9.00 Ml/d	Minimum flow of 1 Ml/d from Winscar and 0.5 Ml/d from Windleden Lower and combined compensation flow of 3.50 Ml/d or 4.50 Ml/d	3.50 Ml/d or 4.50 Ml/d	Minimum flow of 0.66 Ml/d from Winscar and 0.33 Ml/d from Windleden Lower and a group compensation flow of 2.33 Ml/d or 3.00 Ml/d	4.69 Ml/d or 6.00 Ml/d

A2.2 SCOUT DIKE RESERVOIR DROUGHT PERMIT

YWSL releases water from Scout Dike Reservoir under conditions defined by the Ingbirchworth Reservoir abstraction licence (2/27/05/012). Under the terms of this licence, the Licence Holder shall discharge from Ingbirchworth Reservoir into Ingbirchworth Dike not less than 45 cubic metres of water in a continuous flow during every period of 24 hours. Also, the terms of the licence state that YWSL must release flow from Scout Dike Reservoir to compensate the downstream receiving watercourses, Scout Dyke and the River Don. Under the licence conditions, YWSL must continuously discharge not less than 4.00 Ml/d when the reservoir level is above the control line defined in the licence, or 2.70 Ml/d when the reservoir level is below the control line. The drought permit application for Scout Dike Reservoir is to reduce the compensation release required when the reservoir is at or below 25% of its capacity to 2.70 Ml/d, then after two weeks, to reduce further to 1.35 Ml/d. There would then be a further reduction to 0.89 Ml/d if regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks, as defined in the YWSL Drought Plan, or if stocks in the Don Valley supply reservoir group are below its Drought Control Line. This assessment has therefore been undertaken in comparison of a drought permit of 0.89 Ml/d and a reference condition of 2.70 Ml/d. These conditions are set out in **Table A2.2**.

Table A2.2 Scout Dike Reservoir licence data

Compensation Water Source	Receiving Watercourse	NGR	Normal Compensation Release Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Scout Dike Reservoir	Scout Dyke	SE 236047	2.70 or 4.00	1.35	1.35	0.89	1.81

A2.3 LANGSETT RESERVOIR DROUGHT PERMIT

Following flow trials in AMP7, YWSL release water from Langsett reservoir under conditions defined in the Langsett abstraction licence (2/27/05/032). Conditions within this licence specify a seasonally varied compensation flow regime that van vary based on reservoir stocks relative to two control lines. If reservoir stocks are above both control lines the compensation flow from Langsett reservoir shall be not less than 7.00 Ml/d from November to March, 5.00 Ml/d in April and October, and 3.50 Ml/d from May to September. If the reservoir stocks are below both control lines the compensation flow from Langsett reservoir shall be not less than 4.00 Ml/d from November to March, 3.00 Ml/d in April and October and 2.00 Ml/d from May to September. Stocks have to cross both control lines before an increase or decrease to compensation flows can be made.

When Langsett Reservoir stocks are below both control lines then the drought permit would allow a 50% reduction in compensation flow to 2.00 Ml/d from November to March, 1.50 Ml/d in April and October and 1 Ml/d from May to September from the date the permit is granted, and to reduce further to 1.33 Ml/d from November to March, 1.00 Ml/d in April and October and 0.67 Ml/d from May to September if regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks, as defined in the Yorkshire Water Drought Plan. These conditions are set out in **Table A2.3**.

Table A2.3 Langsett Reservoir licence data

Compensation Water Source	Receiving Watercourse	NGR	Normal maintained flow Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Langsett	Little Don River	SE 21438 00334	4.00 or 3.00 or 2.00	2.00 or 1.50 or 1.00	2.00 or 1.50 or 1.00	1.33 or 1.00 or 0.67	2.67 or 2.00 or 1.33

A2.4 UNDERBANK RESERVOIR DROUGHT PERMIT

YWSL releases water from Underbank Reservoir under coincident conditions defined by the abstraction licence for Langsett Reservoir (2/27/05/032) and the abstraction licence for Midhope Reservoir/Knoll Brook Intake (2/27/05/011). The terms of the licences state that YWSL must release flow from Underbank Reservoir to compensate the downstream receiving watercourses, the Little Don River and the River Don. Under the licence conditions, YWSL must continuously discharge not less than 21.70 Ml/d from Underbank Reservoir when the reservoir level is above both control lines defined in the Langsett and Midhope licence (2/27/05/032), or 16.00 Ml/d when the reservoir level is below both the control lines. Reservoir stocks have to cross both control lines before an increase or decrease to compensation flows can be made. The two drought permit applications are to reduce the compensation release required when Underbank Reservoir is below the lower of its control lines for more than two consecutive weeks by 50% to 8.00 Ml/d from the date the permit is granted and to reduce further to 5.28 Ml/d if regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks, as defined in the Yorkshire Water Drought Plan, or if stocks in the Little Don supply group are below its Drought Control Line. This assessment has therefore been undertaken in comparison of a drought permit of 5.28 Ml/d and a reference condition of 16.00 Ml/d. These conditions are set out in **Table A2.4**.

Table A2.4 Underbank Reservoir licence data

Compensation Water Source	Receiving Watercourse	NGR	Normal Compensation Release Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Underbank	River Little Don	SK 253991	16.00 or 21.70	8.00	8.00	5.28	10.72

A2.5 MORE HALL RESERVOIR DROUGHT PERMIT

Under conditions defined by the Broomhead Reservoir abstraction licence YWSL must release flow from More Hall Reservoir to compensate the downstream receiving watercourses, Ewden Beck and the River Don. Under the licence conditions, YWSL must continuously discharge from More Hall Reservoir to ensure not less than 12.00 Ml/d of flow through the More Hall Gauge to the River Ewden when the reservoir level is above the control line defined in the licence and 9.1 Ml/d is released when the level is below the control line. The drought permit application for More Hall Reservoir is to reduce the compensation release when the reservoir is below the lower of its compensation control lines for more than two consecutive weeks by 50% to 4.55 Ml/d from the date the permit is granted and to reduce further to 3.00 Ml/d if regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks, as defined in the Yorkshire Water Drought Plan. These conditions are set out in **Table A2.5**.

Table A2.5 More Hall Reservoir licence data

Compensation Water Source	Receiving Watercourse	NGR	Normal Compensation Release Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
More Hall	Ewden Beck	SK 288957	9.10 or 12.00	4.55	4.55	3.00	6.10

A2.6 DALE DIKE RESERVOIR COMPENSATION FLOW REDUCTION

As per the Damflask application below YWSL is proposing the reduction of Dale Dike's compensation from 3.30 megalitres per day to 1.65 megalitres per day from the date the permit is granted and to reduce further to 1.10 megalitres per day if regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks, as defined in the Yorkshire Water Drought Plan.

These conditions are set out in **Table A2.6**.

Table A2.6 Dale Dike Reservoir Licence Data

Compensation Water Source	Receiving Watercourse	NGR	Normal Compensation Release Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Dale Dike	Dale Dike	SK 24540 91702	3.30	1.65	1.65	1.10	2.20

A2.7 DAMFLASK RESERVOIR DROUGHT PERMIT

YWSL releases water from Damflask Reservoir under conditions defined by the Dale Dike Reservoir and Agden Reservoir abstraction licence (2/27/05/030). The terms of the licence state YWSL must release flow from Damflask Reservoir to compensate the downstream receiving watercourses, the River Loxley and the River Don. Under the licence conditions, YWSL must continuously discharge not less than 28.00 Ml/d when the reservoir level is above both the control lines defined in the licence, or 18.00 Ml/d when the reservoir level is below both the control lines. Reservoir stocks must cross both control lines before an increase or decrease to compensation flow can be made. The drought permit application for Damflask Reservoir is to reduce the compensation release required when the reservoir is below the control line for more than two consecutive weeks by 50% to 9.00 Ml/d from the date the permit is granted and to reduce further to 5.94 Ml/d if regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks, as defined in the YWSL Drought Plan, or if stocks in the Loxley supply group are below its Drought Control Line. This assessment has therefore been undertaken in comparison of a drought permit of 5.94 Ml/d and a reference condition of 18.00 Ml/d. These conditions are set out in **Table A2.7**.

Table A2.7 Damflask Reservoir Licence Data

Compensation Water Source	Receiving Watercourse	NGR	Normal Compensation Release Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Damflask	River Loxley	SK 287905	18.00 or 28.00	9.00	9.00	5.94	12.06

A2.8 RIVELIN RESERVOIR DROUGHT PERMIT

YWSL is licensed to impound water in Rivelin Upper and Lower Reservoirs for supply to customers under the Rivelin Reservoirs and Redmires Reservoirs abstraction licence (2/27/05/029). The terms of the licence state

YWSL must continuously discharge from Rivelin Depositing Pond to ensure not less than 10.3 Ml/d flows through Rivelin Gauge to the River Rivelin. The drought permit application for Rivelin Depositing Pond is to reduce the compensation release by 50% to 5.15 Ml/d from the date the permit is granted and to reduce further to 3.43 Ml/d if regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks, as defined in the YWSL Drought Plan, or if stocks in the Rivelin supply group are below its Drought Control Line. This assessment has therefore been undertaken in comparison of a drought permit of 3.43 Ml/d and a reference condition of 10.3 Ml/d. These conditions are set out in **Table A2.8**.

Table A2.8 Rivelin Reservoir Licence Data

Compensation Water Source	Receiving Watercourse	NGR	Normal Compensation Release Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 1	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Rivelin	River Rivelin	SK 278867	10.30	5.15	5.15	3.40	6.90

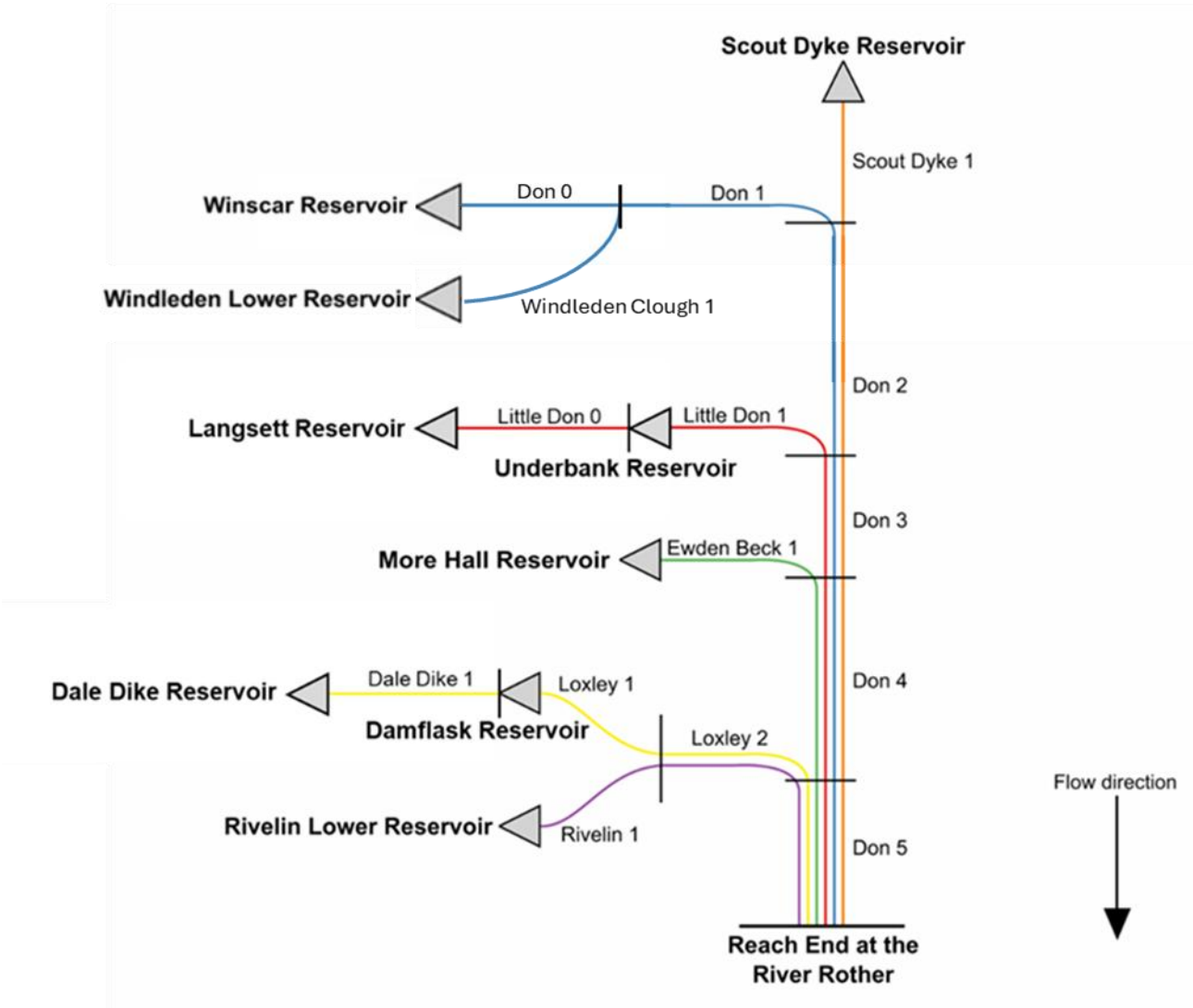
A3 STUDY AREA

The zone of influence associated with each drought option is defined through hydrological effects. Within the overall zone of influence, reaches are then defined on a hydrological basis. YWSL's Drought Plan 2027 Environmental Assessment Methodology[3]. sets out this approach in detail in Section 3.4. The zone of influence and individual reaches for assessment of impacts are set out in **Section A3.1** below. Information on the likely timings of drought options are set out in **Section A3.2** below.

A3.1 ZONE OF INFLUENCE OF THE DROUGHT OPTIONS

The reaches for the South area reservoir drought options have been defined previously during the environmental assessment of YWSL past drought plans. **Table A3.1** provides details of these reaches, and the reaches are illustrated in main EAR **Figures 4.1-4.2** and in a schematic below in **Figure A3.1**.

Figure A3.1 South Area reach schematic



[3] Ricardo (2025). Yorkshire Water Drought Plan 2027. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. February 2025.

Table A3.1 South Area reach details

Reach name	Watercourse name	Reach start	Reach end	Downstream reach	Drought measure							
					Winscar / Windleden Lower Reservoirs	Scout Dike Reservoir	Langsett Reservoir	Underbank Reservoir	More Hall Reservoir	Dale Dike Reservoir	Damflask Reservoir	Rivelin Reservoir
Don 0	River Don	Winscar Reservoir	Windleden Clough	Don 1	✓[4]							
Don 1	River Don	Windleden Clough	Scout Dike	Don 2	✓							
Don 2	River Don	Scout Dyke	Little Don	Don 3	✓	✓						
Don 3	River Don	Little Don River	Ewden Beck	Don 4	✓	✓		✓				
Don 4	River Don	Ewden Beck	River Loxley	Don 5	✓	✓		✓	✓			
Don 5	River Don	River Loxley	River Rother	Study area end	✓	✓		✓	✓		✓	✓
Windleden Clough 1	Windleden Clough	Windleden Lower Reservoir	River Don	Don 1	✓[5]							
Scout Dike 1	Scout Dyke	Scout Dike Reservoir	River Don	Don 2		✓						
Little Don 0	Little Don River	Langsett Reservoir	Underbank Reservoir	N/A			✓					
Little Don 1	Little Don River	Underbank Reservoir	River Don	Don 3				✓				
Ewden Beck 1	Ewden Beck	More Hall Reservoir	River Don	Don 4					✓			
Dale Dike 1	Dale Dike	Dale Dike Reservoir	Damflask Reservoir	N/A						✓		
Loxley 1	River Loxley	Damflask Reservoir	River Rivelin	Loxley 2							✓	
Loxley 2	River Loxley	River Rivelin	River Don	Don 5							✓	✓
Rivelin 1	River Rivelin	Rivelin Lower Reservoir	River Loxley	Loxley 2								✓

[4] Only the Winscar Reservoir element of the drought permit impacts this reach
[5] Only the Windleden Lower Reservoir element of the drought permit impacts this reach

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. No significant impacts related to the drought options occur below these points (see **Table 3.2**).

Table A3.2 South Area extent of zone of influence

Reach	Description	Downstream impacts
Don 5	River Don confluence with River Rother	The potential hydrological impact of the drought options on the River Don downstream of the River Rother confluence (downstream of Don 5) is considered at an assessment point on the confluence, using the Rotherham Tesco flow gauge (560m downstream of the Don/Rother confluence). At that assessment point using available data for the period 2005-2023 adjusted to account for the influence of historic compensation flows from reservoirs in the Don catchment reference condition flow statistics were: • summer Q95 336 Ml/d, summer Q99 285 Ml/d • annual Q50 686 Ml/d, annual Q95 358 Ml/d. It is noted that there is ungauged abstraction into the Sheffield & South Yorkshire Navigation canal just upstream of the gauge and river flows prior to the gauging point are higher. Were all of the drought options to be simultaneously in operation (a total maximum reduction of 43.68 Ml/d), the River Don downstream of the River Rother confluence assessment point statistics identifies the following impacts at the end of the reach: • summer/autumn: 13% reduction in Q95 and 15% reduction in Q99 • winter: 6% reduction in Q50 and 14% reduction in Q95 As the character of the River Don has changed to a broad lowland river with flow moderated by wastewater returns in Don 5 and the significant flow addition from the River Rother, the River Rother confluence is considered a suitable end to the zone of influence of the South area reservoirs drought options.

A3.2 TIMING OF DROUGHT MEASURE EFFECTS

The assessment presented in this appendix is in support of a drought permit application for a drought permit to be implemented in summer 2025. In line with the YWSL's Drought Plan 2027 Environmental Assessment Methodology[6], the assessment here is appropriate for the assessment of hydrological impacts on low flow regimes in watercourses during the spring, summer and autumn. The assessment is also appropriate to determine the impacts of drought options on watercourses during the winter, when watercourses have relatively lower sensitivity to changes in low flow, and moderate sensitivity to changes in moderate flow. This covers the range of potential impacts associated with a six month drought permit.

[6] Ricardo (2025). Yorkshire Water Drought Plan 2027. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. February 2025.

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 habitats (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 each reach within the zone of influence is then provided.

YWSL's Drought Plan 2027 Environmental Assessment Methodology[7] provides details of the approach in Section 3.5. The approach has been developed to ensure compliance with the Environment Agency's March 2025 (DPG2024)[8] This also includes an updated draft of the supplementary guidance on the environmental assessment for water company drought planning.

A4.2 DON 0

A4.2.1 Reach introduction

Don 0 is potentially impacted by a Winscar/Windleden Lower Reservoirs drought permit. A summary of physical environment information for this reach is provided in **Figure A4.1**. The reach includes part of the following river waterbody:

- River Don from Source to Scout Dyke (GB104027057500)

A4.2.2 Reach setting

Don 0, located on main EAR **Figure 4.1,** comprises a 0.67km stretch of the River Don from the outflow of Winscar Reservoir to the confluence with Windleden Clough (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 0.97km^2 along the length of the reach. Don 1 (see **Section A4.3** below) is downstream.

A4.2.3 River flow regime

During the implementation of this drought option, it is likely that the levels in Winscar reservoir will be below top water level and therefore the compensation flow from Winscar reservoir will be the only inflow at the top of this reach. The compensation flow can be released from either or both of the two reservoirs in order to comply with the maintained flow requirement at Dunford Bridge, downstream of both reservoir outflows. The outflow from Windleden Lower Reservoir joins the main River Don channel 0.67 km downstream of the Winscar Reservoir dam at the end of this reach. For the assessment of this reach it is assumed that Winscar Reservoir is providing its minimum compensation flow, with the additional outflow required to maintain the flow at Dunford Bridge entirely being made from Windleden Lower Reservoir. It is noted that this is a precautionary assessment and it is not likely that the reservoirs would be operated in this way in reality.

A reduction of 1.34 Ml/d in the minimum compensation flow from Winscar Reservoir represents a reduction of up to 67% in the flow at the top of this reach, and this is assessed as a **major** hydrological impact at any time of year.

During the winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However,

[7] Ricardo (2025). Yorkshire Water Drought Plan 2027. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. February 2025.

[8] Environment Agency (2024) Water company drought plan guideline. Final, March 2025..

the flow reduction at the top of the reach will remain at 67% until either or both of the two reservoirs reach top water level and begin to spill again.

The hydrological impact of the drought option on Don 0 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the reservoir, the confidence in the assessment of the hydrological impact is high.

There are no significant flow pressures identified in this reach. 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 with there being no onset of drought walkover undertaken in this reach to date.

Don 0 is fairly straight reach which falls ~9m over 0.67km, a slope of 0.75°. The channel is part shaded for much of its length with deciduous riparian tree cover. There are numerous boulders protruding through the flow immediately downstream of the reservoir outflow, with protruding boulders observed at the RHS site (site ID 26469) in this reach. At the RHS site, 5 pools and 1 riffle were observed with the data indicating that, where visible, cobbles were the dominant substrate, with some variation with boulders, pebble and bedrock also being observed. In aerial imagery, the flow surface was predominantly smooth with some areas of broken flow and rippled flow. RHS data identifies that both the left and right banks are predominantly composed of earth though significant variation in the left bank composition was observed with 10% bedrock, 10% boulder; 10% brick and 70% earth. Bank face vegetation was noted as predominantly uniform with some bare areas for the left banks and uniform and simple for the right banks. Bank top vegetation was predominantly uniform on both banks (although simple vegetation was recorded). The left and right banks at the RHS site were noted as being extensively resectioned and reinforced, however, arial imagery has identified some erosional features at the downstream end of the reach where resectioning is limited. Surrounding land-use is generally rough pasture and moorland heath with some urbanisation along most of the reach. No barriers to fish passage are observed in the reach.

Don 0 contains a mixture of high and low energy environments, indicated by the moderate steepness of the valley, the valley shape and the presence of both erosional and depositional features. Although the dominant substrate is less suitable for supporting spawning habitat, it is considered likely that smaller pockets of suitable types are likely to be present with riffles identified at the RHS site. Extensive re-sectioning and reinforcement of banks have the potential to reduce the amount of juvenile nursery habitat and refuge potential for adults, however in-stream features are likely to provide the refuge required by both. The presence of trees in the riparian corridor will provide some allochthonous energy into the stream. The reinforced banks, albeit limited in extent, may provide some additional habitat opportunities for white-clawed crayfish, with suitable substrate also present. The movement/migration of fish and sediments are unlikely to be significantly impacted with no weirs identified.

The drought option reduction in flow could lead to several potential impacts within Don 0.

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for the duration of drought option.
- Potentially major risk of reduction in wetted aquatic habitat (wetted width reduction) due to channel shape in deep V-shaped valley.
- Potentially major risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for duration of drought option, with retention of dominant habitat types.
- Moderate risk to longitudinal connectivity due to moderately steep nature of channel.
- 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. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Don 0 from drought options is therefore assessed as **major**.

A4.2.5 River water quality

One water quality monitoring location is present in Don 0, River Don at Dunford Bridge (NE-49301577). There are no significant continuous or intermittent discharges within Don 0. A summary description of the potential risks to water quality in Don 0 as a result of drought options is presented in **Table A4.1**.

Table A4.1 Potential risks to water quality in Don 0 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly consistent with High WFD status (0.2 mg/l) throughout the monitoring period.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period	Orthophosphate concentrations were variable, though generally consistent with High and Good WFD status. On the two occasions where the samples were at Moderate status, the flow was >Q80.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	Weak
WwTW presenting increased risk	None	None	None
Intermittent pressures presenting risk	None	None	None
Other point source pressures presenting risk	None	None	None
Summary	Minor risk from drought options	Minor risk from drought options	Minor risk from drought options

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

An overall summary of potential changes in the physical environment of Don 0 as a result of drought options is presented in **Table A4.2**.

Table A4.2 Summary of potential changes in the physical environment of Don 0 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that drought options implemented.
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Don 0.
River habitats *Major risk*	• The major reduction in flow will lead to a major change in the energy of the system with a major risk to available aquatic habitat for different species requirements and total wetted habitat in the reach. The risk to longitudinal connectivity in the reach is assessed as moderate and sediment dynamics is assessed as minor.
Water quality *Minor risk*	• Reported water quality is mostly consistent with Good or High status with apparent weak flow sensitivity for SRP. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought options implemented and no significant intermittent pressures presenting risk.

Insert Figure A4.1

A4.3 WINDLEDEN CLOUGH 1

A4.3.1 Reach introduction

Windleden Clough 1 is potentially impacted by a Winscar/Windleden Lower Reservoirs drought permit. A summary of physical environment information for this reach is provided in **Figure A4.2**. The reach includes part of the following river waterbody:

- River Don from Source to Scout Dyke (GB104027057500)

A4.3.2 Reach setting

Windleden Clough 1, located on main EAR **Figure 4.1,** comprises a 0.72km stretch of the River Don from the outflow of Windleden Lower Reservoir to the confluence with River Don (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 0.23km^2 along the length of the reach. Don 1 (see **Section A4.3** below) is downstream.

A4.3.3 River flow regime

During the implementation of this drought option, it is likely that the levels in Windleden Lower Reservoir will be below top water level and therefore the compensation flow from Windleden Lower Reservoir will be the only inflow at the top of this reach. The compensation flow can be released from either or both of the two reservoirs in order to comply with the maintained flow requirement at Dunford Bridge, downstream of both reservoir outflows. This reach joins the River Don, and therefore the outflow from Winscar Reservoir 0.72km downstream of the start of this reach. For the assessment of this reach it is assumed that Windleden Lower Reservoir is providing its minimum compensation flow, with the additional outflow required to maintain the flow at Dunford Bridge entirely being made from Winscar Reservoir. It is noted that this is a precautionary assessment and it is not likely that the reservoirs would be operated in this way in reality.

A reduction of 0.67 Ml/d in the minimum compensation flow from Winscar Reservoir represents a reduction of up to 67% in the flow at the top of this reach, and this is assessed as a **major** hydrological impact at any time of year.

During the winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However, the flow reduction at the top of the reach will remain at 67% until either or both of the two reservoirs reach top water level and begin to spill again.

The hydrological impact of the drought option on Windleden Clough 1 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the reservoir, the confidence in the assessment of the hydrological impact is high.

There are no significant flow pressures identified in this reach. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.3.4 River habitats

River habitats have been characterised at a whole reach scale. No additional information for a representative 500m reach has been surveyed with there being no onset of drought walkover undertaken in this reach to date. Transects and supporting photographs have been supplied by YWSL from August 2022 walkover

Windleden Clough 1 is fairly straight, steep, reach which falls ~34m over 0.72km, a slope of 2.77°. There is limited data available in which to characterise the habitats of this reach with there being no RHS data available in this reach. From extant arial imagery there is limited tree cover along the reach with nearly no shaded channel present until the end of the reach towards the confluence with the River Don. Channel width is generally 1-2m wide throughout the reach with no obvious widening of the channel downstream. This is supported by five transects that were undertaken by YWSL along Windleden Clough on 23rd August 2022. The width of the channel means that it is difficult to identify flow types and geomorphological features in the channel. There are no buildings along the course of reach and one bridge that crosses the reach prior to the confluence with the River Don. There are no in-channel structures that would impede fish passage in this reach. However, the waterbody drops into two culverts under a bridge/track at SE 15958 02345, the watercourse then drops into a section of about 30-50 m of artificial channel where a third culvert joins, the watercourse then remains

culverted before remerging as a single culvert at SE 16170 02403. Surrounding land-use is generally rough pasture and moorland heath throughout the reach.

Windleden Clough 1 likely contains a mixture of high and low energy environments, indicated by the steepness of the valley and the valley shape. There is no data available on substrate composition along the reach though its steep nature and steep catchment likely lead to a range in substrate types being available and in-channel geomorphological features being present. These in-stream features are likely to provide the refuge required by both juvenile nursery habitat and refuge potential for adults. The features may provide some additional habitat opportunities for white-clawed crayfish, with suitable substrate potentially also present. The movement/migration of fish and sediments are unlikely to be significantly impacted upon with no weirs in the channel.

The transects undertaken by YWSL in August 2022 were undertaken under a reservoir outflow of 2.7 Ml/d and 1.0 Ml/d saw a 0%, 4%, 9%, 21% and 5% reduction in wetted width at the five transects moving downstream respectively. The mean depth at each transect reduced by 16%, 8%, 48%, 50% and 18% respectively. Though the values tested here are greater than the value that would be implemented through the drought permit, this demonstrates that flow reductions in this reach are likely to result in both depth and wetted width change, noting depth seems most sensitive to flow reduction.

The drought option reduction in flow could lead to several potential impacts within Windleden Clough 1.

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for the duration of drought option.
- Potentially major risk of reduction in wetted aquatic habitat (wetted width reduction) due to channel shape in deep V-shaped valley.
- Potentially major risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for duration of drought option, with retention of dominant habitat types.
- Moderate risk to longitudinal connectivity due to steep nature of channel.
- 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. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Windleden Clough 1 from the drought option is therefore assessed as **major**.

A4.3.5 River water quality

No water quality monitoring locations are present in Windleden Clough 1. Therefore, water quality monitoring location present in the adjacent reach (Don 0) has been used to characterise the water quality in this reach (River Don at Dunford Bridge (NE-49301577)). Though the catchment contributing to this water quality point is also reservoired, it captures water from the neighbouring sub-catchment which may not be representative of catchment contributing to Windleden Lower Reservoir (and subsequently this reach). There are no significant continuous or intermittent discharges within Windleden Clough 1. A summary description of the potential risks to water quality in Windleden Clough 1 as a result of drought options is presented in **Table A4.3**.

Table A4.3 Potential risks to water quality in Windleden Clough 1 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly consistent with High WFD status (0.2 mg/l) throughout the monitoring period.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period	Orthophosphate concentrations were variable, though generally consistent with High or Good WFD status. On the two occasions where the samples were at Moderate status, the flow was >Q80.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	Weak

	Total ammonia	Oxygen	Phosphate
WwTW presenting increased risk	None	None	None
Intermittent pressures presenting risk	None	None	None
Other point source pressures presenting risk	None	None	None
Summary	Minor risk from drought options	Minor risk from drought options	Minor risk from drought options

A4.3.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Windleden Clough 1 as a result of drought options is presented in **Table A4.4**.

Table A4.4 Summary of potential changes in the physical environment of Windleden Clough 1as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that drought option implemented.
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Windleden Clough 1.
River habitats *Major risk*	• The major reduction in flow will lead to a major change in the energy of the system with a major risk to available aquatic habitat for different species requirements and total wetted habitat in the reach. The risk to longitudinal connectivity in the reach is assessed as moderate and sediment dynamics is assessed as minor.
Water quality *Minor risk*	• Reported water quality is mostly consistent with Good or High status with apparent weak flow sensitivity for SRP. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought options implemented and no significant intermittent pressures presenting risk.

Insert Figure A4.2

A4.4 DON 1

A4.4.1 Reach introduction

Don 1 is potentially impacted by a Winscar/Windleden Lower Reservoirs drought permit. A summary of physical environment information for this reach is provided in **Figure A4.3**. The reach includes part of the following river waterbody:

- River Don from Source to Scout Dyke (GB104027057500)

A4.4.2 Reach setting

Don 1, located on main EAR **Figure 4.1,** comprises a 10.6km stretch of the River Don from the outflow of Winscar Reservoir to the confluence with Scout Dyke (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 38.45km^2 along the length of the reach. Don 2 (see **Section A4.3** below) is downstream.

A4.4.3 River flow regime

During the implementation of this drought option, it is likely that the levels in Winscar and Windleden Lower reservoirs will be below top water level and therefore the compensation flow from the two reservoirs will be the only inflow at the top of this reach. The compensation flow can be released from either or both of the two reservoirs in order to comply with the maintained flow requirement at Dunford Bridge, downstream of both reservoir outflows. The outflow from Windleden Lower Reservoir joins the main River Don channel approximately 0.5 km downstream of the Winscar reservoir dam, the start of this reach.

A reduction of 6 Ml/d in winter or 4.67 Ml/d in summer in the minimum maintained flow at Dunford Bridge (the maximum reduction under this drought option, when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks) therefore represents a reduction of up to 67% in the flow at the top of this reach, and this is assessed as a **major** hydrological impact at any time of year.

During the winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However, the flow reduction at the top of the reach will remain at 67% until either or both of the two reservoirs reach top water level and begin to spill again.

The hydrological impact of the drought option on Don 1 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the maintained flow point, the confidence in the assessment of the hydrological impact is high.

There is one flow pressure influencing flow in Don 1 as described in Section A4.4.3.1. There is no flow depleted reach associated with this abstraction either with or without a drought permit. There are no significant discharges within Don 1, noting the Bullhouse Minewater discharge linked with the groundwater transfer license NE/027/0005/001/R01. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.4.3.1 Significant flow pressures

There is one flow pressure influencing flow in Don 1, a hydropower abstraction licence with a hands-off flow condition of 11.2Ml/d. There is no flow depleted reach associated with this abstraction either with or without a drought permit. With the hands-off flow protecting low flows, the risk associated with this pressure is minor.

YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures.

A4.4.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 24 October 2018 at a reservoir outflow of 13.3Ml/d.

Don 1 is fairly straight reach which falls ~92m over 10.6km, a slope of 0.5°. The channel is part shaded for much of its length with deciduous riparian tree cover. There is one RHS site in this reach (site ID 26486). At

this RHS site a range of flow types were observed including 6 pools and 8 riffles and the dominant sediment type was cobbles, noting protruding boulders, pebbles and bed rock were also observed. In aerial imagery, the flow surface was predominantly smooth with some areas of broken flow and rippled flow along the entire reach. The RHS sites identifies that both the left and right banks are predominantly composed of earth and brick and laid stone, with rip-rap being identified at ~10% of spot sample sites for both banks. The left and right banks at the RHS site is noted as being extensively resectioned and reinforced, however, throughout the mid sections of the reach between ~1-7km, bank erosion was visible on imagery, suggesting limited reinforcement. Surrounding land-use is generally rough pasture and moorland heath in the upper sections with rough pasture and improved grassland in the mid and lower sections of the reach and increasing suburban/urban development towards the end of the reach. In the upper sections of the reach there is evidence of mining activity which has left several spoil heap`s adjacent to the channel.

Don 1 contains a mixture of high and low energy environments, indicated by the moderate steepness of the valley, the valley shape and the presence of both erosional and depositional features. Although the dominant substrate is less suitable for supporting spawning habitat, it is considered likely that smaller pockets of suitable types are likely to be present with riffles identified in the RHS reaches. Extensive re-sectioning and reinforcement of banks have the potential to reduce the amount of juvenile nursery habitat and refuge potential for adults, however in-stream features are likely to provide the refuge required by both. The presence of trees in the riparian corridor will provide some allochthonous energy into the stream. The reinforced banks, albeit limited in extent, may provide some additional habitat opportunities for white-clawed crayfish, with suitable substrate also present. The movement/migration of fish and sediments are likely to be significantly impacted upon by the presence of a significant number of weirs in the channel.

The drought option reduction in flow could lead to several potential impacts within Don 1.

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for the duration of drought option.
- Potentially minor risk of reduction in wetted aquatic habitat (wetted width reduction) due to channel shape in deep V-shaped valley.
- Potentially moderate risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for duration of drought option, with retention of dominant habitat types.
- Moderate risk to longitudinal connectivity due to steep nature of channel.
- 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. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Don 1 from drought options is therefore assessed as **moderate**.

A4.4.5 River water quality

Three water quality monitoring locations are present in Don 1. River Don at Starling Bridge (NE-49301640) has been selected to account for any influence from the Bullhouse Minewater Project, the discharge from which has been sampled separately by the EA (14 samples taken between 2014 and 2017 with a mean dissolved iron concentration of 10.6 mg/l). Another site is located downstream of the Bullhouse Minewater Project though sampling at this site commenced in 2025. The EA has requested that the effect of change in river dilution of iron in the discharge from the Bullhouse Minewater Project is considered in this reach. Aside from the Bullhouse Minewater Project, there are no significant continuous or intermittent discharges either within Don 1 or at risk from changes in flow in the reach. A summary description of the potential risks to water quality in Don 1 as a result of drought options is presented in **Table A4.5**.

Table A4.5 Potential risks to water quality in Don 1 as a result of drought options

	Total ammonia	Oxygen	Phosphate	Iron
General quality	Ammonia concentrations were predominantly consistent with High	Dissolved oxygen saturation (%) values were consistent with High WFD status	Orthophosphate concentrations were variable, though predominantly	Total iron concentrations were occasionally inconsistent with

	Total ammonia	Oxygen	Phosphate	Iron
	WFD status (0.2 mg/l) throughout the monitoring period.	(80%) throughout the monitoring period	consistent with high or Good WFD status. On occasions where the samples were at Moderate status, the flow was >Q80.	"Pass" chemical status (1.0 mg/l) There does not appear to be association between reduced river flows and increased iron concentration.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	Poorer quality at higher flow	Weak
WwTW presenting increased risk	None	None	None	N/A
Intermittent pressures presenting risk	None	None	None	N/A
Other point source pressures presenting risk	None	None	None	Bullhouse Minewater Project (a walkover reach covering this section of the river has been included in the schedule of monitoring for Don 1 on a precautionary basis (see main EAR Section 6)
Summary	Minor risk from drought options	Minor risk from drought options	Minor risk from drought options	Uncertain risk from drought options

A4.4.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Don 1 as a result of drought options is presented in **Table A4.6**.

Table A4.6 Summary of potential changes in the physical environment of Don 1 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that drought options implemented.
Flow depleted reaches/significant flow pressures *Minor risk*	• One significant flow pressure within the reach with hands-off flow protecting low flow conditions..
River habitats *Moderate risk*	• The major reduction in flow will lead to a major change in the energy of the system with a moderate risk to available aquatic habitat for different species requirements and longitudinal connectivity in the reach. The risk to total wetted habitat and sediment dynamics is assessed as minor.
Water quality *Minor risk*	• There is uncertainty associated with the dilution of iron in the discharge from the Bullhouse Minewater Project in Don 1 and how this may change with drought options as to date with limited data available. A walkover reach covering this section of the river has been included in the schedule of monitoring for Don 1 on a precautionary basis (see main EAR Section 6). • Reported water quality is mostly consistent with Good or High status with apparent weak flow sensitivity for SRP. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought options implemented and no significant intermittent pressures presenting risk.

Insert Figure A4.3

A4.5 DON 2

A4.5.1 Reach introduction

Don 2 is potentially impacted by Scout Dike Reservoir and Winscar/Windleden Lower Reservoirs drought permits. A summary of physical environment information for this reach is provided in **Figure A4.2**. The reach includes all of the main channel of the following river waterbody:

- River Don from Scout Dyke to the Little Don (GB104027057490).

A4.5.2 Reach setting

Don 2, located on main EAR **Figure 4.4,** comprises a 12.6km stretch of the River Don from the confluence with Scout Dyke to the confluence with the Little Don River (**Table A2.1**). Don 3 (see **Section A4.4** below) is downstream.

A4.5.3 River flow regime

River flow in Don 2 is influenced by the Winscar/Windleden Lower Reservoir influenced flows of Don 1 and Scout Dike Reservoir influenced flows of Scout Dike 1. As such limited flow variability would be apparent during the implementation of South Area drought options part-reflecting local hydrological response to rainfall conditions during the ongoing environmental drought.

There is no gauged flow data available for this reach of the River Don. Flows at the upstream end of this reach have been estimated using the Gustard flow transposition method, based on catchment parameter ratios and gauged flow data from an available downstream gauge at Sheffield Hadfields. The Sheffield Hadfields record was first adjusted to allow for effluent discharges upstream of the gauge location (from Cheesebottom and Ewden WwTW) and the effects of the reservoirs in the upper catchment including the catchment upstream of the Dunford Bridge maintained flow location. Measured outflows from Scout Dike reservoir and measured daily flows at the Dunford Bridge maintained flow location were then added back on to the estimated (transposed) data series, to provide an estimated flow record for the River Don just downstream of the Scout Dyke confluence.

It was noted that the reservoir outflow data series included a period in 1996 where the normal minimum compensation and/or maintained flow values were not met, reflecting a historic drought permit implemented in 1996 which allowed compensation flow reductions at several of the Sheffield area reservoir groups. The estimated flow record for the River Don downstream of the Scout Dyke confluence was adjusted to a minimum of 11.79 Ml/d over this period, to remove the influence of historic drought permit events on the baseline flow record.

The River Don downstream of the Scout Dyke confluence is influenced by both the Scout Dike Reservoir and the Winscar/Windleden Lower Reservoirs drought options. The maximum combined flow reduction from these two options is 7.80 Ml/d, at times when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks. The combined drought options therefore represent reductions of up to 50% and 66% in the summer Q95 and Q99 flow statistics respectively and would therefore be assessed as a **major** hydrological impact in the summer period. During the winter period, the combined flow reduction represents reductions of up to 47% and 19% in the year round Q95 and Q50 flow statistics, which is assessed as a **major** hydrological impact in winter also.

The hydrological impact of the drought option on Don 2 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place.

There are two significant flow pressures influencing flow in Don 2, an abstraction licence leading to a flow depleted reach[9] as described in **Section A4.5.3.1**, and a discharge licence leading to a significant flow addition from Cheesebottom WwTW, with a dry weather flow of 4.48 Ml/d. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

[9] 'Flow depleted reach' refers to the length between the abstraction and discharge point of non-consumptive licences (e.g. aquaculture, hydro-power).

A4.5.3.1 Significant flow pressures

There is one significant licensed non-consumptive abstraction depleting flow in Don 2 for the production of energy, with a peak daily licensed abstraction rate of 28.08Ml/d. This abstraction is a non-consumptive abstraction for hydroelectric power generation, without a hands-off-flow condition ('River Don –Old Mill – Thurgoland') with potential flow impacts. An abstraction at that rate could reduce flows in the depleted reach, during environmental drought, without or in combination with drought options to zero. A walkover reach covering the section of the river has been included in the schedule of monitoring for Don 2 (see main EAR Section 6). YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures.

A4.5.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 24 August 2018 at an estimated river flow at the flow assessment point for the reach of 19.3Ml/d.

Don 2 is a fairly sinuous reach with relatively straight sections throughout the reach. The reach falls ~65m over 12.6km, a slope of 0.3°. The channel is heavily shaded and flows through heavily wooded valley for the last 8km. Where the channel is visible through tree cover, the channel is between ~10-12m wide.

There are three RHS sites within the reach, the most upstream is 8.1km along the reach (site ID 26997), the second 10.8km along the reach (site ID 23970) and 11.3km along the reach (site ID 18199). At the most upstream RHS site (site 26997), one riffle was observed, there was no recorded pools, or point bars. This survey also noted that <33% of the channel was ponded by artificial channel impoundment, as well as >33% of the channel had been realigned and over-deepened. At the second RHS site (site 23970), 1 unvegetated point bar was observed, as well as stable cliffs identified at this site. At site 23970, the bed substrate was dominated by cobble (40%), however areas of bedrock (10%) and boulders (20%) were observed. The presence of exposed bedrock and exposed boulders has been noted by all RHS sites in this reach (being present at ~40% of the spot sites). Where visible on aerial imagery, the channel surface indicates that smooth flow predominates. RHS data show varied flow types. At RHS site 23970, broken waves (10%), chaotic (10%), rippled (50%) and smooth (20%) flow was observed, areas of upwelling (10%) were also recorded. Vertical or undercut banks and steep banks (>45°) were present throughout the site. At the most downstream RHS site (site 18199), two riffles were observed, as well as one unvegetated point bar. This survey also noted that <33% of the channel was ponded by artificial channel impoundment, with no recorded channel modification. Surrounding land-use is generally suburban/urban development, improved grassland and arable land and deciduous woodland and plantations. Suburban/urban development is particularly common in the upper reaches while deciduous woodland is common in the lower sections of the reach.

Don 2 also supports a variety of high and low energy environments, with the presence of erosional and depositional features identified. However, as the valley slope of Reach 2 is shallower than Reach 1, slower flows are more likely to dominate; however flow variation was observed. The substrate composition identified suggests some, albeit limited, potential for spawning habitat with the RHS data identifying the presence of some riffles in the surveyed reaches. The substrate composition also provides some refuge for juvenile and adult fish and white-clawed crayfish. Although there is a limited number of pools identified, the presence of vertical/undercut banks and large substrate types will provide cover. The extensive coverage of deciduous trees in the riparian habitat will ensure a high input of allochthonous energy into the stream and provide further cover opportunities for fish. The reinforced banks present may provide additional habitat opportunities for white-clawed crayfish. Modification to the channel will have impacts upon the movement/migration of fish and sediment due to the presence of weirs and a large number of road crossings, some of which could incorporate culverts.

The drought options reduction in flow could lead to several potential impacts within Don 2:

- Major changes in the energy of the system associated with up to 66% reduction in flow for duration of drought options.
- Potentially moderate risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars) and protrusion of bed elements (such as larger particles) through the flow surface for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.

- Potentially moderate risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought options, with retention of dominant habitat types.
- Major risk to longitudinal connectivity due to the potentially depleted reach and eight noted weirs, for periods of time during the duration of drought options, noting the retention of an overall variable flow pattern.
- Minor risk of changes in sediment dynamics for duration of drought options. 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Don 2 from drought options is therefore assessed as **major**.

A4.5.5 River water quality

The first water quality monitoring point present in Don 2, River Don at Oxspring Bridge (NE-49301634), was used. Water quality modelling identifies one continuous discharge, YWSL Cheesebottom WwTW, presenting a significant risk to total ammonia in Don 2 and a continued risk to total ammonia due to YWSL Scout Dike WwTW from the upstream reach (Scout Dike 1). There is one frequently spilling CSO potentially presenting an environmental risk in the reach. A summary description of the potential risks to water quality in Don 2 as a result of drought options is presented in **Table A4.7**.

Table A4.7 Potential risks to water quality in Don 2 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were consistent with High WFD status (0.2 mg/l) throughout the monitoring period	Dissolved oxygen saturation (%) values predominantly were consistent with High WFD status (80%) throughout the monitoring period	Orthophosphate concentrations were variable, Moderate to High WFD status throughout the monitoring period. Some seasonality apparent.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	Weak
WwTW presenting increased risk	Risk of medium-term chronic, regular, temporary water quality pressures (acute toxicity of ammonia) downstream of Cheesebottom WwTW and Scout Dike WwTW in the upstream reach	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 one listed CSO during rainfall events		None
Other point source pressures presenting risk	None	None	None
Summary	Moderate risk from drought options associated with CSO discharge and reduction in dilution of WwTWs	Moderate risk from drought options associated with CSO discharge	Moderate risk from drought options

A4.5.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Don 2 as a result of drought options is presented in **Table A4.8**.

Table A4.8 Summary of potential changes in the physical environment of Don 2 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 66% in river flows for periods of time during the duration of the drought option, throughout the reach, at any time of year that drought options implemented
Flow depleted reaches/significant flow pressures *Major risk*	• One flow depleted reach with potential for periods of time with zero flow without mitigation • One significant flow addition associated with a water company wastewater discharge.
River habitats *Major risk*	• The major reduction in flow will result in a major change in the energy of the system with the potential for a major risk to longitudinal connectivity. Risk to wetted aquatic habitats and habitat variability for different species is assessed moderate, whilst risk to sediment dynamics has been assessed as minor.
Water quality *Moderate risk*	• Moderate risk from medium-term chronic, regular, temporary water quality pressures (acute toxicity of ammonia) downstream of Cheesebottom WwTW. Also continued risk to ammonia associated with Scout Dike WwTW in the upstream reach (Scout Dike 1). • Moderate risk from short term acute, infrequent, temporary water quality pressures locally downstream of one listed CSO during rainfall events. • SRP quality is not consistent with Good status with weak flow sensitivity, therefore a moderate risk to water quality has been assessed associated with change in dilution of diffuse pollution pressures to SRP. • Reported water quality is predominantly consistent with Good status and no apparent flow sensitivity for dissolved oxygen and ammonia.

Insert Figure A4.4

A4.6 DON 3

A4.6.1 Reach introduction

Don 3 is potentially impacted by Scout Dike Reservoir, Winscar/Windleden Lower Reservoirs and Underbank Reservoir drought permits. A summary of physical environment information for this reach is provided in **Figure A4.5**. The reach includes all of the main channel of the following river waterbody:

- River Don from the Little Don to River Loxley confluence (GB104027057411).

A4.6.2 Reach setting

Don 3, located on main EAR **Figure 4.1,** comprises a 2.7km stretch of the River Don from the confluence with the Little Don River to the confluence with Ewden Beck (**Table A2.1**). Don 4 (see **Section A4.5** below) is downstream.

A4.6.3 River flow regime

As outlined under the assessment for the Don 2 reach, flows at the upstream end of the Don 3 reach have been estimated using the Gustard flow transposition method, based on catchment parameter ratios and adjusted gauged flow data from an available downstream gauge at Sheffield Hadfields. Measured outflows from Scout Dike Reservoir and Underbank Reservoir, measured daily flows at the Dunford Bridge maintained flow location and the dry weather flow (DWF) from Cheesebottom WwTW were added back on to the estimated (transposed) data series, to provide an estimated flow record for the River Don just downstream of the Little Don River confluence. Again as outlined previously, the estimated flow record for the River Don downstream of the Little Don River confluence was adjusted to a minimum of 27.79 Ml/d, to remove the influence of historic drought permit events (particularly noted in 1996) on the baseline flow record.

The River Don downstream of the Scout Dyke confluence is influenced by the Scout Dike, Underbank and Winscar/Windleden Lower reservoirs drought options. The maximum combined flow reduction from these three options is 18.53 Ml/d, at times when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks. The combined drought options therefore represent reductions of up to 49% and 66% in the summer Q95 and Q99 flow statistics respectively and would therefore be assessed as a **major** hydrological impact in the summer period. During the winter period, the combined flow reduction represents reductions of up to 46% and 22% in the year round Q95 and Q50 flow statistics, which is assessed as a **major** hydrological impact in winter also.

The hydrological impact of the drought option on Don 3 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place.

There are two significant flow pressures influencing flow in Don 3, both discharge licences leading to a significant flow addition. The two discharge licences are from Ewden Water Treatment Works, an intermittent discharge with a max daily flow of 50 Ml/d and Ewden Wastewater Treatment Works, with a dry weather flow of 3.48Ml/d. There are no significant abstractions within Don 3. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.6.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 22 August 2018 at an estimated river flow at the flow assessment point for the reach of 45.6Ml/d.

Don 3 is a fairly straight reach that falls ~26m over 2.7km, a slope of 0.5°. The channel is heavily shaded with semi-continuous to continuous riparian tree cover. The channel is largely obscured by trees on extant aerial imagery, however, where the channel is visible through tree cover at the start of the reach the channel is ~12m wide. No within channel features are visible on aerial imagery. Surrounding land use is generally suburban/urban, rough pasture and deciduous woodland. Suburban/urban development is dominant on the left bank, notably as frequently bare waste ground. At the RHS site (site ID 28070), one pool was observed, there was no recorded riffles, or point bars. This survey also noted that >33% of the channel had been realigned and over-deepened, with no observation of water impoundment. At the YWSL baseline monitoring site (survey site 13516), riffle flows dominated (60%) with run (39%) and a small amount of backwater (1%) also observed.

Additionally, at survey site 13516 it was noted that boulders (60%) dominated the substrate, with cobbles (25%), pebbles/ gravel (10%) and sand (5%) were also noted.

Don 3 contains high and low energy environments, indicated by the moderate slope of the valley. The extensive cover of riparian trees will ensure a high input of allochthonous energy and provide cover/refuge for fish and white-clawed crayfish.

The drought options reduction in flow could lead to several potential impacts within Don 3:

- Major risk of changes in the energy of the system associated with up to 66% reduction in flow for periods of time during the duration of drought options.
- Potentially minor risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins and the margins of within-channel features (such as channel bars and islands) for periods of time during the duration of drought options.
- Potentially minor risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought options, with retention of dominant low energy habitat types.
- Negligible risk to longitudinal connectivity.
- Minor risk of changes in sediment dynamics for duration of drought options. 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Don 3 from drought options is therefore assessed as **minor**.

A4.6.5 River water quality

Two water quality monitoring points are present in Don 3. For this assessment the second sample in the reach, River Don Downstream Of Stocksbridge S.W (NE-49301683), was used due to its better data quality. A summary description of the potential risks to water quality in Don 3 as a result of drought options is presented in **Table A4.9**.

Table A4.9 Potential risks to water quality in Don 3 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly consistent with High or Good WFD status (0.3 mg/l) throughout the monitoring period	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. .	Orthophosphate concentrations were inconsistent, typically Moderate or Poor WFD status throughout the monitoring period. Some seasonality was apparent with notable peaks in June/ August.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	Moderate
WwTW presenting increased risk	None	None	None
Intermittent pressures presenting risk	None	None	None
Other point source pressures presenting risk	None	None	None
Summary	No risk from drought option	No risk from drought option	Moderate risk from drought options

A4.6.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Don 3 as a result of drought options is presented in **Table A4.10**.

Table A4.10 Summary of potential changes in the physical environment of Don 3 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 66% in river flows for periods of time during the duration of the drought option, throughout the reach, at any time of year that drought options implemented
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Don 3.
River habitats *Minor impacts*	• The major reduction in flow will present major change to the current low energy system with the potential for minor risks to total wetted aquatic habitat, available habitat for different species, longitudinal connectivity and sediment dynamics.
Water quality *Moderate risk*	• SRP quality is not consistent with Good status with moderate flow sensitivity, therefore a moderate risk to water quality has been assessed associated with change in dilution of diffuse pollution pressures to SRP. • Reported water quality is predominantly consistent with Good status and no apparent flow sensitivity for dissolved oxygen and ammonia. • No significant intermittent or continuous pressures presenting risk.

Insert Figure A4.5

A4.7 DON 4

A4.7.1 Reach introduction

Don 4 is potentially impacted by Scout Dike Reservoir, Winscar/Windleden Lower Reservoirs, Underbank Reservoir and More Hall Reservoir drought permits. A summary of physical environment information for this reach is provided in **Figure A4.6**. The reach includes part of the following river waterbody:

- River Don from the Little Don to River Loxley confluence (GB104027057411).

A4.7.2 Reach setting

Don 4, located on main EAR **Figure 4.1,** comprises a 9.6 km stretch of the River Don from the confluence with Ewden Beck to the confluence with the River Loxley. (**Table A2.1**). Don 5 (see **Section A4.6** below) is downstream.

A4.7.3 River flow regime

As outlined under the assessment for the "Don 2" reach, flows at the upstream end of the "Don 4" reach have been estimated using the Gustard flow transposition method, based on catchment parameter ratios and adjusted gauged flow data from an available downstream gauge at Sheffield Hadfields. Measured outflows from Scout Dike Reservoir, Underbank Reservoir and More Hall Reservoir, measured daily flows at the Dunford Bridge maintained flow location and the dry weather flows (DWF) from Cheesebottom and Ewden WwTWs were added back on to the estimated (transposed) data series, to provide an estimated flow record for the River Don just downstream of the Ewden Beck confluence. Again as outlined previously, the estimated flow record for the River Don downstream of the Ewden Beck confluence was adjusted to a minimum of 36.89 Ml/d, to remove the influence of historic drought permit events (noted in 1996) on the baseline flow record.

The River Don downstream of the Ewden Beck confluence is influenced by the Scout Dike, Underbank, More Hall and Winscar/Windleden Lower reservoirs drought options. The maximum combined flow reduction from these four options is 24.63 Ml/d, at times when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks. The combined drought options therefore represent reductions of up to 45% and 67% in the summer Q95 and Q99 flow statistics respectively, and would therefore be assessed as a **major** hydrological impact in the summer period. During the winter period, the combined flow reduction represents reduction of up to 43% and 23% in the year round Q95 and Q50 flow statistics, which is assessed as a **major** hydrological impact in winter also.

The hydrological impact of the drought option on Don 4 is therefore assessed as **major** for both the summer/ autumn period and any winter refill period while drought options remain in place.

There are no significant flow pressures, either abstractions or discharges, influencing flow in Don 4. There are no flow depleted reaches within Don 4. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.7.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 5 September 2018 at a reservoir outflow of 63.5Ml/d.

Don 4 is a relatively straight reach with some fairly sinuous sections in the middle of the reach. The reach falls ~50m over 9.6km, a slope of 0.3°. Riparian tree cover is variable along the length of the reach, with the channel surrounded by several woods in the upper and mid reaches, notably Wharncliffe Wood and Beeley Wood. Channel width varies between 12-15m wide throughout the reach. Where riparian tree cover is limited several in channel features are visible, most notably side bars towards the mid sections of the reach as well as several areas of boulders protruding through the channel surface, notably in the upper reaches. The single RHS site (site ID 19969) records natural berms at 5 spot sites with a point bar and vegetated side bars also recorded, one unvegetated bar was recorded in the latest survey; indicating the channel is dynamic. Data from the RHS sites indicates that the river bed substrate is composed predominantly of cobble (50%) and bedrock (30%) at some sites. The bed was not visible at the remaining 20% of the spot sites measured. The presence of exposed bedrock and exposed boulders has been noted as occurring throughout the reach. Where visible on aerial imagery, the channel surface indicates that smooth flow predominates with some areas

of broken flow. Flow at the RHS site was recorded as smooth (40% of spot sites and extensive throughout the reach) and unbroken standing wave (30%) with the remaining flow recorded as rippled and broken standing wave. Data for the RHS site identifies the banks are dominated by shallow angles (<45º); however 33% of the banks are steep (>45º). The RHS survey identified the left banks are predominantly composed of earth (with some brick or laid stone) and the right banks were composed of brick or laid stone with minor contributions of earth. Left bank face vegetation was recorded as mainly complex, while the right face was complex (50%) and bare (50%). Bank top vegetation was recorded as mostly bare, with some uniform and complex vegetation. The left and right banks at the RHS site were noted as being extensively reinforced or resectioned. The RHS also noted the presence of natural berms (suggesting readjustment of channel form in response to channel changes). Surrounding land use is generally deciduous woodland for the first 5.3km from the start of the reach, however there is some suburban/urban development around 3.0 - 4.5km (Oughtibridge). Thereafter land-use is predominantly suburban/urban development with scattered parkland and gardens and improved grassland as the reach flows through Sheffield.

Don 4 supports both high and low energy environments, with low energy flows dominating the flow structure. Spawning habitat is considered unlikely to occur within the reach, as cobble and boulder substrates dominate the watercourse and only one riffle was identified within the RHS reach. However, the reduced flows and presence of some features to provide refuge indicate juveniles may utilise the habitat. The variable presence of trees in the riparian habitat indicates some input of allochthonous energy into the watercourse. The reinforced banks may provide additional habitat opportunities for white-clawed crayfish, with suitable substrate also present. Movement/migration of fish and sediments in the reach are likely to be significantly influenced by the presence of weirs.

The drought options reduction in flow could lead to several potential impacts within Don 4

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for duration of drought options.
- Potentially moderate risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars) and protrusion of bed elements (such as larger particles) through the flow surface for periods of time during the duration of drought options, noting the retention of an overall variable flow pattern.
- Potentially moderate risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought options, with retention of dominant habitat types.
- Moderate risk to longitudinal connectivity from nine noted weirs, for periods of time during the duration of drought options, noting the retention of an overall variable flow pattern.
- Moderate risk of changes in sediment dynamics for duration of drought options. 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Don 4 from drought options is therefore assessed as **moderate**.

A4.7.5 River water quality

For this assessment the first sample site in the reach River Don at Oughtibridge (NE-49301628) has been used. There is one frequently spilling CSO potentially presenting an environmental risk in the reach. A summary description of the potential risks to water quality in Don 4 as a result of drought options is presented in **Table A4.11**.

Table A4.11 Potential risks to water quality in Don 4 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly consistent with High WFD status (0.2 mg/l)	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period.	Orthophosphate concentrations were inconsistent, typically Moderate or Poor WFD status) throughout the

	Total ammonia	Oxygen	Phosphate
	throughout the monitoring period.		monitoring period. Some seasonality was apparent with notable peaks in June/ August.
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 one listed CSO 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.

A4.7.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Don 4 as a result of drought options is presented in **Table A4.12**.

Table A4.12 Summary of potential changes in the physical environment of Don 4 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows for periods of time during the duration of the drought option, throughout the reach, at any time of year that drought options implemented
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Don 4.
River habitats *Moderate risk*	• The major reduction in flow will lead to a major change in the energy of the system with the potential for moderate impacts to total wetted aquatic habitat, available habitat for different species, longitudinal connectivity and sediment dynamics.
Water quality *Moderate risk*	• Moderate risk from short term acute, infrequent, temporary water quality pressures locally downstream of one listed CSO during rainfall events. • SRP quality is not consistent with Good status with moderate flow sensitivity, therefore a moderate risk to water quality has been assessed associated with change in dilution of diffuse pollution pressures to SRP. • Reported water quality is predominantly consistent with Good status and no apparent flow sensitivity for dissolved oxygen and ammonia. • No identified risk associated with continuous discharges.

Insert Figure A4.6

A4.8 DON 5

A4.8.1 Reach introduction

Don 5 is potentially impacted by Scout Dike Reservoir, Winscar/Windleden Lower Reservoirs, Underbank Reservoir, More Hall Reservoir, Damflask Reservoir and Rivelin Lower Reservoir drought permits. A summary of physical environment information for this reach is provided in **Figure A4.7**. The reach includes part of the following river waterbodies:

- River Don from River Loxley conf to River Don Works (GB104027057412);
- River Don from River Don Works to River Rother (GB104027057413)

A4.8.2 Reach setting

Don 5, located on main EAR **Figure 4.1,** comprises a 13.7km stretch of the River Don from the confluence with the River Loxley to the confluence with the River Rother (**Table A2.1**).

A4.8.3 River flow regime

As outlined under the assessment for the Don 2 reach, flows at the upstream end of the Don 5 reach have been estimated using the Gustard flow transposition method, based on catchment parameter ratios and adjusted gauged flow data from the gauge at Sheffield Hadfields which is further downstream within this reach. Measured outflows from Scout Dike Reservoir, Underbank Reservoir, More Hall Reservoir, Damflask Reservoir and Rivelin Reservoir, measured daily flows at the Dunford Bridge maintained flow location and the dry weather flows (DWF) from Cheesebottom and Ewden WwTW were added back on to the estimated (transposed) data series, to provide an estimated flow record for the River Don just downstream of the River Loxley confluence. As outlined previously, the estimated flow record for the River Don downstream of the River Loxley confluence was adjusted to a minimum of 65.19 Ml/d, to remove the influence of historic drought permit events (particularly noted in 1996) on the baseline flow record.

The River Don downstream of the River Loxley confluence is influenced by the Winscar/Windleden Lower, Scout Dike, Underbank, More Hall, Damflask and Rivelin reservoirs drought options. The maximum combined flow reduction from these six options is 43.59 Ml/d, at times when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks. The combined drought options therefore represent reductions of up to 49% and 67% in the summer Q95 and Q99 flow statistics respectively, and would therefore be assessed as a **major** hydrological impact in the summer period. During the winter period, the combined flow reduction represents reductions of up to 47% and 25% in the year round Q95 and Q50 flow statistics, which is assessed as a **major** hydrological impact in winter also.

Further down the reach, flows are measured at the Sheffield Hadfields gauge at grid reference SK3893190954. The summer Q95 and Q99 flow statistics, after adjustment for historic drought permit and historic compensation flow regimes, are 90.72 Ml/d and 65.19 Ml/d respectively, so that the combined flow reduction of 43.68 Ml/d represents percentage reductions of 48% and 67% respectively in these flow statistics at the gauged location, and would therefore still be assessed as a **major** hydrological impact during the summer months of April to September inclusive. Similarly the year round Q95 and Q50 statistics for the Sheffield Hadfields record, after adjustment for historic drought permit and historic compensation flow regimes, are 99.40 Ml/d and 234.00 Ml/d respectively, so that the 43.68 Ml/d flow reduction equates to percentage reductions of 44% and 19% in these flow statistics and would therefore also be assessed as a **major** hydrological impact during the winter months of October to March inclusive, but again noting that the flow statistics are influenced by the effect of previous drought permit flow reductions.

The hydrological impact of the drought option on Don 5 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place.

There are three significant flow pressures influencing flow in Don 5, two abstraction licences as described in **Section A4.6.3.1**, and a discharge permit leading to a significant flow addition from Blackburn Meadows WwTW, with a dry weather flow of 158.00 Ml/d. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.8.3.1 Significant flow pressures

There are two significant licensed abstractions depleting flow in Don 5 for industrial services.

One abstraction is for a non-consumptive abstraction for metal production, with a peak daily licensed abstraction rate of 9.09Ml/d without a hands-off-flow condition ('River Don – Ickles – Rotherham') with potential flow impacts. An abstraction at that rate could reduce flows in the reach, during environmental drought, in combination with drought options by a further 13.9% (compared to baseline Qs99 flows of 65.3 Ml/d for the reach).

The other abstraction is for a non-consumptive abstraction for metal production with a peak daily licensed abstraction rate of 26.3Ml/d, without a hands-off-flow condition ('River Don Forgemasters Steel') with potential flow impacts. An abstraction at that rate could reduce flows in the reach, during environmental drought, in combination with drought options by a further 40.3% (compared to baseline Qs99 flows of 65.3 Ml/d for the reach).

YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures.

A4.8.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 4 September 2018 at a local flow of 109.2Ml/d.

Don 5 is a fairly sinuous reach which falls ~30m over 13.7km, a slope of 0.1°. Riparian tree cover is semi-continuous along the reach. From a review of arial imagery, the channel measures between 23-29m, this width apparently reflecting the confinement of the channel with reinforced banks as it flows through Sheffield. Approximately 3 islands and 2 large berms are noted in the channel, mostly caused by deposition downstream of weirs or bridges, the largest situated at ~1.6km downstream. The flow surface of the channel is predominantly smooth with some areas of broken flow. Approximately two areas of broken flow in the upper section of the reach are apparently related to riffles. Aerial imagery shows that most channel banks are reinforced and vertical. Surrounding land use is dominantly suburban/urban with a small area of waste ground towards the top of the reach on the left bank. At the YWSL baseline monitoring site (survey site 13518), it was observed that run flows dominated (84%) with backwater (5%) and a small amount of riffle (1%) also observed. Additionally, at survey site 13518 it was noted that pebbles/gravel (40%) and cobbles (35%) dominated the substrate, with sand (15%), boulders (5%) and silt/clay (5%) also noted.

Don 5 is likely to be dominated by low energy environments, indicated by the shallow slope of the watercourse, however high energy environments are also likely to be present, with erosional and depositional features identified in the watercourse. The potential presence of riffles within the reach indicates some potential for spawning habitat to be present, with lower energy flows likely to support juvenile fish. The semi-continuous presence of trees in the riparian habitat will provide some allochthonous energy into the watercourse and provide cover/refuge for fish and white-clawed crayfish. Movement/migration of fish and sediments are potentially limited in the reach by the presence of weirs.

The drought options reduction in flow could lead to several potential impacts within Don 5:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for periods of time during the duration of drought options.
- Potentially minor risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins and the margins of within-channel features (such as channel bars and islands) for periods of time during the duration of drought options.
- Potentially minor risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought options, with retention of dominant low energy habitat types.
- Minor risk to longitudinal connectivity from ten in-channel structures for periods of time during the duration of drought options.
- Minor risk of changes in sediment dynamics for duration of drought options. 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Don 5 from drought options is therefore assessed as **minor**.

A4.8.5 River water quality

There are numerous water quality sites in this reach. Of all of the sites in the reach, the Don at Meadowhall Centre (NE-49301610) site has been selected to characterise the general water quality in this reach due to it having the best quality data spanning between 2014-2024. There are seven frequently spilling CSO potentially presenting an environmental risk in the reach. A summary description of the potential risks to water quality in Don 5 as a result of drought options is presented in **Table A4.13**.

Table A4.13 Potential risks to water quality in Don 5 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly consistent with High WFD status (0.2 mg/l) throughout the monitoring period with one sample achieving 'Moderate' status. Some seasonality was apparent.	Dissolved oxygen saturation (%) values predominantly consistent with High WFD status (80%) throughout the monitoring. Some seasonality was apparent.	Orthophosphate concentrations were variable, typically consistent with Moderate WFD status (0.141 mg/l). Some seasonality was apparent with notable peaks in June/ August.
Flow sensitivity (diffuse pollution)	None apparent	Weak	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 seven listed CSO 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.

A4.8.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Don 5 as a result of drought options is presented in **Table A4.14**.

Table A4.14 Summary of potential changes in the physical environment of Don 5 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows for periods of time during the duration of the drought option, throughout the reach, at any time of year that drought options implemented
Flow depleted reaches/significant flow pressure *Major risk*	• One abstraction with potential for periods of time with flow reduced by 13.9% without mitigation. • One abstraction with potential for periods of time with flow reduced by 40.3% without mitigation. • One significant flow addition associated with a water company wastewater discharge.
River habitats *Minor impacts*	• The major reduction in flow will present a major change to the current low energy system with the potential for minor risks to total wetted aquatic habitat, available habitat for different species, longitudinal connectivity and sediment dynamics.
Water quality *Moderate risk*	• Moderate risk from short term acute, infrequent, temporary water quality pressures locally downstream of seven listed CSO during rainfall events. • SRP quality is not consistent with Good status with moderate flow sensitivity, therefore a moderate risk to water quality has been assessed associated with change in dilution of diffuse pollution pressures to SRP. • Reported water quality is predominantly consistent with High and Good status and weak/no apparent flow sensitivity for dissolved oxygen and ammonia. • No identified risk associated with continuous discharges.

Insert Figure A4.7

A4.10 SCOUT DIKE 1

A4.10.1 Reach introduction

Scout Dike 1 is potentially impacted by a Scout Dike Reservoir drought permit. A summary of physical environment information for this reach is provided in **Figure A4.8**. The reach includes part of the following river waterbody:

- Scout Dike from Source to River Don (GB104027057530).

A4.10.2 Reach setting

Scout Dike 1, located on main EAR **Figure 4.1,** comprises a 1.8km stretch of Scout Dike from the outflow of Scout Dike Reservoir to the confluence with the River Don (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 0.97km^2 along the length of the reach. Don 2 (see **Section A4.3** above) is downstream.

A4.10.3 River flow regime

During the implementation of this drought option, it is likely that the level in Scout Dike Reservoir will be below top water level and therefore the compensation flow from the reservoir will be the only inflow at the top of this reach. A reduction of 1.8 Ml/d (the maximum reduction under this drought option, when reservoir level is below the control line and when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks) therefore represents a reduction of up to 67% in the flow at the top of this reach, and this is assessed as a **major** hydrological impact at any time of year.

During the winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However, the flow reduction at the top of the reach will remain at 67% until the reservoir reaches top water level and begins to spill again.

The hydrological impact of the drought option of Scout Dike 1 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the reservoir, the confidence in the assessment of the hydrological impact is high.

There are no significant flow pressures, either abstractions or discharges, influencing flow in Scout Dike 1. There are no flow depleted reaches within Scout Dike 1. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.10.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 22 August 2018 at an estimated river flow at the flow assessment point for the reach of 2.7Ml/d.

Scout Dike 1 is a fairly straight reach which falls ~16m over 1.8km, a slope of 0.5°. The channel is heavily shaded with extensive deciduous riparian tree cover along most of its length.

There are two RHS sites in this reach, the furthest upstream site being site ID 26602, with site ID 26476 being located towards the confluence with the River Don. The further downstream RHS site 26476, identifies the presence of one river terrace. The reach flows through two pond systems ~0.3km and ~0.6km downstream of the reservoir outflow. The latter pond is an ornamental water feature, currently managed as a coarse fishery. Where the channel is visible through tree cover, the channel is between ~2m wide in the upper sections, increasing to ~6m wide in the lower reaches next to the confluence with the River Don. At the RHS site 26476, the river was recorded as 6m wide. The RHS has indicated approximately 2 side bars, and 4 vegetated point bars, no depositional features were recorded at the RHS survey site. Several stable cliffs were identified, confirmed by the RHS site 26476, where 20% of the left bank was recorded as stable cliff. At RHS site 26476, a range of bed substrate was recorded including: boulder (20%); cobble (20%), gravel / pebble (40%), bedrock (10%) and artificial material (10%). Further data is available due to the YWSL baseline monitoring site (survey site 13556), where cobble dominated (40%). However, areas of boulder (33%), pebble/gravel (20%), sand (5%) and silt (2%) were also observed. The presence of exposed bedrock and exposed boulders have been noted at this RHS site. At RHS site 26476, smooth flow dominated (60%), however areas of rippled flow were also observed (40%); 10 pools and 9 riffles were recorded within the reach. Data from the YWSL baseline

monitoring site also identified flow variation. 50% of flow was riffle, however areas of smooth flow (35%) and backwaters (15%) were also observed. At RHS site 26476, earth dominated, however areas of brick were also observed. There was a mixture of complex and no vegetation on the left bank top and generally no vegetation on the right banktop. The left and right banks at the RHS site was noted as extensively steep (>45°), with the presence of undercut, gently sloping and composite banks throughout the site. Whole bank reinforcement, re-sectioning and poaching were identified on both banksides throughout the RHS site. Surrounding land use is generally rough pasture and improved grassland in the upper and mid sections of the reach with suburban/development, parkland and gardens and open water towards the end of the reach. At the second RHS site 26602, located further upstream, three pools and two riffles were observed with no point bars observed. The survey also noted that <33% of the channel was ponded by artificial channel impoundment, as well as >33% of the channel had been realigned and over-deepened.

Scout Dike 1 supports a mixture of high and low energy environments, indicated by the moderate steepness in the valley and the presence of both erosional and depositional features. The presence of a significant number of pools and riffles and favourable substrates identified in the RHS reach suggests that the reach is likely to be an important habitat for spawning and juvenile nursery for fish species requiring clean and unconsolidated gravels, with sufficient pools and features to support resting adults. The extensive coverage of deciduous trees in the riparian habitat will ensure a high input of allochthonous energy into the stream and provide further cover opportunities for fish. The reinforced banks present may provide additional habitat opportunities for white-clawed crayfish, with suitable substrate present.

The drought option reduction in flow could lead to several potential impacts within Scout Dike 1:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for periods of time during the duration of drought option.
- Potentially minor risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins and the margins of within-channel features (such as channel bars and islands) for periods of time during the duration of drought option.
- Potentially minor risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought option, with retention of dominant low energy habitat types.
- Minor risk to longitudinal connectivity from four in-channel structures for periods of time during the duration of drought option.
- 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Scout Dike 1 from drought options is therefore assessed as **minor**.

A4.10.5 River water quality

In Scout Dike 1 the Scout Dike at Don Confluence (A628 Bridge) (NE-49302111) site has been used due to its superior data quality. Water quality modelling identifies one continuous discharge, YWSL Scout Dike WwTW, presenting a significant risk to both total ammonia and dissolved oxygen in Scout Dike 1. There are no intermittent water quality pressures identified in the reach. A summary description of the potential risks to water quality in Scout Dike 1 as a result of drought options is presented in **Table A4.15**.

Table A4.15 Potential risks to water quality in Scout Dike 1 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly consistent with High WFD status (0.2 mg/l) throughout the monitoring period.	Dissolved oxygen saturation (%) values were consistent with High' WFD status (80%) throughout the monitoring period.	Orthophosphate concentrations were variable, typically Moderate to High WFD status throughout the monitoring period.

	Total ammonia	Oxygen	Phosphate
Flow sensitivity (diffuse pollution)	None apparent	None apparent	Strong
WwTW presenting increased risk	Risk of medium-term chronic, regular, temporary water quality pressures (acute toxicity of ammonia, dissolved oxygen sags) downstream of Scout Dike WwTW.		None
Intermittent pressures presenting risk	None	None	None
Other point source pressures presenting risk	None	None	None
Summary	Moderate risk from drought options associated with reduction in dilution of WwTW	Minor risk from drought options	Moderate risk from drought options

A4.10.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Scout Dike 1 as a result of drought options is presented in **Table A4.16**.

Table A4.16 Summary of potential changes in the physical environment of Scout Dike 1 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows at any time of year that drought options implemented.
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Scout Dike 1.
River habitats *Minor impacts*	• The major reduction in flow will present major change to energy of the system with the potential for minor impacts on total wetted aquatic habitat, available habitat for different species, longitudinal connectivity and sediment dynamics.
Water quality *Moderate risk*	• Moderate risk from medium-term chronic, regular, temporary water quality pressures (acute toxicity of ammonia, dissolved oxygen sags) downstream of Scout Dike WwTW • SRP quality is not consistent with Good status with strong flow sensitivity, therefore a moderate risk to water quality has been assessed associated with change in dilution of diffuse pollution pressures to SRP. • Reported water quality is predominantly consistent with High and Good status and weak/no apparent flow sensitivity for dissolved oxygen and ammonia. • No significant intermittent pressures presenting risk.

Insert Figure A4.8

A4.11 LITTLE DON 0

A4.11.1 Reach introduction

Little Don 0 is potentially impacted by a Langsett Reservoir drought permit. A summary of physical environment information for this reach is provided in **Figure A4.9**. The reach includes part of the following river waterbody:

- Little Don from Source to River Don (GB104027057460).

A4.11.2 Reach setting

Little Don 0, located on main EAR **Figure 4.1,** comprises a 3.2km stretch of the Little Don River from the outflow of Langsett Reservoir to Underbank Reservoir (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 9.2km^2 along the length of the reach.

A4.11.3 River flow regime

During the implementation of this drought option, it is likely that the level in Langsett Reservoir will be below top water level and therefore the compensation flow from the reservoir will be the only inflow at the top of this reach. It is also assumed for this assessment that the antecedent dry conditions will mean that the storage in Langsett Reservoir is below the Normal Control Line. A reduction of 2.67 Ml/d (the maximum reduction under this drought option, when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks) therefore represents a reduction of up to 67% in the flow at the top of this reach, and this is assessed as a **major** hydrological impact at any time of year.

During the winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However, the flow reduction at the top of the reach will remain at 67% until the reservoir reaches top water level and begins to spill again.

The hydrological impact of the drought option on Little Don 0 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the reservoir, the confidence in the assessment of the hydrological impact is high.

There are no significant flow pressures, either abstractions or discharges, influencing flow in Little Don 0. There are no flow depleted reaches within Little Don 0. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.11.4 River habitats

River habitats have been characterised at a whole reach scale. No onset of drought walkovers have been conducted to date to support this assessment.

Little Don 0 is a fairly sinuous and steep reach which falls ~63m over 3.2km, a slope of 1.14°. There is limited available data for characterising the river habitats in this reach. The channel is heavily shaded along its length with continuous to semi-continuous tree cover. The average width of the channel is approximately 8.7m. There are three weirs on this reach, though none of these weirs provide barriers to connectivity within the main channel, and two bridges. Little urbanisation is present, with only a few buildings towards the end of the reach. From aerial imagery there is evidence of bank modification and realignment. There are two springs in this reach, at 1.1km and 2km down the reach.

With the relatively steep gradient and high sinuosity, Little Don 0 supports a mixture of high energy and lower energy flows with run- riffle sequence flows with some glide present within the reach. There is at least one vegetated point bar visible from aerial imagery with several side bars also present. A range of bed substrate is likely to be present with protruding boulder/cobble substrate observable through ariel imagery. The range of flows and substrate suggests suitable spawning habitat opportunities are likely present. The larger substrates and undercut banks, where present, provide suitable refuge/cover habitat opportunities for juvenile and adult fish and white-clawed crayfish. The continuous and semi-continuous presence of trees in the riparian habitat will provide an input of allochthonous energy and provide further refuge/cover opportunities for fish and white-clawed crayfish.

YWSL undertook flow trials on a ~2.1km reach of the Little Don between Langsett Reservoir and Underbank Reservoir in May 2024 as part of their AMP7 WINEP investigation to introduce a compensation flow regime from Langsett Reservoir[10]. Habitat mapping between flows of 3.5 Ml/d (reservoir outflow) and 0.7 Ml/d (noting this is a measured flow from a supporting ADCP rather than a outflow from the reservoir) indicated a 13% loss of wetted habitat at flows of 0.7 Ml/d compared to 3.5 Ml/d and a 82% reduction in fry and mixed juvenile habitat recorded during the walkover surveys.

The reduction in flow could lead to several potential impacts within Little Don 0:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for duration of drought option.
- Potentially major risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars) and protrusion of bed elements (such as larger particles) through the flow surface for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.
- Potentially major risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought option, with changes to the range and abundance of flow types.
- Minor risk to longitudinal connectivity with no obvious signs of dysconnectivity in the flow trail surveys.
- Moderate 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Little Don 0 from drought options is therefore assessed as **major**.

A4.11.5 River water quality

There are two water quality monitoring sites on this reach. For this assessment the most upstream sample in the reach, Little Don below Langsett Filters (NE-49301788), has been used due its superior quality in dataset (though it is noted that this site is likely strongly influenced by the process waters from Langsett Water Treatment Works so may not be representative of the entire reach). It is noted that the reach has only been consistently flowing with a compensation flow since October 2023 so using data prior to this period as representative of the baseline water quality in this reach is not suitable. There are no intermittent or continuous water quality pressures in this reach. A summary description of the potential risks to water quality in Little Don 0 as a result of drought option is presented in **Table A4.17**.

Table A4.17 Potential risks to water quality in Little Don 0 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly consistent with High WFD status (0.2 mg/l), noting several samples in the record are worse than Good status with two samples at Bad status.	Dissolved oxygen saturation (%) values were predominantly consistent with High WFD status (80%) throughout the monitoring period, noting four samples that were recorded as worse than Good status.	Orthophosphate concentrations were variable, typically consistent with Poor WFD status
Flow sensitivity (diffuse pollution)	No flow paired flow data available	No flow paired flow data available	No flow paired flow data available
WwTW presenting increased risk	None	None	None
Intermittent pressures presenting risk	None	None	None

[10] APEM (2024). Little Don multi-day flow trial monitoring report. APEM Scientific Report P00009834. Yorkshire Water, 17th October 2024. Final v1.0, 41pp

	Total ammonia	Oxygen	Phosphate
Other point source pressures presenting risk	None	None	None
Summary	Uncertain risk from drought option	Uncertain risk from drought option	Uncertain risk from drought option

A4.11.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Little Don 0 as a result of drought options is presented in **Table A4.18**.

Table A4.18 Summary of potential changes in the physical environment of Little Don 0 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that drought options implemented.
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Little Don 0.
River habitats *Major risk*	• The major reduction in flow will lead to a major change to the energy of the system with the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. The risk to sediment dynamics is assessed as moderate.
Water quality *Uncertain risk*	• There is no paired flow data in this reach to assess the risk to general water quality. • No continuous or intermittent water quality pressures are present in this reach.

Insert Figure A4.9

A4.12 LITTLE DON 1

A4.12.1 Reach introduction

Little Don 1 is potentially impacted by an Underbank Reservoir drought permit. A summary of physical environment information for this reach is provided in **Figure A4.10**. The reach includes part of the following river waterbody:

- Little Don from Source to River Don (GB104027057460).

A4.12.2 Reach setting

Little Don 1, located on main EAR **Figure 4.1,** comprises a 4.5km stretch of the Little Don River from the outflow of Underbank Reservoir to the confluence with the River Don. (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 8.7km^2 along the length of the reach. Don 3 (see **Section A4.4** above) is downstream.

A4.12.3 River flow regime

During the implementation of this drought option, it is likely that the level in Underbank Reservoir will be below top water level and therefore the compensation flow from the reservoir will be the only inflow at the top of this reach. A reduction of 10.72 Ml/d (the maximum reduction under this drought option, when reservoir level is below the control line and when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks) therefore represents a reduction of up to 67% in the flow at the top of this reach, and this is assessed as a **major** hydrological impact at any time of year.

During the winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However the flow reduction at the top of the reach will remain at 67% until the reservoir reaches top water level and begins to spill again. The outflow from Midhope Reservoir (via Hagg Brook) enters this reach halfway along the reach, however, there is no managed compensation regime from this reservoir so no flow from Midhope Reservoir would be expected in drought permit conditions.

The hydrological impact of the drought option on Little Don 1 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the reservoir, the confidence in the assessment of the hydrological impact is high.

There is one significant flow pressure influencing flow in Little Don 1, an abstraction licence for metal production usage as described in **Section A4.8.3.1**. There are no significant discharges within Little Don 1. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.12.3.1 Flow depleted reaches

There is one significant licensed abstraction depleting flow in Little Don 1 for industrial, commercial and public services. The abstraction is for metal production, with a peak daily licensed abstraction rate of 20.62Ml/d without a hands-off-flow condition ('The Porter – Little Don') with potential flow impacts. An abstraction at that rate could reduce flows in the reach, during environmental drought, without or in combination with drought options to zero. YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures.

A4.12.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 22 August 2018 at an estimated river flow at the flow assessment point for the reach of 16.9Ml/d.

Little Don 1 is fairly straight reach which falls ~39m over 4.5km, a slope of 0.5°. The channel is heavily shaded along its length with three sections which are culverted. The channel was not sufficiently visible on aerial imagery to measure channel widths. Two islands are recorded on the OS maps, one being especially large, situated ~0.4km downstream of the start of the reach. There are two RHS sites in this reach, one further upstream (site ID 26637) and one further downstream (site ID 26439). An artificial berm was also recorded at RHS site 26637 covering 20% of the survey site. Boulders (70%) were recorded as the dominant channel substrate in the upstream reaches, with cobbles and bedrock also observed. At RHS site 26637, rippled flow

dominated (70%), however areas of upwelling and chaotic flow were also observed. Data for RHS site 26637 indicates that the left and right banks are predominantly composed of earth and brick or laid stone. Concrete was noted as a bank material at ~20% of spot sites for both survey sites, gabions were also observed (10%) at RHS site 26637 with bank vegetation variation observed. At RHS site 26637, the channel had been realigned and over-deepened. The banks/ channel had been resectioned and reinforced. At the most downstream RHS site 26439 the channel and banks had also been resectioned and reinforced. Additionally, at this RHS site five pools and six riffles were noted. Surrounding land-use is predominantly suburban/urban on both banks, with residential buildings on the right bank and industrial buildings on the left bank. Towards the end of the reach, there is an increase in rough pasture and woodland, mostly on the left bank.

Little Don 1 supports both high and low energy environments, as indicated by the steep valley slope and presence of depositional and erosional features. Although high energy environments are considered likely to dominate on a watercourse with such a high slope, RHS data indicates the opposite with the possible influence of weirs. Although the dominant substrate identified is less suitable for spawning (although becomes more suitable towards the end of the reach), the watercourse is likely to support discrete patches of suitable substrate and the presence of a significant number of riffles identified indicate spawning habitat is likely to be present. The larger substrate material and bank structure are likely to provide significant cover/refuge for juvenile and adult fish and white-clawed crayfish. The extensive coverage of deciduous trees in the riparian habitat will ensure a high input of allochthonous energy into the stream and provide further cover/refuge opportunities for fish and white-clawed crayfish. The reinforced banks may provide additional habitat opportunities for white-clawed crayfish. Movement/migration of fish and sediments are potentially limited in the reach by the presence of weirs and the culverting of the watercourse in three sections.

The drought options reduction in flow could lead to several potential impacts within Little Don 1

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for duration of drought options.
- Potentially moderate risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars) and protrusion of bed elements (such as larger particles) through the flow surface for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.
- Potentially moderate risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought option, with retention of dominant habitat types.
- Moderate risk to longitudinal connectivity from three noted weirs, for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.
- 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Little Don 1 from drought options is therefore assessed as **moderate**.

A4.12.5 River water quality

For this assessment the only sample in the reach, Little Don D/S Underbank Reservoir (NE-49301804) has been used. There are no significant continuous discharges either within Little Don 1 or at risk from changes in flow in the reach. There is one frequently spilling CSO potentially presenting an environmental risk in the reach. A summary description of the potential risks to water quality in Little Don 1 as a result of drought options is presented in **Table A4.19**.

Table A4.19 Potential risks to water quality in Little Don 1 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were consistent with 'Good' WFD status (0.3 mg/l) throughout the monitoring period.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Some seasonality was apparent with saturation rising in late winter/spring and falling in late summer/autumn.	Orthophosphate concentrations were predominantly consistent with 'Good' WFD status (0.028 mg/l) throughout the monitoring period. Some seasonality was apparent.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	None apparent
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 one listed CSO 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	Minor risk from drought options

A4.12.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Little Don 1 as a result of drought options is presented in **Table A4.20**.

Table A4.20 Summary of potential changes in the physical environment of Little Don 1 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that drought options implemented.
Flow depleted reaches/significant flow pressures *Major risk*	• One significant abstraction in the reach with potential for periods of time with zero flow without mitigation
River habitats *Moderate risk*	• The major reduction in flow will lead to a major change in the energy of the system with the potential for moderate risks to the total wetted aquatic habitats, available habitat for different species and longitudinal connectivity. Risks to sediment dynamics is assessed as minor.
Water quality *Moderate risk*	• Moderate risk from short term acute, infrequent, temporary water quality pressures locally downstream of one listed CSO during rainfall events. • Reported water quality is mostly consistent with Good or High status with no apparent flow sensitivity. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought options implemented.

Insert Figure A4.10

A4.13 EWDEN BECK 1

A4.13.1 Reach introduction

Ewden Beck 1 is potentially impacted by a More Hall Reservoir drought permit. A summary of physical environment information for this reach is provided in **Figure A4.11**. The reach includes part of the following river waterbody:

- Ewden Beck from Source to River Don (GB104027057400).

A4.13.2 Reach setting

Ewden Beck 1, located on main EAR **Figure 4.1,** comprises a 1.7km stretch of Ewden Beck from the outflow of More Hall Reservoir to the confluence with the River Don. (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 1.2km^2 along the length of the reach. Don 4 (see **Section A4.5** above) is downstream.

A4.13.3 River flow regime

During the implementation of this drought option, it is likely that the level in More Hall Reservoir will be below top water level and therefore the compensation flow from the reservoir will be the only inflow at the top of this reach. A reduction of 6.10 Ml/d (the maximum reduction under this drought option, when reservoir level is below the control line and when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks) therefore represents a reduction of up to 67% in the flow at the top of this reach, and this is assessed as a **major** hydrological impact at any time of year.

During the winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However, the flow reduction at the top of the reach will remain at 67% until the reservoir reaches top water level and begins to spill again.

The hydrological impact of the drought option on Ewden Beck 1 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the reservoir, the confidence in the assessment of the hydrological impact is high.

There are no significant flow pressures, either abstractions or discharges, influencing flow in Ewden Beck 1. There are no flow depleted reaches within Ewden Beck 1. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.13.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 22 August 2018 at an estimated river flow at the flow assessment point for the reach of 12.9Ml/d.

Ewden Beck 1 is sinuous reach which falls ~18m over 1.7km, a slope of 0.6°. The channel is heavily shaded along its length. Two river terraces have been recorded at both sites.

There are four RHS sites on this reach, with multiple surveys at some of the sites: 300m downstream is RHS site ID 11304, 560m downstream is RHS site ID 26477, 1.36km downstream is RHS site ID 25064 and 1.43km downstream is RHS site ID 6438.

The channel was not sufficiently visible on aerial imagery to measure channel widths, however the upper RHS site 11304 recorded bankfull width as 9.5m, this increases to 12m at RHS Site 26477, at RHS Site 25064, the width was recorded as 10m, and this decreases to 6m at the lower RHS site 6438. No within channel features are visible from aerial imagery. However, a total of 8 unvegetated point bars, 2 unvegetated point bars, and 1 vegetated point bar were recorded for all RHS sites. Side bars were recorded at 30% of the spot check sites at Site 6438. Channel substrate was recorded as predominantly cobble at all RHS sites, although boulders (10%) were noted at site 6438. Some variation was recorded in the more recent surveys, boulders (10%) and gravel / pebble (10%) were recorded at RHS Site 26477 and boulders (40%) at RHS Site 25064. The presence of exposed bedrock and boulders have been noted by the RHS in this reach. Data from the upper RHS site (11304) indicated rippled (40%) and unbroken standing waves (30%) with some chute flow (20%). Rippled flow (50%) dominated RHS Site 26477, however areas of upwelling (50%) and smooth flow (10%) were also

recorded. Upwelling dominated RHS Site 40001 (70%), however areas of rippled flow (30%) were also recorded. Rippled (30%) and smooth (30%) flow dominated at site 6438. A total of 13 riffles and 24 pools were counted for all surveys, indicating that other flow types are likely to be present. Data for all RHS sites indicate that the left and right banks are predominantly composed of earth and brick or laid stone. Bedrock and boulders were also noted as minor constituents of the left banks at sites 6438 and 11304. Peat was recorded as a minor component for the left and right banks at RHS Sites 26477 and 25064. Concrete was noted as forming the left bank material at ~20% of spot sites at site 6438 and 10% of sites at RHS site 26477. Bank face vegetation at both RHS sites is predominantly simple (70%) with some bare faces (20%) and the remainder as uniform vegetation. Bank tops at site 11304 were predominantly simple (60%) with uniform vegetation (30%), while at site 6438 bank top vegetation was wholly uniform. A range of bank types were noted at all RHS sites, with vertical and undercut banks, extensively steep (>45°), resectioned and reprofiled and reinforced banks all been present. Gentle and composite banks were also noted. Surrounding land-use is predominantly deciduous woodland and improved grassland.

Ewden Beck 1 is relatively sinuous with a high slope, indicating the likely presence of high energy environments within the reach. The presence of depositional features also indicates the presence of low energy environments, with the RHS data identified supporting these, including the flow structure present. Although the dominant substrate is unlikely to provide spawning opportunities, suitable habitat is likely to be present in discrete patches and a low number of riffles were present. The low energy flows have potential to support juvenile fish with cover/refuge for both juveniles and adults provided by the undercut banks and large substrate present, which also provides suitable habitat for white-clawed crayfish. The extensive coverage of trees in the riparian habitat provides an input of allochthonous energy into the stream and provide additional cover for fish and white-clawed crayfish. Movement/migration of fish and sediments is likely to be impacted by the presence of weirs in the watercourse.

The reduction in flow could lead to several potential impacts within Ewden Beck 1:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for duration of drought option.
- Potentially major risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars) and protrusion of bed elements (such as larger particles) through the flow surface for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.
- Potentially major risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought option, with changes to the range and abundance of flow types.
- Minor risk to longitudinal connectivity from two noted weirs, for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.
- Moderate 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Ewden Beck 1 from drought options is therefore assessed as **major**.

A4.13.5 River water quality

For this assessment the only sample in the reach, Ewden Beck at More Hall Bridge (NE-49300690) has been used. A summary description of the potential risks to water quality in Ewden Beck 1 as a result of drought options is presented in **Table A4.21**.

Table A4.21 Potential risks to water quality in Ewden Beck 1 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were consistent with High WFD status (0.2 mg/l) throughout the monitoring period.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period.	Orthophosphate concentrations were mostly consistent with 'Good' WFD status (0.032 mg/l)

	Total ammonia	Oxygen	Phosphate
			throughout the monitoring period.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	None apparent
WwTW presenting increased risk	None	None	None
Intermittent pressures presenting risk	None	None	None
Other point source pressures presenting risk	None	None	None
Summary	Minor risk from drought options	Minor risk from drought options	Minor risk from drought options

A4.13.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Ewden Beck 1 as a result of drought options is presented in **Table A4.22**.

Table A4.22 Summary of potential changes in the physical environment of Ewden Beck 1 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that drought options implemented.
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Ewden Beck 1.
River habitats *Major risk*	• The major reduction in flow will lead to a major change in the energy of the system with the potential for a major reduction in total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. Risk to sediment dynamics has been assessed as moderate.
Water quality *Moderate risk*	• Reported water quality is mostly consistent with Good or High status with no apparent flow sensitivity. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous or intermittent water quality pressures identified as presenting increased risk with drought options implemented.

Insert Figure A4.11

A4.14 DALE DIKE 1

A4.14.1 Reach introduction

Dale Dike 1 is potentially impacted by a Dale Dike Reservoir drought permit. A summary of physical environment information for this reach is provided in **Figure A4.12**. The reach includes part of the following river waterbodies:

- Strines Dike from Source to River Loxley (GB104027057380)
- Loxley from Strines Dike to River Don (GB104027057370).

A4.14.2 Reach setting

Dale Dike 1, located on main EAR **Figure 4.1,** comprises a 2.4km stretch of the Dale Dike from the outflow of Dale Dike Reservoir to Damflask Reservoir (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 13.2km^2 along the length of the reach.

A4.14.3 River flow regime.

During the implementation of this drought option, it is likely that the level in Dale Dike Reservoir will be below top water level and therefore the compensation flow from the reservoir will be the only inflow at the top of this reach. A reduction of 2.2 Ml/d (the maximum reduction under this drought option, when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks) therefore represents a reduction of up to 67% in the flow at the top of this reach, and this is assessed as a **major** hydrological impact at any time of year.

During the winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However the flow reduction at the top of the reach will remain at 67% until the reservoir reaches top water level and begins to spill again. The outflow from Agden Reservoir (via a small tributary) enters this reach at the end of the reach, however, there is no managed compensation regime from this reservoir so no flow from Agden Reservoir would be expected in drought permit conditions.

The hydrological impact of the drought option on Dale Dike 1 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the reservoir, the confidence in the assessment of the hydrological impact is high.

There are no significant flow pressures, either abstractions or discharges, influencing flow in Dale Dike 1. There are no flow depleted reaches within Dale Dike 1. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.14.4 River habitats

River habitats have been characterised at a whole reach scale. No onset of drought walkovers have been conducted to date to support this assessment, however, photographs taken by YWSL on a walkover of the reach on 5th November 2024 have been used to help support the assessment.

Dale Dike 1 is a moderately sinuous and steep reach which falls ~54m over 2.4km, a slope of 1.3°. A review of aerial imagery for the reach indicates that the channel is shaded across its length with almost continuous tree cover. This tree cover limits the number of features that can be observed through aerial imagery, though, where the channel is visible it measures at between 5-10m wide. The extensive tree cover likely also indicates the presence of earth banks which is corroborated by the walkover photographs. There is one RHS site on this reach with one survey (survey site 26641). Within the RHS survey 23 pools and eight riffles were observed, as well as one unvegetated point bar was identified. Walkover photographs also confirm the presence of depositional features in the channel as well occasional poaching. The survey observed ponding in <33% of the reach resultant of artificial channel impoundment, behind one of the four weirs present along the reach. Urbanisation is limited throughout the reach, noting the reach flows through the parish of Bradfield before it inflows to Damflask Reservoir.

Dale Dike 1 contains likely a mixture of high and low energy environments, indicated by the moderate steepness of the valley. It is considered likely that discrete patches of suitable substrate will be present and the presence of a significant number of riffles indicates the likely presence of spawning habitat. The bank structure and likely exposed tree roots are likely to provide cover/refuge for both juvenile and adult fish. The extensive coverage of trees in the riparian habitat will also ensure a high input of allochthonous energy into the stream and provide further cover/refuge opportunities for fish and white-clawed crayfish. The earth banks may provide additional habitat opportunities for white-clawed crayfish. Movement/migration of fish and sediments are potentially limited in the reach by the presence of in-channel structures.

The reduction in flow could lead to several potential impacts within Dale Dike 1:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for duration of drought option.
- Potentially major risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars) and protrusion of bed elements (such as larger particles) through the flow surface for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.
- Potentially major risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought option, with changes to the range and abundance of flow types.
- Major risk to longitudinal connectivity from four noted weirs, for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.
- Moderate 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Dale Dike 1 from drought options is therefore assessed as **major**.

A4.14.5 River water quality

There are two water quality monitoring sites on this reach. For this assessment the most upstream sample in the reach, Dale Dike at Mill Lane Road – Low Bradfield (NE-49300552), has been used due its superior quality in dataset. There are no intermittent or continuous water quality pressures in this reach. A summary description of the potential risks to water quality in Dale Dike 1 as a result of drought option is presented in **Table A4.23**.

Table A4.23 Potential risks to water quality in Dale Dike 1 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were consistent with High WFD status (0.2 mg/l) throughout the monitoring period.	Dissolved oxygen saturation (%) values were consistent with High (80%) WFD status throughout the monitoring period.	Orthophosphate concentrations were mostly consistent with High or Good WFD status (0.04 mg/l) throughout the monitoring period with one sample achieving poor status in the monitoring period.
Flow sensitivity (diffuse pollution)	No flow paired flow data available	No flow paired flow data available	No flow paired flow data available
WwTW presenting increased risk	None	None	None

	Total ammonia	Oxygen	Phosphate
Intermittent pressures presenting risk	None	None	None
Other point source pressures presenting risk	None	None	None
Summary	Minor risk from drought options	Minor risk from drought options	Minor risk from drought options

A4.14.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Dale Dike 1 as a result of drought options is presented in **Table A4.24**.

Table A4.24 Summary of potential changes in the physical environment of Dale Dike 1 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that drought options implemented.
Flow depleted reaches/significant flow pressues *None*	• There are no flow depleted reaches or significant flow pressures within Dale Dike 1.
River habitats *Major risk*	• The major reduction in flow will lead to a major change to the energy of the system with the potential for major impacts on total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. Risk to changes in sediment dynamics is assessed as moderate.
Water quality *Minor risk*	• Reported water quality is mostly consistent with Good or High status with no apparent flow sensitivity. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous or intermittent water quality pressures identified as presenting increased risk with drought options implemented.

Insert Figure A4.12

A4.15 LOXLEY 1

A4.15.1 Reach introduction

Loxley 1 is potentially impacted by a Damflask Reservoir drought permit. A summary of physical environment information for this reach is provided in **Figure A4.13**. The reach includes part of the following river waterbody:

- River Loxley from Strines Dike to River Don (GB104027057370).

A4.15.2 Reach setting

Loxley 1, located on main EAR **Figure 4.1,** comprises a 5.3km stretch of the River Loxley from the outflow of Damflask Reservoir to the confluence with the River Rivelin (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 13.04km^2 along the length of the reach. Loxley 2 (see **Section A4.11** below) is downstream.

A4.15.3 River flow regime

During the implementation of this drought option, it is likely that the level in Damflask Reservoir will be below top water level and therefore the compensation flow from the depositing pond will be the only inflow at the top of this reach. A reduction of 12.06 Ml/d (the maximum reduction under this drought option, when the reservoir level is below its control line, regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks or if stocks in the Loxley supply group are below its Drought Control Line) therefore represents a reduction of up to 67% in the flow at the top of this reach, and this is assessed as a **major** hydrological impact at any time of year.

During the winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However, the flow reduction at the top of the reach will remain at 67% until the reservoir reaches top water level and begins to spill again.

To supplement the assessment an additional assessment point approximately halfway down the reach has been considered. Flow is gauged at Loxley Rowel Bridge at grid reference SK302895. The summer Q95 and Q99 flow statistics are 30.49 Ml/d and 22.83 Ml/d respectively, based on a daily flow record from 2001 to 2023 inclusive with some short periods of missing data (as outlined in the assessment for the Loxley 2 reach later in this section). The flow reduction of 12.06 Ml/d therefore represents percentage reductions of 40% and 53% respectively in the summer Q95 and Q99 flow statistics at the gauged location, and would therefore still be assessed as a major hydrological impact during the summer months of April to September inclusive. Similarly the year round Q95 and Q50 statistics for the 2001-2023 Rowel Bridge record are 33.35 Ml/d and 45.19 Ml/d respectively, so that the 12.06 Ml/d flow reduction equates to percentage reductions of 36% and 27% in the year round Q95 and Q50 statistics and would therefore also be assessed as a major hydrological impact during the winter months of October to March inclusive, at the gauged location.

The hydrological impact of the drought option on Loxley 1 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the reservoir, the confidence in the assessment of the hydrological impact is high.

There are two significant flow pressures influencing flow in Loxley 1, a non-consumptive abstraction licence as described in **Section A4.10.3.1**, and a discharge licence leading to a significant flow addition from Loxley Water Treatment Works, an intermittent discharge with a max daily flow of 45.00 Ml/d. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.15.3.1 Flow depleted reaches/significant flow pressures

There is one licensed non-consumptive abstraction depleting flow in Loxley 1 for the production of energy. The abstraction is for a non-consumptive abstraction for hydroelectric power generation, with a peak daily licensed abstraction rate of 56.16Ml/d ('River Loxley at Wisewood Weir') with potential flow impacts. Noting that the hydropower turbine is an Archimedes screw mounted in the weir, the only

depletion is the flow of water over the face of the weir itself. The unlicensed amenity throughflow to the associated Wisewood Dam (pond) from upstream of the weir to the flow return point (~230m downstream) does lead to flow depletion. That flow depletion is observed to be exacerbated when the hydropower scheme is turned off by its low water level condition which would be more frequently activated under drought permit conditions. A walkover reach covering the section of the river has been included in the schedule of monitoring for Loxley 1 (see main EAR Section 6). YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures.

A4.15.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 21 August 2018 at a reservoir outflow of 28.2Ml/d.

Loxley 1 is a fairly sinuous reach which falls ~55m over 5.3km, a slope of 0.6°. The channel is heavily shaded along its length. There are two RHS sites within the reach, the furthest upstream reach RHS site ID 26448 and the furthest downstream reach RHS site ID 26415. No within channel features are visible from aerial imagery. One unvegetated point bar was observed at RHS sites 39683 and 39630, respectively. Stable cliffs were noted at both RHS sites. At RHS site 39683, boulders dominated (60%), and cobbles (20%) and artificial material (10%) were also recorded. At RHS site 39630, cobbles dominated (50%), however boulders (40%) and gravel / pebble (10%) were also recorded. The presence of exposed bedrock and exposed boulders have been noted by the RHS in this reach. RHS data indicate a wide range of flow types. At RHS site 39683, upwelling dominated (50%), however smooth flow (40%) and rippled flow (10%) was also recorded. At RHS site 39630 upwelling dominated (50%), however rippled flow (40%) and smooth flow (10%) was also observed. Bedrock was noted as composing both banks of RHS site 39630 and 39683. A large series of industrial buildings exists on the left bank between 0.4-1.5km downstream. There are scattered small lakes along the banks of this reach, mostly in the upper to mid sections of the reach.

Loxley 1 contains a mixture of high and low energy environments, indicated by the moderate steepness of the valley and the presence of both erosional and depositional features. Although the dominant substrate is less suitable for supporting spawning habitat, it is considered likely that discrete patches of suitable substrate will be present and the presence of a significant number of riffles indicates the likely presence of spawning habitat. The larger substrate material and bank structure are likely to provide cover/refuge for both juvenile and adult fish. The extensive coverage of trees in the riparian habitat will ensure a high input of allochthonous energy into the stream and provide further cover/refuge opportunities for fish and white-clawed crayfish. The reinforced banks may provide additional habitat opportunities for white-clawed crayfish. Movement/migration of fish and sediments are potentially limited in the reach by the presence of in-channel structures.

The reduction in flow could lead to several potential impacts within Loxley 1:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for duration of drought option.
- Potentially moderate risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars) and protrusion of bed elements (such as larger particles) through the flow surface for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.
- Potentially moderate risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought option, with changes to the range and abundance of flow types.
- Moderate risk to longitudinal connectivity from nine noted weirs, for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.
- 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes

that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Loxley 1 from drought options is therefore assessed as **moderate**.

Under Local Enforcement Position (LEP), in the summer of 2024, YWSL tested how aquatic habitat in the River Loxley changed under a range of flow conditions controlled by changing the compensation release from Damflask Reservoir (with outflows ranging from 41Ml/d to 9Ml/d). Despite a wide range of outflows being tested, response of the habitat extent and diversity to change in reservoir outflow was more limited than was expected. The proportion of the wetted channel in this reach is typically high under baseline conditions, limiting the extent of marginal change to increased flow, and the sediment bars vary little in their exposure with reduced flow. Noting the gradient of the system, a velocity response to the change in flow would have been expected more than a change in wetted perimeter. Despite this, the supporting hydromorphological assessment to the tests records low energy habitats as present, glides and occasionally pools, even under the highest test conditions as well as high energy habitats under the lowest test condition. Through these tests there was no indication of significant environmental risk under any of the tested flows. Despite this, the findings from this test can not be directly applied to the potential changes in habitats as a result of a drought permit with the tests only being undertaken over the duration of a week and the drought permit compensation flow of 6Ml/d was not tested.

A4.15.5 River water quality

For this assessment the first sample in the reach, River Loxley At Rowel Lane (NE-49301815) has been used. The EA has requested that the effect of change in river dilution of iron in the discharge from abandoned minewater discharges is considered in this reach. There is no iron data available for this reach. There are no significant continuous or intermittent discharges either within Loxley 1 or at risk from changes in flow in the reach. A summary description of the potential risks to water quality in Loxley 1 as a result of drought options is presented in **Table A4.25**.

Table A4.25 Potential risks to water quality in Loxley 1 as a result of drought options

	Total ammonia	Oxygen	Phosphate	Iron
General quality	Ammonia concentrations were consistent with High WFD status (0.2 mg/l) throughout the monitoring period.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Seasonality was apparent with saturation rising in late winter/spring and falling in late summer/autumn.	Orthophosphate concentrations were predominantly consistent with 'Good' WFD status (0.032 mg/l) throughout the monitoring period.	N/A
Flow sensitivity (diffuse pollution)	None apparent	None apparent	None apparent	N/A
WwTW presenting increased risk	None	None	None	N/A
Intermittent pressures presenting risk	None	None	None	N/A
Other point source pressures presenting risk	None	None	None	Abandoned minewater discharges at Loxley Bottom and Myers Grove (a walkover reach covering this section of the river has been included in the schedule of monitoring for Loxley 1 on a precautionary basis (see main EAR Section 6)
Summary	Minor risk from drought options	Minor risk from drought options	Minor risk from drought options	Uncertain risk from drought options

A4.15.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Loxley 1 as a result of drought options is presented in **Table A4.26**.

Table A4.26 Summary of potential changes in the physical environment of Loxley 1 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that drought options implemented.
Flow depleted reaches/significant flow pressures *Major*	• One flow depleted reach with potential for periods of time with zero flow without mitigation.
River habitats *Moderate risk*	• The major reduction in flow will lead to a major change to the energy of the system with the potential for a moderate impact on total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. The risk to sediment dynamics is assessed as minor.

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
Water quality *Minor risk*	• There is uncertainty associated with the dilution of iron in the discharge from abandoned minewater discharges and how this may change with drought options as to date no data is available. A walkover reach covering this section of the river has been included in the schedule of monitoring for Loxley 1 on a precautionary basis (see main EAR Section 6). • Reported water quality is mostly consistent with Good or High status with no apparent flow sensitivity. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous or intermittent water quality pressures identified as presenting increased risk with drought options implemented.

Insert Figure A4.13

A4.16 LOXLEY 2

A4.16.1 Reach introduction

Loxley 2 is potentially impacted by both Damflask Reservoir and Rivelin Lower Reservoir drought permits. A summary of physical environment information for this reach is provided in **Figure A4.14**. The reach includes part of the following river waterbody:

- River Loxley from Strines Dike to River Don (GB104027057370).

A4.16.2 Reach setting

Loxley 2, located on main EAR **Figure 4.1,** comprises a 2.2km stretch of the River Loxley from the confluence with the River Rivelin to the confluence with the River Don (**Table A2.1**). Don 5 (see **Section A4.6** above) is downstream.

A4.16.3 River flow regime

There is no gauged flow data available for this stretch of the River Loxley, however the rivers Loxley and Rivelin are both gauged upstream of their confluence. Downstream of the confluence, therefore, a daily flow series was produced by summing the daily gauged flows at the Loxley Rowel Bridge (River Loxley) and Hollins Bridge (River Rivelin) gauges, and an estimate of the flow accretion due to the increase in catchment areas downstream of these two gauges to their confluence. The ungauged portion of the catchment downstream of the confluence is approximately 5.5% of the catchment area at this location. The daily flow accretion for this small portion of the catchment was estimated by using the Gustard flow transposition method based on relative catchment parameter ratios and the gauged flow record of the River Loxley at Rowel Bridge, adjusted to remove the influence of the reservoirs in the upstream catchment.

It was observed that the Hollins Bridge data record includes some periods when the gauged flow is less than the normal compensation release from Rivelin Reservoir. This is due to a change in the minimum compensation rate from Rivelin Reservoir implemented in 2004. An adjustment was therefore applied to the Hollins Bridge record, before summing with the Rowel Bridge record and estimated flow accretion downstream of the gauges, by setting the Hollins Bridge daily mean flow to a minimum of 10.3 Ml/d (the Rivelin compensation rate from 2004 onwards).

The River Loxley downstream of the River Rivelin confluence is influenced by both the Rivelin and Damflask reservoir drought options. The maximum combined flow reduction from these two options is 18.96 Ml/d, at times when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks. The combined drought options therefore represent reductions of up to 38% and 48% in the summer Q95 and Q99 flow statistics respectively, and would therefore be assessed as a **major** hydrological impact in the summer period. During the winter period, the combined flow reduction represents reduction of up to 35% and 23% in the year round Q95 and Q50 flow statistics, which is assessed as a **major** hydrological impact in winter also.

The hydrological impact of the drought option on Loxley 2 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place. With low flows in this reach being dominated by the outflow from Damflask Reservoir and Rivelin Reservoir, the confidence in the assessment of the hydrological impact is high.

There are no significant flow pressures, either abstractions or discharges, influencing flow in Loxley 2. There are no flow depleted reaches within Loxley 2. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.16.4 River habitats

River habitats have been characterised at a whole reach scale. Characterisation has been assisted using photographs taken on 12th July 2024 as part of the YWSL Damflask flow testing. Flow on this day in this reach is estimated as 73.1 Ml/d with the compensation flow from Damflask Reservoir and Rivelin Reservoir measured at 29.7 Ml/d and 12.2 Ml/d, respectively.

Loxley 2 is a fairly sinuous reach which falls ~15m over 2.2km, a slope of 0.4°. Riparian tree cover is semi-continuous along the reach. The single RHS site (site ID 19971) identifies the presence of two river terraces. Cobbles were noted as the dominant substrate at the RHS site, with some boulders present (10%). Exposed bedrock was noted as extensive throughout the RHS site, however, is not dominant. Any visible sections of the channel had predominantly smooth surfaces with several small sections of broken surfaces. Data from the RHS site indicate a mixture of smooth (40%) and rippled flow (30%) with some unbroken standing wave and chaotic flow noted; similar flow variability was noted during the later RHS survey. A total of 3 riffles were counted during the survey. Data for the RHS site indicates that the left and right banks are composed predominantly of earth with some brick or laid (20-40%). Bank vegetation varies along the RHS site. The left bank faces are a mix of bare, uniform and simple vegetation types, while the right bank is generally complex vegetation (50%), the remainder of bare, simple and uniform vegetation. Bank tops at this site were composed of predominantly bare and uniform vegetation. The left and right banks at RHS site were noted as extensively steep (>45°) with resectioned or reprofiled banks, reinforced banks and gentle banks noted as being present throughout the site. However, shallower sections were also noted. Surrounding land use is predominantly suburban/urban on both banks as the reach passes through Sheffield.

Loxley 2 also contains a mixture of high and low energy environments, indicated by the presence of erosional and depositional features within the reach. The presence of spawning habitat is likely to be limited, with few riffles identified as present and cobble substrate dominating, but nonetheless suitable habitat is present. The larger substrates and features, such as exposed bedrock, will provide cover/refuge opportunities for juvenile and adult fish and white-clawed crayfish. The semi-continuous presence of trees in the riparian habitat will provide some allochthonous energy into the system and will provide further refuge/cover potential for fish and white-clawed crayfish. The reinforced banks may provide additional habitat opportunities for white-clawed crayfish. Movement/migration of fish and sediments are potentially limited in the reach by the presence of weirs and the culverting of the watercourse in three sections.

The reduction in flow could lead to several potential impacts within Loxley 2:

- Major risk of changes in the energy of the system associated with up to 48% reduction in flow for duration of drought options.
- Potentially moderate risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars) and protrusion of bed elements (such as larger particles) through the flow surface for periods of time during the duration of drought options, noting the retention of an overall variable flow pattern.
- Potentially moderate risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought options, with changes to the range and abundance of flow types.
- Moderate risk to longitudinal connectivity from four noted weirs, for periods of time during the duration of drought options, noting the retention of an overall variable flow pattern.
- Minor risk of changes in sediment dynamics for duration of drought options. 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Loxley 2 from drought options is therefore assessed as **moderate**.

Under LEP, in the summer of 2024, YWSL tested how aquatic habitat in the River Loxley changed under a range of flow conditions controlled by changing the compensation release from Damflask Reservoir (ranging from 41Ml/d to 9Ml/d). Despite a wide range of outflows being tested, response of the habitat extent and diversity to change in reservoir outflow was more limited than was expected. The proportion of the wetted channel in this reach is typically high under baseline conditions, limiting the extent of marginal change to increased flow, and the sediment bars vary little in their exposure with reduced flow. Through these tests there was no indication of significant environmental risk under any

of the tested flows. Despite this, the findings from this test can not be directly applied to the potential changes in habitats as a result of a drought permit with the tests only being undertaken over the duration of a week. The maximum flow reduction in this reach as a result of the Damflask Reservoir and Rivelin Reservoir drought permits was not reviewed through these tests.

A4.16.5 River water quality

For this assessment the only water quality site in the reach, Loxley 120M Upstream of Confluence With Don (NE-49301811), has been used. There are no samples at this site that have sampled either ammonia or phosphate. As such, the River Loxley At Rowel Lane (NE-49301815), in the upstream reach (Loxley 1), has been used to characterise the baseline condition for these determinands. There are no significant continuous or intermittent discharges either within Loxley 2 or at risk from changes in flow in the reach. A summary description of the potential risks to water quality in Loxley 2 as a result of drought options is presented in **Table A4.27**.

Table A4.27 Potential risks to water quality in Loxley 2 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were consistent with High WFD status (0.2 mg/l) throughout the monitoring period.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period.	Orthophosphate concentrations were predominantly consistent with 'Good' WFD status (0.032 mg/l) throughout the monitoring period.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	None apparent
WwTW presenting increased risk	None	None	None
Intermittent pressures presenting risk	None	None	None
Other point source pressures presenting risk	None	None	None
Summary	Minor risk from drought options	Minor risk from drought options	Minor risk from drought options

A4.16.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Loxley 2 as a result of drought options is presented in **Table A4.28**.

Table A4.28 Summary of potential changes in the physical environment of Loxley 2 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 48% in river flows for periods of time during the duration of the drought option, throughout the reach, at any time of year that drought options implemented
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Loxley 2.
River habitats *Moderate risk*	• The major reduction in flow will lead to a major change to the energy of the system with the potential for a moderate impact on total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. The risk to sediment dynamics is assessed as minor.

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
Water quality *Minor risk*	• Reported water quality is mostly consistent with Good or High status with no apparent flow sensitivity. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous or intermittent water quality pressures identified as presenting increased risk with drought options implemented.

Insert Figure A4.14

A4.17 RIVELIN 1

A4.17.1 Reach introduction

Rivelin 1 is potentially impacted by a Rivelin Lower Reservoir drought permit. A summary of physical environment information for this reach is provided in **Figure A4.15**. The reach includes part of the following river waterbody:

- River Rivelin from Source to River Loxley (GB104027057340).

A4.17.2 Reach setting

Rivelin 1, located on main EAR **Figure 4.1,** comprises a 7.3km stretch of the River Rivelin from the outflow of Rivelin Depositing Pond to the confluence with the River Loxley.(**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 10.7km^2 along the length of the reach. Loxley 2 (see **Section A4.11** above) is downstream.

A4.17.3 River flow regime

During the implementation of this drought option, it is likely that the level in Rivelin Reservoir will be below top water level and therefore the compensation flow from the depositing pond will be the only inflow at the top of this reach. A reduction of 6.90 Ml/d (the maximum reduction under this drought option, when regional reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks or if stocks in the Rivelin supply group are below its Drought Control Line) therefore represents a reduction of up to 67% in the flow at the top of this reach, and this is assessed as a **major** hydrological impact at any time of year.

During the winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However, the flow reduction at the top of the reach will remain at 67% until the reservoir reaches top water level and begins to spill again.

Towards the downstream end of the reach, flow is gauged at Hollins Bridge at grid reference SK322884. The summer Q95 and Q99 flow statistics are 7.60 Ml/d and 4.56 Ml/d respectively, based on a daily flow record from 2001 to 2023 inclusive with some short periods of missing data (as outlined in the assessment for the Loxley 2 reach). However, this gauged record includes some periods when the gauged flow is below the normal compensation release of 10.30 Ml/d, possibly due to previous drought permit flow reductions. In practice the drought permit would not be expected to reduce the downstream flow to below the reduced compensation rate of 3.40 Ml/d. This would represent percentage reductions of 55% and 25% in the summer Q95 and Q99 flow statistics at the gauged location and would therefore still be assessed as a major hydrological impact during the summer months of April to September inclusive. Similarly, the year round Q95 and Q50 statistics for the 2001-2019 Hollins Bridge record are 10.89 Ml/d and 27.56 Ml/d respectively, so that the drought permit flow reduction of 6.90 Ml/d (to no less than 3.40 Ml/d) equates to percentage reductions of 63% and 25%, and would therefore also be assessed as a major hydrological impact during the winter months of October to March inclusive.

The hydrological impact of the drought option on Rivelin 1 is therefore assessed as **major** for both the summer/autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the reservoir, the confidence in the assessment of the hydrological impact is high.

There is one significant flow pressure influencing flow in Rivelin 1, a discharge licence leading to a significant flow addition from Rivelin Water Treatment Works, an intermittent discharge with a max daily flow of 75 Ml/d. There are no significant abstractions within Rivelin 1. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.17.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 3 August 2018 at a reservoir outflow of 10.7Ml/d.

Rivelin 1 is a fairly sinuous and steep reach which falls ~119m over 7.3km, a slope of 0.9°. The channel is heavily shaded along its length with semi-continuous to continuous tree cover. Between one to three river terraces have been recorded at the RHS sites (the most terraces towards the end of the reach).

Bankfull width was recorded as 28m at RHS site (site ID 26429). The section at Walkley measured 8.5m, however this section was characterised by reinforced banks and due to the artificial nature of the channel the width is not representative of a natural channel at this point. At RHS site 26429, boulders dominated (60%), however areas of bedrock (10%), cobble (20%) and gravel (10%). Data from the RHS site indicates that flow was predominantly smooth and rippled. Some chute flow (20%) was indicated at the RHS site. Bedrock also forms the bank at 10% of spot sites at the RHS site. Boulders were also observed at site 26429 within the left bank. Seven pools and five riffles were observed. The survey also noted that >33% of the channel had been realigned and over-deepened.

Rivelin 1 is likely to support predominantly high energy environments, indicated by the steep slope of the watercourse and relative absence of depositional features. However, the flow structure identified in the reach supports lower energy flows, so both are likely to be present. Although the substrate is dominated by cobble, boulder and bedrock, the presence of a significant number of riffles suggests suitable spawning habitat opportunities are present. The larger substrates and undercut banks, where present, provide suitable refuge/cover habitat opportunities for juvenile and adult fish and white-clawed crayfish. The semi-continuous presence of trees in the riparian habitat will provide an input of allochthonous energy and provide further refuge/cover opportunities for fish and white-clawed crayfish. White-clawed crayfish may also find habitat opportunities in the reinforced banks. Migration/movement of fish and sediment may potentially be impacted by the presence of the weirs in the reach.

The reduction in flow could lead to several potential impacts within Rivelin 1:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for duration of drought option.
- Potentially major risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars) and protrusion of bed elements (such as larger particles) through the flow surface for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.
- Potentially major risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of drought option, with changes to the range and abundance of flow types.
- Major risk to longitudinal connectivity from 19 noted weirs, for periods of time during the duration of drought option, noting the retention of an overall variable flow pattern.
- Moderate 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 land-based sources will be largely dormant during environmental drought. During winter refill periods, overland flow processes that add fine sediment to the channel during rainfall events will increase in-channel flows and increase velocities. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Rivelin 1 from drought options is therefore assessed as **major**.

A4.17.5 River water quality

For this assessment the most downstream sample in the reach, River Rivelin at Hollins Lane Bridge (NE-49301821), has been used. This was selected due to data quality over the upstream site. There is one frequently spilling CSO potentially presenting an environmental risk in the reach. A summary description of the potential risks to water quality in Rivelin 1 as a result of drought options is presented in **Table A4.29**.

Table A4.29 Potential risks to water quality in Rivelin 1 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were consistent with High WFD status (0.2 mg/l) throughout the monitoring period.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period.	Orthophosphate concentrations were consistent with 'Good' WFD status (0.04 mg/l) throughout the monitoring period. Some seasonality was apparent with notable peaks in June/ August.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	None apparent
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 one listed CSO 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	Minor risk from drought options

A4.17.6 Summary of potential changes in the physical environment as a result of drought options

An overall summary of potential changes in the physical environment of Rivelin 1 as a result of drought options is presented in **Table A4.30**.

Table A4.30 Summary of potential changes in the physical environment of Rivelin 1 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that drought options implemented.
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Rivelin 1.
River habitats *Major risk*	• The major reduction in flow will lead to a major change to the energy of the system with the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. The risk to sediment dynamics is assessed as moderate.
Water quality *Moderate risk*	• Moderate risk from short term acute, infrequent, temporary water quality pressures locally downstream of one listed CSO during rainfall events. • Reported water quality is mostly consistent with Good or High status with no apparent flow sensitivity. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought options implemented.

Insert Figure A4.15

ANNEX 1 – REGULATED ABSTRACTIONS IN SOUTH AREA REACHES

DP reach	Licence No.	Use Description	NGR	Max Annual Quantity (m^3)	Max Daily Quantity (m^3)	Significant flow pressure
Don 1	NE/027/0005/007	Production of Energy	SE2090202675	12960000	51840 (HoF of 11200)	Yes
Don 2	2/27/05/201/R01	Hydroelectric Power Generation	SE2790000626	10249200	28080	Yes
Don 2	NE/027/0005/034	Transfer Between Sources (Post Water Act 2003)	SE2793300655	-	-	No
Don 4	NE/027/0005/024	Transfer Between Sources (Post Water Act 2003)	SK2992394457	-	-	No
Don 4	NE/027/0005/033	Transfer Between Sources (Post Water Act 2003)	SK3288091537	-	-	No
Don 5	2/27/06/006	Spray Irrigation - Direct	SK4110291676	1000000	9093	Yes
Don 5	2/27/06/006	Conveying Materials	SK4110291676	1000000	9093	Yes
Don 5	2/27/06/006	Evaporative Cooling	SK4110291676	1000000	9093	Yes
Don 5	2/27/06/006	Non-Evaporative Cooling	SK4110291676	1000000	9093	Yes
Don 5	2/27/06/006	Process Water	SK4110291676	1000000	9093	Yes
Don 5	2/27/06/026	General Cooling (Existing Licences Only) (Low Loss)	SK3849090036	6100000	26300	Yes
Don 5	NE/027/0006/022	Non-Evaporative Cooling	SK3833689808	99999	260	No
Don 5	NE/027/0006/009	Evaporative Cooling	SK4173191856	936650	3026	No
Don 5	NE/027/0006/020	Supply To A Canal For Throughflow	SK3969491007	-	-	No
Little Don 1	2/27/05/097	General Use Relating To Secondary Category (High Loss)	SK257991 SK269987	7065455	20618	Yes
Loxley 1	NE/027/0005/020	Hydroelectric Power Generation	SK3176089625	20554560	56160	Yes

ANNEX 2 – WATER QUALITY PRESSURES CONSIDERED IN THE ASSESSMENT

Name	Permit Reference	Outfall NGR	Significant Water Quality Pressure	Intermittent/ Continuous
Abbey Lane Sheffield/CSO	WRA7562 1(4)	SK 33658 83258	No	Intermittent
Abbeydale Road 46/CSO	WRA7562 1(5)	SK 33658 83258	No	Intermittent
Abbeydale Road South/CSO	WRA7562 1	SK 33658 83258	No	Intermittent
Alma Street Sheffield/CSO	EPR/DP3024GP	SK 35450 88028	No	Intermittent
Blackburn Meadows/STW	YWS00902	SK 40250 92110	Yes	Intermittent
Bridge End Penistone/CSO	C4960	SE 24433 03703	No	Intermittent
Bridge Street Courts/CSO	WADC752	SK 35691 87753	No	Intermittent
Brinsworth Street/CSO	YWS00627	SK 42306 92630	Yes	Intermittent
Broadfield Road/CSO	WRA8499 1	SK 34762 84768	No	Intermittent
Brompton Road/CSO	3201(SS) A1	SK 38020 89390	No	Intermittent
Burgoyne Road/CSO	3431(SS)	SK 34229 88852	No	Intermittent
Burnaby Crescent/CSO	3430(SS)	SK 34084 89449	No	Intermittent
Catchbar Lane/CSO	WRA8504	SK 33092 90625	No	Intermittent
Claywheels Lane/CSO	WADC833	SK 32795 91656	No	Intermittent
Dudley Road/CSO	EPR/UP3128XD	SK 32973 90870	No	Intermittent
Dvisa A22 Gilpin Street/CSO	WRA7031	SK 34475 88633	No	Intermittent
Fraser Drive/CSO	WRA7482 A2	SK 34629 83151	No	Intermittent
Gibson Lane/No 2 CSO	WRA8520	SK 26992 98596	No	Intermittent
Glen Bridge/CSO	WRA7981	SK 31150 87828	No	Intermittent
Green Brook Place/CSO	EPR/EP3225XP	SE 24985 02799	No	Intermittent
Hangingwater Road/CSO	WRA6682 A1	SK 3163 8531	No	Intermittent
Hastilar Road South/CSO	218 A1	SK 39955 85004	No	Intermittent
Herries Road/No 2 CSO	WRA8261	SK 33767 90737	Yes	Intermittent
Hill Bridge/CSO	WRA9131	SK 33276 89572	No	Intermittent
Holme Lane Sheffield/CSO	WRA8509	SK3342589701	No	Intermittent
Holme Lane Sypte/CSO	WRA8514	SK 32799 89335	No	Intermittent
Holme Lane/CSO	27/24/0188	SE 6156 3264	No	Intermittent
Holme Lane/CSO	WRA8509	SK33420 89700	No	Intermittent
Hunshelf Road/No 2 CSO	WRA8524	SK 27304 98452	No	Intermittent
Jordan/CSO	YWS00675	SK 40810 92245	Yes	Intermittent
Langsett Road/CSO	WRA8454	SK 31514 92502	No	Intermittent
Manchester Rd Garage/CSO	WRA8521	SK 29029 97973	No	Intermittent
Manchester Road Weir/CSO	WRA8523	SK 28483 98153	Yes	Intermittent
Marsh Street/CSO	YWS01506	SK 42350 92230	Yes	Intermittent
Masbrough Street/CSO	YWS00711	SK 42066 92590	Yes	Intermittent
Parkside Road/CSO	WRA9195	SK 33264 90517	No	Intermittent
Rivelin Valley 3/CSO	WADC1286	SK 31430 87987	Yes	Intermittent
Rudyard Road/CSO	WRA9134	SK 33310 89618	No	Intermittent
Sicey Avenue/CSO	WRA8166 A1	SK 36627 93759	No	Intermittent
Springvale/CSO	2002	SE2574 0321	No	Intermittent
Stannington Road/No 2 CSO	735	SK 32507 89293	No	Intermittent
Station Lane W17/No 2 CSO	WRA8155	SK 30795 93368	No	Intermittent
Stocksbridge/CSO	3300(SS)	SK 29053 97798	No	Intermittent

Name	Permit Reference	Outfall NGR	Significant Water Quality Pressure	Intermittent/ Continuous
Thurgoland/CSO	2992	SE 2930 0010	Yes	Intermittent
Thurlstone Road/No 2 CSO	WRA8207	SE 23621 03516	No	Intermittent
Union Street/CSO	YWS00710	SK 41760 92810	Yes	Intermittent
Vickers Road/CSO	WRA8113 A1	SK 36777 91072	Yes	Intermittent
Waingate/CSO	WRA9130	SK 35724 87758	No	Intermittent
Watersmeet Road/No 1 CSO	318	SK 32660 89308	No	Intermittent
Whams Road/No 2 CSO	WRA8685	SE 1916 0412	No	Intermittent
Wharncliffe West/CSO	YWUCD1/107	SK 29891 94513	No	Intermittent
Wisewood Road/CSO	WRA9024	SK 32405 89402	No	Intermittent
Aldwarke WWTW	C4954	SK4507494392	No	Continuous
Beulah Road Premesis	WRA7289	SK3390090300	No	Continuous
Blackburn Meadows STW	E25	SK4053491922	No	Continuous
Bullhouse Mill	WRA7530	SE2120002950	No	Continuous
Bullhouse Minewater Project	WRA7526	SE2155002910	No	Continuous
Carlecotes STW	556	SE1817502736	No	Continuous
Cheesebottom STW	2556	SE2792001270	Yes	Continuous
Crane Moor STW	557	SE3085301478	No	Continuous
Crow Edge STW	1614	SE1935003980	No	Continuous
Dunford Bridge STW	E684(SS)	SE1614102461	No	Continuous
Dungworth STW	E685(SS)	SK2879290208	No	Continuous
Ewden Village STW	C5298	SK2725595929	No	Continuous
Ewden WwTW	EPRMB3797WP	SK2982195770	No	Continuous
Harden STW	E687(SS)	SE1527603573	No	Continuous
Hood Green STW	558	SE3091803285	No	Continuous
Hoylandswaine STW	2344	SE2688205712	No	Continuous
Ingbirchworth STW	WRA7365	SE2422603763	No	Continuous
Langsett STW	3701(SS)	SE2183200378	No	Continuous
Livesey Street Premises	WRA 6752	SK3371090350	No	Continuous
Long Lane STW	NPSWQD002225	SK4367789206	No	Continuous
Midhopestones STW	3740(SS)	SK2374699738	No	Continuous
Morehall Works	C5299	SK2909495680	No	Continuous
Private	EPRGP3129XK	SE2118302999	No	Continuous
Private	3335	SK2970099100	No	Continuous
Private	WA6494	SK3122093510	No	Continuous
Private	3181	SK3390090300	No	Continuous
Scout Dike STW	E696(SS)	SE2370004600	Yes	Continuous
Silkstone WWTW	WRA7222	SE2955706550	No	Continuous
Wentworth Castle	E702(SS)	SE3206203924	No	Continuous
Wharncliffe Side STW	E704(SS)	SK2999094550	No	Continuous
Wortley East STW	3717(SS)	SE3272801728	No	Continuous
Wortley West STW	E757(SS)	SK2975999079	No	Continuous

ANNEX 3 - DON 5 SIGNIFICANT INTERMITTENT WATER QUALITY PRESSURES

Map and table of the significant intermittent water quality pressures on the Don 5 reach.

Map Number	CSO Name
1	Union Street/CSO
2	Masbrough Street/CSO
3	Brinsworth Street/CSO
4	Marsh Street/CSO
5	Blackburn Meadows/STW
6	Jordan/CSO
7	Vickers Road/CSO

ANNEX 4 – FLOW TRANSPOSITION IN THE ABSENCE OF MEASURED DATA (FOR ILLUSTRATIVE TIME SERIES)

The Gustard[11] method for flow transposition has been used to scale flows from a suitable donor gauge to an ungauged assessment point. This is applied across the flow duration curve as follows:

[11] Gustard, A., Bullock, A. and Dixon, J. M. (1992). Low flow estimation in the United Kingdom. Institute of Hydrology Report No. 108, Centre for Ecology and Hydrology, Wallingford.

1) For low flows (Q95 and lower flows):

$$\text{AP flow} = \frac{\text{Donor flow} \times \text{AP area} \times \text{AP BFI-HOST}}{\text{Donor area} \times \text{Donor BFI-HOST}}$$

2) For mean flows and higher:

$$\text{AP flow} = \frac{\text{Donor flow} \times \text{AP area} \times \text{AP SAAR} \times \text{AP SPR-HOST}}{\text{Donor area} \times \text{Donor SAAR} \times \text{Donor SPR-HOST}}$$

For this assessment this equation has been applied to flows of Q50 and higher, accepting that Q50 is not mean flow.

3) For intermediate flows between Q95 and Q50 a proportion of each of equation (1) and (2) has been used, based on Q statistic.

Scaling factors have been applied to the daily flow series of the donor catchment using the on-the-day Q statistic. Data covers the period from 1990-2023, unless otherwise stated.

As agreed with the Environment Agency, all abstractions and discharges of >5% of the summer Q95 of the donor gauge have been re-naturalised. Where those abstractions or discharges are YWSL then daily data have been used in the re-naturalisation. For all other identified abstractions or discharges the permitted value has been used in the re-naturalisation. Flow modifications in the catchment of the Assessment Point (AP) are treated similarly. This then provides the following equation:

4) Daily flow at AP = scaled re-naturalised donor gauge flow + flow modifications in recipient catchment

The section below identifies the specific datasets and values used in the derivation of the illustrative flow series at the AP in those reaches with appropriate measured data.

The flow transposition approach has been utilised for APs in five reaches of the South Area EAR:

- Don 2
- Don 3
- Don 4
- Don 5
- Loxley 2

Don 2

There are no data limitations that impede the length of flow transposition period for this reach.

Aspect	Point	Data source
Donor gauge	River Don at Sheffield Hadfields	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for re-naturalisation	90.7Ml/d	Derived from EA dataset for the 1990-2023 period
Re naturalisation of donor gauge	• Reservoired catchments upstream of the Sheffield Hadfields flow gauge • Upstream WwTW (Cheesebottom, Stocksbridge and Ewden)	• YWSL daily flow and level data • YWSL daily mean discharges or dry weather flows when not available
Re-naturalisation of recipient AP catchment descriptors	Reservoired catchments	N/A
Post processing of recipient AP	• Scout Dike Reservoir outflow • Dunford Bridge maintained flow	• YWSL daily flow and level data • YWSL daily flow data

Catchment descriptors were collected, for each relevant site, from the FEH Webservice[12] as listed below:

	Area km^2	SAAR mm	SPR-HOST	BFI-HOST
Donor gauge	373.0	1014	38.4	0.416
Re-naturalised donor gauge	223.8	913	34.2	0.433
Recipient AP (raw)	52.5	1196	38.3	0.433
Re-naturalised recipient AP	28.9	1138	39.0	0.410

Scaling factors applied to the re-naturalised donor gauge daily flow series in deriving the re-naturalised daily flow series at the recipient AP are listed below:

Q95 and lower flow scaling factor	Q50 and higher flow scaling factor
0.122	0.184

[12] https://fehweb.ceh.ac.uk/GB/map

Don 3

There are no data limitations that impede the length of flow transposition period for this reach.

Aspect	Point	Data source
Donor gauge	River Don at Sheffield Hadfields	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for re-naturalisation	90.7Ml/d	Derived from EA dataset for the 1990-2023 period
Re naturalisation of donor gauge	• Reservoired catchments upstream of the Sheffield Hadfields flow gauge • Upstream WwTW (Cheesebottom, Stocksbridge and Ewden)	• YWSL daily flow and level data • YWSL daily mean discharges or dry weather flows when not available
Re-naturalisation of recipient AP catchment descriptors	Reservoired catchments	N/A
Post processing of recipient AP	• Scout Dike Reservoir outflow • Underbank Reservoir outflow • Dunford Bridge maintained flow • Cheesebottom WwTW	• YWSL daily flow and level data • YWSL daily flow and level data • YWSL daily flow data • YWSL dry weather flow

Catchment descriptors were collected, for each relevant site, from the FEH Webservice[13] as listed below:

	Area km^2	SAAR mm	SPR-HOST	BFI-HOST
Donor gauge	373.0	1014	38.4	0.416
Re-naturalised donor gauge	223.8	913	34.2	0.433
Recipient AP (raw)	122.1	1119	36.7	0.446
Re-naturalised recipient AP	62.4	1010	31.5	0.463

Scaling factors applied to the re-naturalised donor gauge daily flow series in deriving the re-naturalised daily flow series at the recipient AP are listed below:

Q95 and lower flow scaling factor	Q50 and higher flow scaling factor
0.298	0.284

[13] https://fehweb.ceh.ac.uk/GB/map

Don 4

There are no data limitations that impede the length of flow transposition period for this reach.

Aspect	Point	Data source
Donor gauge	River Don at Sheffield Hadfields	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for re-naturalisation	90.7Ml/d	Derived from EA dataset for the 1990-2023 period
Re naturalisation of donor gauge	• Reservoired catchments upstream of the Sheffield Hadfields flow gauge • Upstream WwTW (Cheesebottom, Stocksbridge and Ewden)	• YWSL daily flow and level data • YWSL daily mean discharges or dry weather flows when not available
Re-naturalisation of recipient AP catchment descriptors	Reservoired catchments	N/A
Post processing of recipient AP	• Scout Dike Reservoir outflow • Underbank Reservoir outflow • Morehall Reservoir outflow • Dunford Bridge maintained flow • Cheesebottom, Stockbridge and Ewden WwTW	• YWSL daily flow and level data • YWSL daily flow and level data • YWSL daily flow and level data • YWSL daily flow data • YWSL dry weather flow

Catchment descriptors were collected, for each relevant site, from the FEH Webservice[14] as listed below:

	Area km^2	SAAR mm	SPR-HOST	BFI-HOST
Donor gauge	373.0	1014	38.4	0.416
Re-naturalised donor gauge	223.8	913	34.2	0.433
Recipient AP (raw)	154.1	1112	38.1	0.436
Re-naturalised recipient AP	68.2	996	32.1	0.463

Scaling factors applied to the re-naturalised donor gauge daily flow series in deriving the re-naturalised daily flow series at the recipient AP are listed below:

Q95 and lower flow scaling factor	Q50 and higher flow scaling factor
0.326	0.312

[14] https://fehweb.ceh.ac.uk/GB/map

Don 5

There are no data limitations that impede the length of flow transposition period for this reach.

Aspect	Point	Data source
Donor gauge	River Don at Sheffield Hadfields	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for re-naturalisation	90.7Ml/d	Derived from EA dataset for the 1990-2023 period
Re naturalisation of donor gauge	• Reservoired catchments upstream of the Sheffield Hadfields flow gauge • Upstream WwTW (Cheesebottom, Stocksbridge and Ewden)	• YWSL daily flow and level data • YWSL daily mean discharges or dry weather flows when not available
Re-naturalisation of recipient AP catchment descriptors	Reservoired catchments	N/A
Post processing of recipient AP	• Upstream reservoir outflows • Dunford Bridge maintained flow • Cheesebottom, Stockbridge and Ewden WwTW	• YWSL daily flow and level data • YWSL daily flow data • YWSL dry weather flow

Catchment descriptors were collected, for each relevant site, from the FEH Webservice[15] as listed below:

	Area km^2	SAAR mm	SPR-HOST	BFI-HOST
Donor gauge	373.0	1014	38.4	0.416
Re-naturalised donor gauge	223.8	913	34.2	0.433
Recipient AP (raw)	269.0	1071	39.3	0.421
Re-naturalised recipient AP	119.8	953	32.7	0.459

Scaling factors applied to the re-naturalised donor gauge daily flow series in deriving the re-naturalised daily flow series at the recipient AP are listed below:

Q95 and lower flow scaling factor	Q50 and higher flow scaling factor
0.568	0.535

[15] https://fehweb.ceh.ac.uk/GB/map

Loxley 2

Gauged data is only available from October 2001 onwards meaning that it is not possible to develop a flow series for prior to this date.

Aspect	Point	Data source
Donor gauge	Loxley at Rowel Bridge	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for re-naturalisation	30.5Ml/d	Derived from EA dataset for the 2001-2023 period
Re naturalisation of donor gauge	• Damflask Reservoir • Rivelin Reservoir	• YWSL daily flow and level data • YWSL daily flow and level data
Re-naturalisation of recipient AP catchment descriptors	Reservoired catchments	N/A
Post processing of recipient AP	• Damflask Reservoir • Rivelin Reservoir	• YWSL daily flow and level data • YWSL daily flow and level data

Catchment descriptors were collected, for each relevant site, from the FEH Webservice[16] as listed below:

	Area km^2	SAAR mm	SPR-HOST	BFI-HOST
Donor gauge	9.9	958	29.9	0.497
Re-naturalised donor gauge	28.4	1029	46.6	0.332
Recipient AP (raw)	86.1	1064	43.3	0.376
Re-naturalised recipient AP	4.7	860	35.5	0.349

Scaling factors applied to the re-naturalised donor gauge daily flow series in deriving the re-naturalised daily flow series at the recipient AP are listed below:

Q95 and lower flow scaling factor	Q50 and higher flow scaling factor
0.335	0.508

[16] https://fehweb.ceh.ac.uk/GB/map

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APPENDIX B – ENVIRONMENTAL RECEPTORS

B1 INTRODUCTION

This appendix assesses the potential impacts on the environmental receptors of the South Area river catchment during the period of implementation of associated drought options.

The South area Agency Reservoirs comprise eight drought options as reported in this appendix:

1. Winscar/Windleden Lower Reservoirs drought permit
2. Scout Dyke Reservoir drought permit
3. Langsett Reservoir drought permit
4. Underbank Reservoir drought permit
5. More Hall Reservoir drought permit
6. Dale Dike Reservoir compensation flow reduction
7. Damflask Reservoir drought permit
8. Rivelin Lower Reservoir drought permit.

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 2027 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 receptors 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 **Figures B1.1** and **B1.2**.

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 receptors
5. Invasive non-native species (INNS)
6. Landscape, navigation, recreation and heritage.

Section B.3 Environmental receptors screening.

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

1. Receptors assessment
2. Summary of impacts.

Section B.5 Cumulative impacts receptors assessment.

Section B.6 Monitoring and mitigation

[1] Ricardo (2025). Yorkshire Water Drought Plan 2027 Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. February 2025.

[Insert Figure B1.1]

[Insert Figure B1.2]

B2 BASELINE & SENSITIVITY

B2.1 DON 0

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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see).

Table B2-1 Statutory designated sites

Site/Receptor 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)*
The Dark Peak SSSI	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
South Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Peak District Moors (South Pennine Moors Phase 1) SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No

B2.1.2 NERC and local wildlife sites

Table B2-2 summarises the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

No NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see Table B2-2).

Table B2-2 NERC habitats and local wildlife sites

Site/Receptor 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)*
Wogden Foot, Dunford Bridge LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Western Moors LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Habitat – Blanket bog -18982 -18972	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Cotton grass moorland.	Not sensitive	No
NERC Habitat - Blanket bog -19541	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Dry bog non-heather dominant.	Not sensitive	No
NERC Habitat - Blanket bog -526337 -13952 -13951	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Blanket bog, Upland flushes, fens and swamps, Fragmented heath, Upland heath, Grass moorland and rough grazing	Not sensitive	No
NERC Habitat - Blanket bog -13991 -13993 -13992 -13959 -13961 -13960 -13976	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Blanket bog, Upland heathland, Upland flushes, fens and swamps, Fragmented heath, Upland heath, Grass moorland and rough grazing	Not sensitive	No
NERC Habitat - Deciduous woodland -315253 -315254 -315256	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Lowland heath, Lowland meadows and pastures	Not sensitive	No
NERC Habitat - Good quality semi-improved grassland -362411 -362410 -362405 -362404 -362403	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Lowland meadows and pastures; Restoration of species-rich, semi-natural grassland	Not sensitive	No
NERC Habitat - Good quality	Major	Unlikely to be in connectivity with impacted reach or support aquatic	Not sensitive	No

Site/Receptor 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)*
semi-improved grassland -360076 -360961 -360960 -360962		receptors. Restoration of species-rich, semi-natural grassland		
NERC Habitat - Grass moorland -369324 -369384	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Blanket bog, Fragmented heath, Upland heath, Grass moorland and rough grazing	Not sensitive	No
NERC Habitat - Lowland heathland -414343 -414345 -414344 -414346 -414421 -414420 -414419 -414261 -414259	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Habitat - Lowland heathland -414447	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Upland flushes, fens and swamps	Not sensitive	No
NERC Habitat - No main habitat but additional habitats present -442487 -442486	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Lowland heath.	Not sensitive	No
NERC Habitat - Upland heathland -499103	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Bilberry/crowberry moorland.	Not sensitive	No
NERC Habitat - Upland heathland -499698	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Heather moor.	Not sensitive	No

B2.1.3 NERC and other protected species

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

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. White-clawed crayfish surveys carried out by YWSL in 2016 in Don 1 found no

evidence of white-clawed crayfish. The Environment Agency reported that signal crayfish were recorded near Millhouse Green (at SE2155302908) in October 2018. Given the dense populations of signal crayfish in this reach the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this reach.

Two nationally scarce macroinvertebrate species, *Potamophylax rotundipennis,* and *Rhyacophila septentrionis* were recorded within the impacted reach. Based on the available information this receptor is considered to be susceptible to drought option impacts and have a **medium** 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 to inform the assessment of otter in the impacted reach. Historic data records from the NBN gateway confirm the presence of otters within the impacted reach. However, no survey data post-2014 is available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the available information these species are considered not to be susceptible to drought option impacts and have a **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, but positive records of water vole have been identified approximately 2km Northwest of Don 0. However, 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 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.**

Two NERC act section 41 fish species, Brown trout and European eel, have been identified as present in the impacted reach.

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/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipe)*	Major	Given the presence of signal crayfish in this reach the Environment Agency considers it unlikely that white-clawed crayfish are present and they are not considered further for this reach.	Not sensitive	No
Notable Species – Invertebrates -Caddisfly (*Potamophylax rotundipennis)* -Caddisfly	Major	*P. rotundipennis* is a tolerant species which favours moderate flow rates unlikely to be impacted by reduced flows. *R. septentrionis* are commonly found in fast-flowing, upland waters with stony bottoms. Low flow impacts	Low	Yes

Site/Receptor 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)*
(Rhyacophila septentrionis)		of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only) and may therefore not markedly detract from the quality of the supporting environment for the present species.		
NERC Species – mammals Otter *(Lutra lutra)*	Major	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 Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish - Brown Trout (*Salmo trutta)* -European Eel *(Anguilla Anguilla)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
NERC and Notable species – Birds There are many birds species present across the region	Major	The following bird species to varying extents rely on water dependent habitats. However, they are not expected to be impacted severely from implementation of the drought option against a baseline of reduced flows characteristic of drought: -Little Ringed Plover Bird (*Charadrius dutius*) - Snipe (*Gallinago gallinago*) - House Martin (*Delichon urbica*) - Swallow (*Hirundo rustica*) - Grey Wagtail (*Motacilla cinerea*)	Not sensitive	No

B2.1.4 WFD receptors

The sensitivity analysis has considered the relationship between macroinvertebrate and/or fish communities and the supporting environmental variables over the baseline period. Table B2 10 below summarises of the RBMP Cycle 2 Status/ Potential of the WFD waterbody, including WFD receptors for fish and macroinvertebrates. The purpose of the analysis is to establish whether biological metrics/indices respond inter-annually to changes in flow and associated environmental variables including habitat quality and availability.

B2.1.4.1 Macroinvertebrates

The WFD waterbody GB104027057500 Don from Source to Scout Dyke classifies as 'good' for macroinvertebrates in 2022, Cycle 3. The WFD classification of 'good' for macroinvertebrates in 2022 is informed by one Environment Agency monitoring site, D/S Windledon Bridge (ID 74843), located outside the impacted reach in Don 1.

At EA Site ID 118, baseline surveys were conducted in 2010, 2012-2021 and 2023 with five YWSL surveys supplementing data between 2021 and 2023. This sites provide strong temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors.

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A**.

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Moderate' on two occurrences to 'High' on five occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification.

Table B2-4 Macroinvertebrate EQR classification boundaries

WHPT Classification	$WHPT_{ASPT}$ EQR	$WHPT_{NTAXA}$ EQR	LIFE EQR (Non-WFD)	PSI EQR (Non-WFD)
High	>0.97	>0.8	0.94	0.7
Good	0.86 - 0.97	0.68 - 0.8		
Moderate	0.72 - 0.86	0.56 - 0.68		
Poor	0.59 - 0.72	0.47 - 0.56		
Bad	<0.59	<0.47		

$WHPT_{ASPT}$ scores ranged between 6.2 and 7.16 with the lowest WHPT ASPT score of 6.2 in Autumn 2014, and the highest score of 7.16 in Spring 2013. The $WHPT_{ASPT}$ expected score for this site is 7.2, with all samples above the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.9 and 0.99 with the lowest $WHPT_{ASPT}$ EQR of 0.9 at Site 118 in Spring 2010, and the highest EQR of 0.99 at Site 118 in Spring 2013.

In Don 0 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ scores ranging between 15 and 29 with the lowest $WHPT_{NTAXA}$ score of 15 in Autumn 2012, and the highest score of 29 in Autumn 2023. The $WHPT_{NTAXA}$ expected score for this site is 26.07, with 2 of the 28 samples below the 'Good/Moderate boundary.' $WHPT_{NTAXA}$ EQR scores ranged between 0.6 and 1.16 with the lowest $WHPT_{NTAXA}$ EQR of 0.6 in Autumn 2012, and the highest EQR of 1.16 in Autumn 2023.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. See **Table B2-5** for guidance in interpreting raw LIFE scores.

Table B2-5 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

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. $LIFE_{FAMILY}$ scores ranged between 6.93 - 7.71 (7.38) with the lowest $LIFE_{FAMILY}$ score of 6.93 in Autumn 2021, and the highest score of 7.71 in Spring 2013. The $LIFE_{FAMILY}$ expected score for this site is 7.78, with 8 of the 28 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.9 and 1, with the lowest $LIFE_{FAMILY}$ EQR of 0.9 in Autumn 2021, and the highest EQR of 1 in Autumn 2018.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 42 and 75 with the lowest PSI_{FAMILY} score of 42 in Autumn 2021, and the highest score of 75 in Spring 2013. The PSI_{FAMILY} expected score for this site is 72.38, with 24 of the 28 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.62 and 1.04 with the lowest PSI_{FAMILY} EQR of 0.62 in Autumn 2021, and the highest EQR of 1.04 in Spring 2013.

One invasive non-native species, including *Crangonyx pseudogracilis/floridanus* was recorded as present between 2010 to 2023.

Two designated species, including *Potamophylax rotundipennis* and *Rhyacophila septentrionis* were recorded as present at two sites in 2015 and 2019, respectively.

Summary

The WFD status of the macroinvertebrate community in Don 0 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

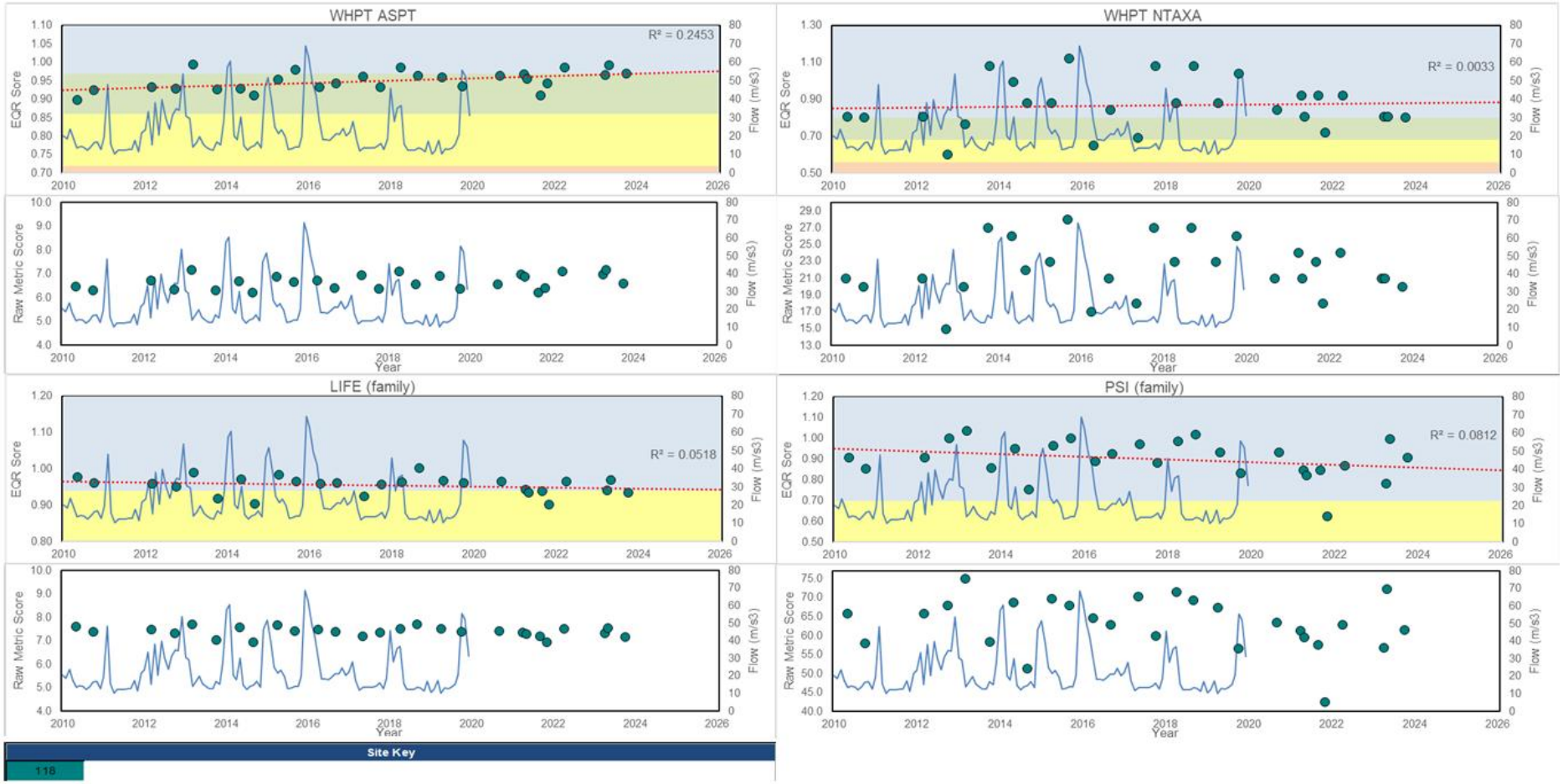
Baseline data indicates that under present conditions, the macroinvertebrate community in Don 0 has medium to high sensitivity to reduced flows, with site ID 118 showing medium to high sensitivity (**Figure B2-3**). See **Table B2-5** for guidance in interpreting raw LIFE scores.

A summary of the above data is presented within **Table B2-6.** Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-6 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
118	SE1579202415	28	2010 to 2023	0.9 - 1 (0.95)	6.93 - 7.71 (7.38)	0.62 - 1.04 (0.9)	42.42 - 75 (62.83)	0.9 - 0.99 (0.95)	G - H (G)	6.2 - 7.16 (6.67)	0.6 - 1.16 (0.88)	M - H (H)	15 - 29 (22)

Figure B2-1 Macroinvertebrate EQR scores (Top) and observed scores (Bottom) for $WHPT_{NTAXA}$, $WHPT_{ASPT}$, $LIFE_{FAMILY}$ and PSI_{FAMILY} scores



B2.1.4.2 Fish

Waterbody GB104027057500 Don from Source to Scout Dyke is classified under Cycle 3 (2022) as 'moderate'. The WFD classification is informed by two Environment Agency monitoring sites, Bull House Bridge (ID13683) and Soughley Farm (ID 4035). Both sites are located outside the impacted reach in Don 1 and classified as moderate in 2022.

Baseline data is available for one site, U/S Windleden Clough (ID RD1). YWSL commissioned surveys at RD1 between from 2020 through to 2024.**Table B2-7** details survey sites within the Don 0 reach.

The WFD status of the fish community in Don 0 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

No Environment Agency fisheries monitoring sites were present in the impacted reach, FCS2 data was provided by Soughley Farm, located downstream of the impacted reach (Don 0).

The site Soughley Farm is individually classified as 'Good' with a site EQR of 0.4648, based on the FCS2 EQR scores from the 2023 survey. The site has a relatively poor diversity, with one species present from an expected three species. Trout are observed at the site at lower densities than expected, contributing to a good EQR score of 0.7363. Bullhead and stone loach were expected at the site, but not observed.

Catch depletion survey data from 2020 to 2024 at RD1 show a consistently recorded presence of brown trout, with annual counts ranging from 18 to 27 individuals. The highest count was observed in 2023, and while some year-to-year variation is evident, the results indicate stable and comparable catch numbers throughout the five-year period. These findings support the conclusion that brown trout are reliably present at this site **Table B2-8** details species presence by year across all sites within the Don 0 reach. All fish counts are available in Annex 1 to this appendix.

Although European eel have not been identified, an absence from the impacted reach is not considered likely as previous historical data obtained from the EA suggested their presence. Therefore, a low abundance of this species has been assumed.

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

Table B2-7 Don 0 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
RD1	u/s Windleden Clough	SE1587002426	Electric Fishing (AC, PDC and DC)	5	2020	2024

Table B2-8 Don 0 Fish Survey Results

Tolerance Category	Species Name	2020	2021	2022	2023	2024
Low tolerance	Brown trout	X	X	X	X	X

B2.1.4.3 WFD waterbody status

Table B2-9 summarises the WFD Classification of waterbody which contain the impacted reach**. Table B2-9** also displays the objective status for 2027 (Cycle 3) or the predicted status in 2027 where the objective to meet good status has been met in 2022. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-9 WFD classifications

Waterbody ID & Name		**GB104027057500 Don from Source to Scout Dyke**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	High
	Macroinvertebrates	Good	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Moderate	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.1.5 Invasive non-native species (INNS)

Table B2-10 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see Table B2-10).

Table B2-10 INNS Receptors

Site/Receptor 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 - Freshwater shrimp (*Crangonyx pseudogracilis*)	Major	The implementation of this drought option is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – Terrestrial plants -Himalayan balsam (*Impatiens glandulifera)* - Rhododendron (*Rhododendron ponticum*)	Major	The implementation of this drought option is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.1.6 Landscape, navigation, recreation and heritage

Table B2-11 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see Table B2-11).

Table B2-11 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Trans Pennine Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Barnsley Boundary Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
River Don - canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No
River Don - angling	Major	Receptors club-administered and public angling. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No

B2.2 WINDLEDEN CLOUGH 1

B2.2.1 Statutory designated sites

Table B2-12 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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-12**).

Table B2-12 Statutory designated sites

Site/Receptor 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)*
The Dark Peak SSSI	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
South Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Peak District Moors (South Pennine Moors Phase 1) SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No

B2.2.2 NERC and local wildlife sites

Table B2-13 summarises the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

No NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see Table B2-13).

Table B2-13 NERC habitats and local wildlife sites

Site/Receptor 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)*
Wogden Foot, Dunford Bridge LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No

Site/Receptor 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)*
Western Moors LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Habitat – Blanket bog -18982 -18972	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Cotton grass moorland.	Not sensitive	No
NERC Habitat - Blanket bog -19541	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Dry bog non-heather dominant.	Not sensitive	No
NERC Habitat - Blanket bog -526337 -13952 -13951	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Blanket bog, Upland flushes, fens and swamps, Fragmented heath, Upland heath, Grass moorland and rough grazing	Not sensitive	No
NERC Habitat - Blanket bog -13991 -13993 -13992 -13959 -13961 -13960 -13976	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Blanket bog, Upland heathland, Upland flushes, fens and swamps, Fragmented heath, Upland heath, Grass moorland and rough grazing	Not sensitive	No
NERC Habitat - Deciduous woodland -315253 -315254 -315256	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Lowland heath, Lowland meadows and pastures	Not sensitive	No
NERC Habitat - Good quality semi-improved grassland -362411 -362410 -362405 -362404 -362403	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Lowland meadows and pastures; Restoration of species-rich, semi-natural grassland	Not sensitive	No
NERC Habitat - Good quality semi-improved grassland -360076 -360961 -360960 -360962	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Restoration of species-rich, semi-natural grassland	Not sensitive	No

Site/Receptor 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 Habitat - Grass moorland -369324 -369384	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Blanket bog, Fragmented heath, Upland heath, Grass moorland and rough grazing	Not sensitive	No
NERC Habitat - Lowland heathland -414343 -414345 -414344 -414346 -414421 -414420 -414419 -414261 -414259	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Habitat - Lowland heathland -414447	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Upland flushes, fens and swamps	Not sensitive	No
NERC Habitat - No main habitat but additional habitats present -442487-442486	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Lowland heath.	Not sensitive	No
NERC Habitat - Upland heathland -499103	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Bilberry/crowberry moorland.	Not sensitive	No
NERC Habitat - Upland heathland -499698	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Heather moor.	Not sensitive	No

B2.2.3 NERC and other protected species

Table B2-23 summarises the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. White-clawed crayfish surveys carried out by YWSL in 2016 in Don 1 found no evidence of white-clawed crayfish. The Environment Agency reported that signal crayfish were recorded near Millhouse Green (at SE2155302908) in October 2018. Given the dense populations of signal crayfish in this reach the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this reach.

Data obtained from the Environment Agency and a review of available data from NBN gateway was used to inform the assessment of otter in the impacted reach. Historic data records from the NBN

gateway confirm the presence of otters within the impacted reach. However, no survey data post-2014 is available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the available information these species are considered not to be susceptible to drought option impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Data obtained from the Environment Agency, YWSL and a review of available data from NBN gateway was used inform the assessment of water vole in the impacted reach. Positive records of water vole presence were identified within 500m of the impacted reach in 2024 by the Sheffield & Rotherham Trust. However, the distribution of information and survey data for the species was considered to be limited. Based on the limited available information water vole are considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

Two NERC act section 41 and notable fish species have been identified as present in the impacted reach, including two NERC Act Section 41 fish species (Brown trout and European eel).

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 B2-14 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipe)*	Major	Given the presence of signal crayfish in this reach the Environment Agency considers it unlikely that white-clawed crayfish are present and they are not considered further for this reach.	Not sensitive	No
NERC Species – mammals Otter *(Lutra lutra)*	Major	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 Water vole (*Arvicola amphibious)*	Major	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 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.	Medium	Yes
NERC Species – Fish - Brown Trout (*Salmo trutta)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within	High	Yes

Site/Receptor 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)*
-European Eel *(Anguilla Anguilla)*		the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.		
NERC and Notable species – Birds There are many birds species present across the region	Major	The following bird species to varying extents rely on water dependent habitats. However, they are not expected to be impacted severely from implementation of the drought option against a baseline of reduced flows characteristic of drought: -Little Ringed Plover Bird (*Charadrius dutius*) - Snipe (*Gallinago gallinago*) - House Martin (*Delichon urbica*) - Swallow (*Hirundo rustica*) - Grey Wagtail (*Motacilla cinerea*)	Not sensitive	No

B2.2.4 WFD receptors

The sensitivity analysis has considered the relationship between macroinvertebrate and/or fish communities and the supporting environmental variables over the baseline period. Table B2 10 below summarises of the RBMP Cycle 2 Status/ Potential of the WFD waterbody, including WFD receptors for fish and macroinvertebrates. The purpose of the analysis is to establish whether biological metrics/indices respond inter-annually to changes in flow and associated environmental variables including habitat quality and availability.

B2.2.4.1 Macroinvertebrates

The WFD waterbody GB104027057500 Don from Source to Scout Dyke classifies as ‘good’ for macroinvertebrates in 2022, Cycle 3. The WFD classification of ‘good’ for macroinvertebrates in 2022 is informed by one Environment Agency monitoring site, D/S Windledon Bridge (ID 74843), located outside the impacted reach in Don 1.

Baseline macroinvertebrate surveys were conducted by APEM at one (Site MI_WR1 - Dunford Bridge) in between 2020 and 2024 at NGR: SE 15792 02415.

$WHPT_{ASPT}$ scores ranged between 6.29 - 7.57 (6.95) with the lowest $WHPT_{ASPT}$ score of 6.29 in Autumn 2021, and the highest score of 7.57 in Spring 2024. The $WHPT_{ASPT}$ expected score for this site is 7.161, with all samples above the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.88 - 1.06 (0.97) with the lowest $WHPT_{ASPT}$ EQR of 0.88 in Autumn 2021, and the highest EQR of 1.06 in Spring 2024.

$WHPT_{NTAXA}$ scores ranged between 13 - 26 (22.38) with the lowest $WHPT_{NTAXA}$ score of 13 in Autumn 2024, and the highest score of 26 in Spring 2021. The $WHPT_{NTAXA}$ expected score for this site is24.936, with 1 of the 8 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.52 - 1.04 (0.9) with the lowest $WHPT_{NTAXA}$ EQR of 0.52 in Autumn 2024, and the highest EQR of 1.04 in Spring 2021.

$LIFE_{FAMILY}$EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. $LIFE_{FAMILY}$ scores ranged between 7.35 - 7.86 (7.62) with the lowest $LIFE_{FAMILY}$ score of 7.35 in Autumn 2020, and the highest score of 7.86 in Spring 2021. The $LIFE_{FAMILY}$ expected score for this site is7.813, with all samples above the 'Good/Moderate boundary'. $LIFE_{FAMILY}$ EQR scores ranged between 0.94 - 1.01 (0.98) with the lowest LIFE(fam) EQR of 0.94 in Autumn 2020, and the highest EQR of 1.01 in Spring 2021.

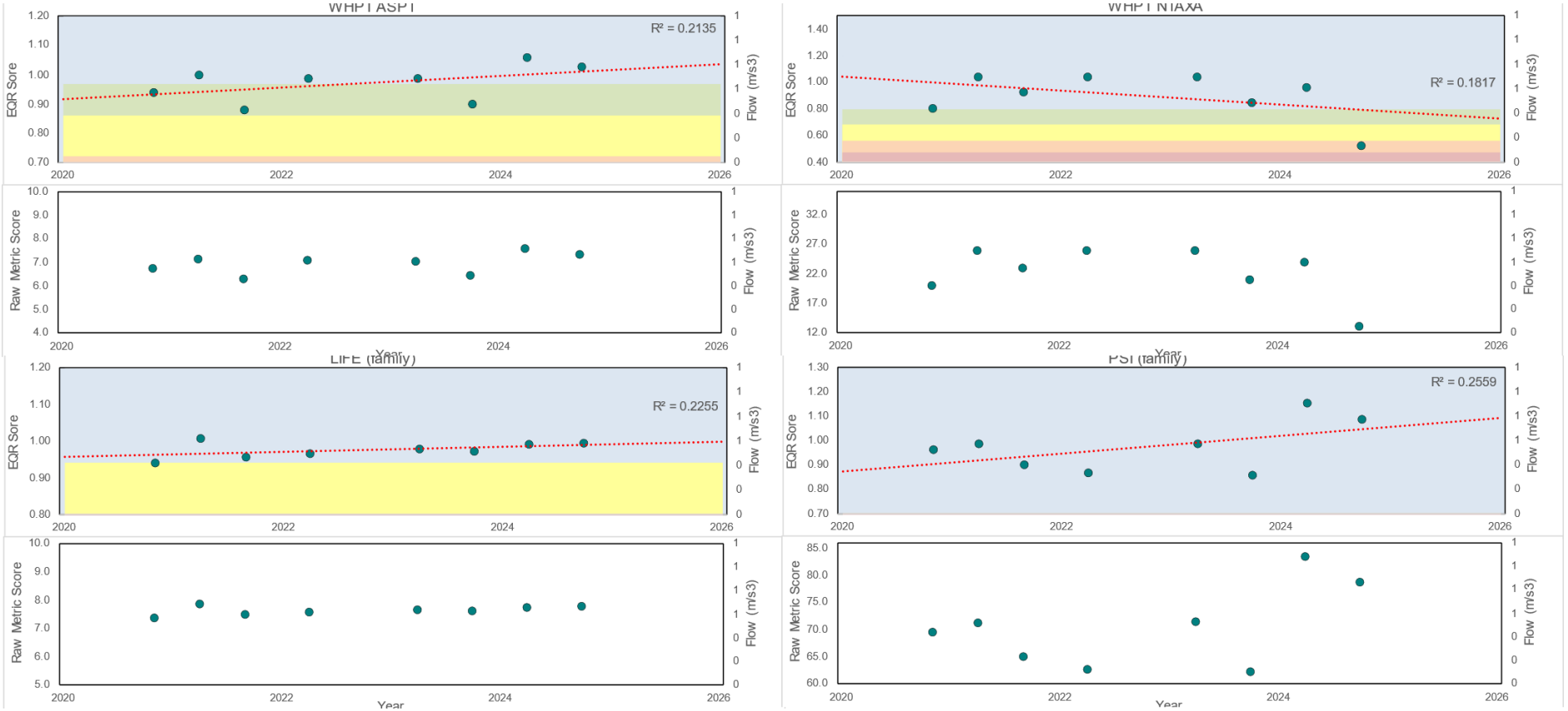
Similarly, PSI_{FAMILY} EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 62.16 - 83.33 (70.5) with the lowest PSI(family) score of 62.16 in Autumn 2023, and the highest score of 83.33 in Spring 2024. The PSI(family) expected score for this site is72.323, with 6 of the 8 above the expected PSI(family) score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.86 - 1.15 (0.97) with the lowest PSI_{FAMILY} EQR of 0.86 in Autumn 2023, and the highest EQR of 1.15 in Spring 2024.

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Poor' on one occurrence to 'High' on four occurrences.

Table B2-15 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
MI_WR1	SE1595702237	8	2020 to 2024	0.94 - 1.01 (0.98)	7.35 - 7.86 (7.62)	0.86 - 1.15 (0.97)	62.16 - 83.33 (70.5)	0.88 - 1.06 (0.97)	G - H (H)	6.29 - 7.57 (6.95)	0.52 - 1.04 (0.9)	P - H (H)	13 - 26 (22)

Figure B2-2 Macroinvertebrate EQR scores (Top) and observed scores (Bottom) for $WHPT_{NTAXA}$, $WHPT_{ASPT}$, $LIFE_{FAMILY}$ and PSI_{FAMILY} scores



B2.2.4.2 Fish

Waterbody GB104027057500 Don from Source to Scout Dyke is classified under Cycle 3 (2022) as 'moderate'. The WFD classification is informed by two Environment Agency monitoring sites, Bull House Bridge (ID13683) and Soughley Farm (ID 4035). Both sites are located outside the impacted reach in Don 1 and classified as moderate in 2022.

Baseline data is available for one site, WC1, commissioned by YWSL and sampled in 2020 through to 2024. **Table B2-16** details survey sites within the Windleden Clough 1 reach.

The WFD status of the fish community in Windleden Clough 1 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The Brown trout were counted in moderate abundance in 2021 and 2022, with 29 counted in 2021 and 25 in 2022. Specific records of number of individuals are not available for surveys undertaken in 2020, 2023 and 2024.

Though the data indicate a stable brown trout population at the site, with densities of ≥1+ fish (older juveniles and adults) remain consistently high throughout the period, falling within the 'Excellent' category in four of the five years, and 'Good' in 2022. This suggests a well-established and persistent adult population. In contrast, 0+ fish densities (young-of-year) show considerable interannual variability, with most years rated as 'Fair/Poor' and a complete absence recorded in 2021. Only 2023 showed a notably strong 0+ cohort ('Good'). This pattern suggests that while adult brown trout are consistently present and surviving well at the site, recruitment success is intermittent, likely influenced by annual environmental variability such as flow, temperature, or habitat conditions. Overall, the site supports a resilient brown trout population, though recruitment appears to be more sensitive to changing conditions.

Table B2-17 details species presence by year across all sites within the Windleden Clough 1 reach. All fish counts are available in Annex 1 to this appendix.

Although European eel have not been identified, an absence from the impacted reach is not considered likely as previous historical data obtained from the EA suggested their presence. Therefore, a low abundance of this species has been assumed.

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

Table B2-16 Windleden Clough 1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
WC1	u/s Windleden Clough	SE1587002426	Electric Fishing (AC, PDC and DC)	5	2020	2024

Table B2-17 Windleden Clough 1 Fish Survey Results

Tolerance Category	Species Name	2020	2021	2022	2023	20224
Low tolerance	Brown trout	X	X	X	X	X

B2.2.4.3 WFD waterbody status

Table B2-18 summarises the WFD Classification of waterbody which contain the impacted reach. Table B2-18 also displays the objective status for 2027 (Cycle 3) or the predicted status in 2027 where the objective to meet good status has been met in 2022. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-18 WFD classifications

Waterbody ID & Name		**GB104027057500 Don from Source to Scout Dyke**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	High
	Macroinvertebrates	Good	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Moderate	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.2.5 Invasive non-native species (INNS)

Table B2-19 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-19**).

Table B2-19 INNS Receptors

Site/Receptor 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 -Signal crayfish (*Pacifastacus leniusculus*)	Major	The implementation of this drought option isnot anticipated to increase the spread of Invasive non-native species.	Low	No
Invasive non-native species – Terrestrial plants -Himalayan balsam (*Impatiens glandulifera)* - Rhododendron (*Rhododendron ponticum*)	Major	The implementation of this drought option is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.2.6 Landscape, navigation, recreation and heritage

Table B2-20 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-20**).

Table B2-20 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Trans Pennine Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Sheffield Country Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Barnsley Boundary Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
River Don - canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No
River Don - angling	Major	Receptors club-administered and public angling. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No

B2.3 DON 1

B2.3.1 Statutory designated sites

Table B2-21 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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-21**).

Table B2-21 Statutory designated sites

Site/Receptor 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)*
Wharncliffe Crags SSSI	Major	Wharncliffe Crags SSSI comprises natural sandstone outcrops that are of geological interest. The crags here are the best available exposure in the Upper Carboniferous (approximately 300 million years old) sandstones of the Wharncliffe Edge Rock Formation. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
Wharncliffe Heaths LNR	Major	Situated above Wharncliffe Crags overlooking the Don Valley to the northwest of Sheffield. It lies in an area of outstanding local natural history and archaeological interest and protects one of the few remaining remnants of a formerly much larger heathland complex. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
The Dark Peak SSSI	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
South Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Peak District Moors (South Pennine Moors Phase 1) SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No

B2.3.2 NERC and local wildlife sites

Table B2-22 summarises the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

No NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-22**).

Table B2-22 NERC habitats and local wildlife sites

Site/Receptor 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)*
Wogden Foot, Dunford Bridge LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Western Moors LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Habitat – Blanket bog -18982 -18972	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Cotton grass moorland.	Not sensitive	No
NERC Habitat - Blanket bog -19541	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Dry bog non-heather dominant.	Not sensitive	No
NERC Habitat - Blanket bog -526337 -13952 -13951	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Blanket bog, Upland flushes, fens and swamps, Fragmented heath, Upland heath, Grass moorland and rough grazing	Not sensitive	No
NERC Habitat - Blanket bog -13991 -13993 -13992 -13959 -13961 -13960 -13976	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Blanket bog, Upland heathland, Upland flushes, fens and swamps, Fragmented heath, Upland heath, Grass moorland and rough grazing	Not sensitive	No
NERC Habitat - Deciduous woodland -315253 -315254 -315256	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Lowland heath, Lowland meadows and pastures	Not sensitive	No
NERC Habitat - Good quality semi-improved grassland	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Lowland meadows and pastures; Restoration of species-rich, semi-natural grassland	Not sensitive	No

Site/Receptor 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)*
-362411 -362410 -362405 -362404 -362403				
NERC Habitat - Good quality semi-improved grassland -360076 -360961 -360960 -360962	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Restoration of species-rich, semi-natural grassland	Not sensitive	No
NERC Habitat - Grass moorland -369324 -369384	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Blanket bog, Fragmented heath, Upland heath, Grass moorland and rough grazing	Not sensitive	No
NERC Habitat - Lowland heathland -414343 -414345 -414344 -414346 -414421 -414420 -414419 -414261 -414259	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Habitat - Lowland heathland -414447	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Upland flushes, fens and swamps	Not sensitive	No
NERC Habitat - No main habitat but additional habitats present -442487-442486	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Lowland heath.	Not sensitive	No
NERC Habitat - Upland heathland -499103	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Bilberry/crowberry moorland.	Not sensitive	No
NERC Habitat - Upland heathland -499698	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Heather moor.	Not sensitive	No

B2.3.3 NERC and other protected species

Table B2-23 summarises the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. White-clawed crayfish surveys carried out by YWSL in 2016 in Don 1 found no evidence of white-clawed crayfish. The Environment Agency reported that signal crayfish were recorded near Millhouse Green (at SE2155302908) in October 2018. Given the dense populations of signal crayfish in this reach the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this reach.

Four notable macroinvertebrate species were recorded within the impacted reach, including one Near Threatened species (*Oreodytes davisii*), one Priority Species (*Nigrobaetis niger*), and two species classified as Nationally Notable (*Rhyacophila septentrionis* and *Sialis nigripes*). These taxa are considered nationally scarce and of conservation concern. Based on the available information this receptor is considered to be susceptible to drought option impacts and have a **medium** 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 to inform the assessment of otter in the impacted reach. Historic data records from the NBN gateway confirm the presence of otters within the impacted reach. However, no survey data post-2014 is available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the available information these species are considered not to be susceptible to drought option impacts and have a **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, but positive records of water vole have been identified approximately 3km Northwest and Southwest of Don 1. However, 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 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.**

Four NERC act section 41 and notable fish species have been identified as present in the impacted reach, including two NERC Act Section 41 fish species (Brown trout and European eel) and two notable fish species (Bullhead and grayling).

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 B2-23 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipe)*	Major	Given the presence of signal crayfish in this reach the Environment Agency considers it unlikely that white-clawed crayfish are present and they are not considered further for this reach.	Not sensitive	No
Notable Species – Invertebrates -Caddisfly (*Potamophylax rotundipennis)* -Water beetle (*Oreodytes davisii*) -Alderfly (*Sialis nigripes*)	Major	*P. rotundipennis* is a tolerant species which favours moderate flow rates unlikely to be impacted by reduced flows. *S. nigripes* are typically found in slow-flowing, large, calcareous waterbodies. *O. davisii* are commonly found in fast-flowing, upland waters with stony bottoms. Low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only) and may therefore not markedly detract from the quality of the supporting environment for the present species.	Low	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Major	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 Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish - Brown Trout (*Salmo trutta)* -European Eel *(Anguilla Anguilla)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse.	High	Yes

Site/Receptor 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)*
		Predation could occur on fish stranded in pools in high densities.		
Notable Species – Fish Grayling (*Thymallus thymallus)* Bullhead *(Cottus gobio)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
NERC and Notable species – Birds There are many birds species present across the region	Major	The following bird species to varying extents rely on water dependent habitats. However, they are not expected to be impacted severely from implementation of the drought option against a baseline of reduced flows characteristic of drought: -Little Ringed Plover Bird (*Charadrius dutius*) - Snipe (*Gallinago gallinago*) - House Martin (*Delichon urbica*) - Swallow (*Hirundo rustica*) - Grey Wagtail (*Motacilla cinerea*)	Not sensitive	No

B2.3.4 WFD receptors

The sensitivity analysis has considered the relationship between macroinvertebrate and/or fish communities and the supporting environmental variables over the baseline period. Table B2 10 below summarises of the RBMP Cycle 2 Status/ Potential of the WFD waterbody, including WFD receptors for fish and macroinvertebrates. The purpose of the analysis is to establish whether biological metrics/indices respond inter-annually to changes in flow and associated environmental variables including habitat quality and availability.

B2.3.4.1 Macroinvertebrates

The WFD waterbody GB104027057500 Don from Source to Scout Dyke classifies as 'good' for macroinvertebrates in 2022, Cycle 3. The WFD classification of 'good' for macroinvertebrates in 2022 is informed by one Environment Agency monitoring site, D/S Windledon Bridge (ID 74843).

Baseline macroinvertebrate data is provided by two Environment Agency monitoring sites, D/S Confluence (74841) and D/S Windleden Bridge (ID 74843).

Site ID 74841 had no EA surveys within the survey period, and four YWSL commissioned surveys between 2020 and 2022. EA Site ID 74843 had baseline monitoring in 2012-2020 and 2023, with six YWSL supplementary surveys between 2020-2023. These sites provide strong temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors.

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A**.

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Moderate' on five occurrences to 'High' on twenty occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification.

RICT3 analysis was successfully calculated for Sites 74843; however, no physical environmental data (such as river depth, width, alkalinity or sediment composition) was available for Site 74841. As a result, site-specific EQR values could not be calculated using RICT3 for that site. RICT requires specific environmental parameters to model expected macroinvertebrate community responses under various conditions. Without these key environmental factors, it is not possible to generate accurate EQR predictions or classify the ecological status of the sites using RICT3, limiting the ability to fully assess the observed ecological conditions relative to reference conditions. An average expected score has been derived from those sites within the reach which expected scores were calculated. Though the EQR's for these sites are presented, it is noted they will likely have a reduced confidence in the final EQRs.

$WHPT_{ASPT}$ scores ranged between 5.59 and 7.79 with the lowest $WHPT_{ASPT}$ score of 5.59 at Site 74843 in Autumn 2023, and the highest score of 7.79 at Site 74843 in Spring 2012. The $WHPT_{ASPT}$ expected scores for ranged from 6.81 to 7.41 across the sites, with 1 of the 30 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.79 and 1.05 with the lowest $WHPT_{ASPT}$ EQR of 0.79 at Site 74843 in Autumn 2023, and the highest EQR of 1.05 at Site 74843 in Spring 2012.

In Don 1 data from the sites identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ scores ranging between 14 and 34 with the lowest $WHPT_{NTAXA}$ score of 14 at Site 74843 in Autumn 2020, and the highest score of 34 at Site 74843 in Spring 2022. The $WHPT_{NTAXA}$ expected scores ranged from 24.41 to 26.08 across the sites, with 1 of the 30 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.57 and 1.32 with the lowest $WHPT_{NTAXA}$ EQR of 0.57 at Site 74843 in Autumn 2020, and the highest EQR of 1.32 at Site 74841 in Spring 2022.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. See **Table B2-5** for guidance in interpreting raw LIFE scores.

$LIFE_{FAMILY}$ scores ranged between 7.05 and 8.44 with the lowest $LIFE_{FAMILY}$ score of 6.93 at 7.05 at Site 74841 in Autumn 2020, and the highest score of 8.44 at Site 74843 in Spring 2013. The $LIFE_{FAMILY}$ expected scores ranged from 7.68 to 7.86 across the sites, with 3 of the 30 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.9 and 1.08 with the lowest $LIFE_{FAMILY}$ EQR of 0.91 at Site 74841 in Autumn 2020, and the highest EQR of 1.08 at Site 74843 in Autumn 2018.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 56.41 and 90.7with the lowest PSI_{FAMILY} score of 56.41 at Site 74841 in Autumn 2020, and the highest score of 90.7 at Site 74843 in Autumn 2018. The PSI_{FAMILY} expected scores ranged between 67.9 to 74.86 across the sites, with 34 of the 58 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.79 and 1.27 with the lowest PSI_{FAMILY} EQR of 0.79 at Site 74841 in Autumn 2020, and the highest EQR of 1.27 at Site 74843 in Autumn 2018.

A total of two invasive non-native species, including *Crangonyx pseudogracilis/floridanus* and *Potamopyrgus antipodarum* were recorded as present at two sites between 2010 to 2023.

Four designated species, including *Oreodytes davisii, Nigrobaetis niger, Potamophylax rotundipennis*, *Sialis nigripes* were recorded as present at two sites between 2015 to 2021.

Summary

The WFD status of the macroinvertebrate community in Don 1 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

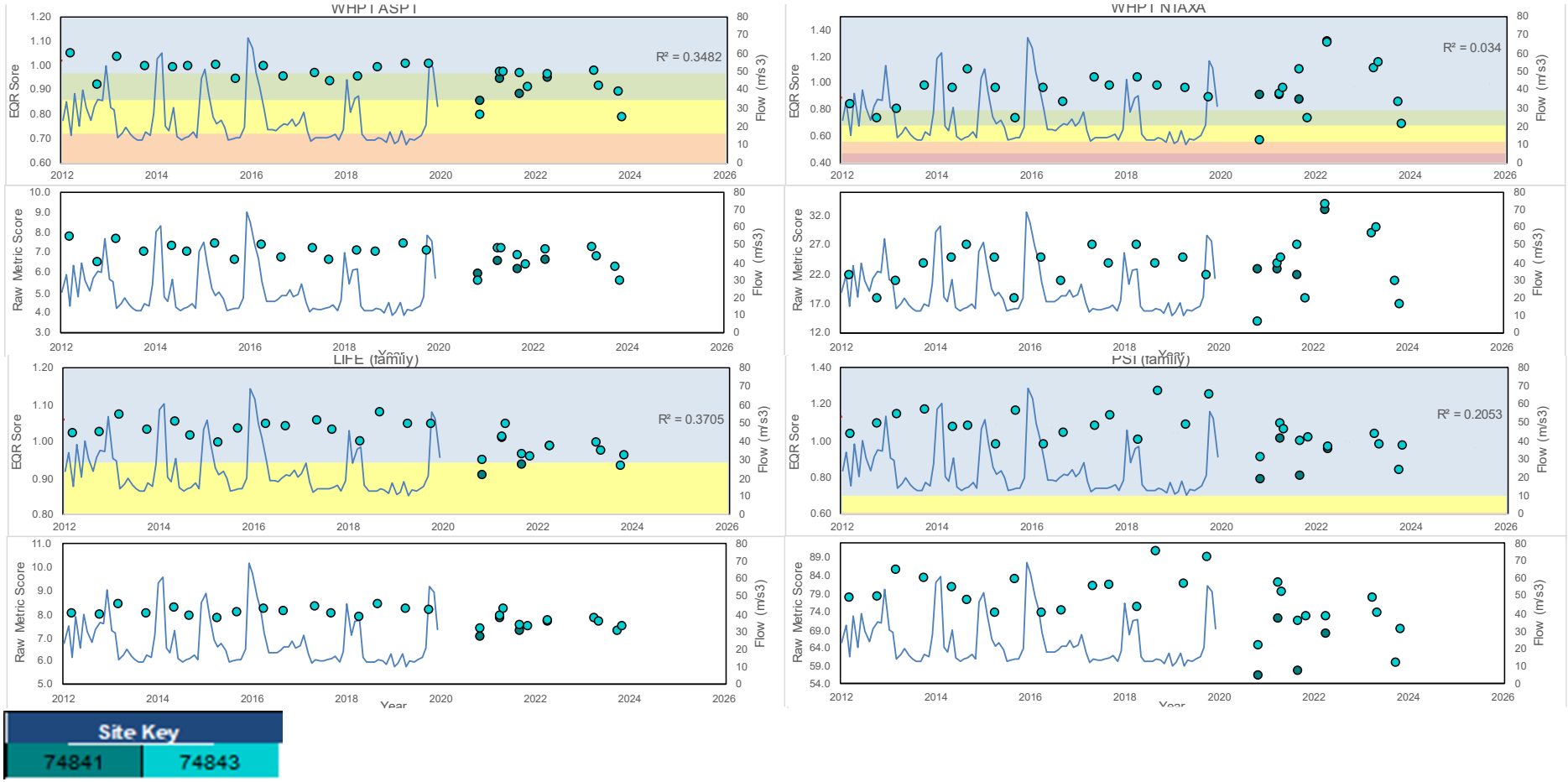
Baseline data indicates that under present conditions, the macroinvertebrate community in Don 1 has medium to high sensitivity to reduced flows, with site IDs 74843 and 74841 showing medium to high sensitivity (**Figure B2-3**). See **Table B2-5** for guidance in interpreting raw LIFE scores.

A summary of the above data is presented within **Table B2-24**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-24 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
74843	SE1870002880	26	2012 to 2023	0.93 - 1.08 (1.02)	7.28 - 8.44 (7.95)	0.84 - 1.27 (1.06)	60 - 90.7 (77.35)	0.79 - 1.05 (0.96)	M - H (G)	5.59 - 7.79 (6.96)	0.57 - 1.31 (0.94)	M - H (H)	14 - 34 (24)
74841	SE2014703075	4	2020 to 2022	0.91 - 1.01 (0.96)	7.05 - 7.84 (7.46)	0.79 - 1.01 (0.89)	56.41 - 72.09 (63.49)	0.86 - 0.95 (0.91)	M - G (G)	5.99 - 6.65 (6.37)	0.88 - 1.32 (1.01)	H - H (H)	22 - 33 (25)

Figure B2-3 Macroinvertebrate EQR scores (Top) and observed scores (Bottom) for $WHPT_{NTAXA}$, $WHPT_{ASPT}$, $LIFE_{FAMILY}$ and PSI_{FAMILY} scores



B2.3.4.2 Fish

Waterbody GB104027057500 Don from Source to Scout Dyke is classified under Cycle 3 (2022) as 'moderate'. Baseline fisheries data is informed by two sites, Bull House Bridge (ID13683) and Soughley Farm (ID 4035). Both sites were classified as moderate in 2022.

Baseline EA data is available for Soughley Farm, Dunford Bridge (Lower Site) (ID 4079), Thurlstone (ID 4133) and Bull House Bridge. Soughley Farm and Dunford Bridge (Lower Site) were both surveyed in 2011, 2012, 2017 and 2018, with Dunford Bridge receiving additional surveys in 2015 and 2019. Thurlstone and Bull House Bridge were both surveyed in 2011 and 2017.

YWSL commissioned additional surveys at D/S Windleden Clough (ID RD2), D/S Confluence (ID RD 3), Pylons (ID RD 4), Holme Farm (ID RD 5), Dunford Bridge Car Park (ID 32088), U/S Soughley Farm (ID RD 6) and Soughley Farm (ID RD7). All sites except Dunford Bridge Car Park were sampled in 2020, whilst Pylons was the only site not sampled in 2021.

Table B2-25 details survey sites within the Don 1 reach.

The WFD status of the fish community in Don 1 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site Soughley Farm is individually classified as 'Good' with a site EQR of 0.4648, based on the FCS2 EQR scores from the 2023 survey. The site has a relatively poor diversity, with one species present from an expected three species. Trout are observed at the site at lower densities than expected, contributing to a good EQR score of 0.7363. Bullhead and stone loach were expected at the site, but not observed.

The site Bull House Bridge is individually classified as moderate with a site EQR of 0.3188, based on the FCS2 EQR scores from the 2017 survey. The site has a relatively good diversity, with three species present from an expected three species. Trout are observed at the site at lower densities than expected, contributing to a poor EQR score of 0.583. The EQR score for grayling was high than expected at 0.7527. 3-spined stickleback were expected to be observed at the site, with an expected prevalence of greater than 50%, being more likely to occur at the site than not. Though diversity at the site was good, with three species observed, bullhead were absent when expected with a prevalence >50%.

Brown trout were the only species captured consistently across all survey sites and years. Bullhead were only captured at two sites, Dunford Bridge (lower site) in 2010, and Thurlstone in 2011 and 2017. The highest count of brown trout was 258 at Soughley Farm in 2021, with the lowest count of four at Thurlestone in 2017.

Three other species have been found in the reach; grayling, roach and 3-spined stickleback, however only one individual was counted when these species were captured. This drought option is not expected to have any detectable impact upon 3-spined stickleback and roach beyond their natural variation within the reach.

Table B2-26 details species presence by year across all sites within the Don 1 reach. All fish counts are available in Annex 1 to this appendix.

Although European eel have not been identified, an absence from the impacted reach is not considered likely as previous historical data obtained from the EA suggested their presence. Therefore, a low abundance of this species has been assumed.

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

Table B2-25 Don 1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
13683	Bull House Bridge	SE2152902936	Electric Fishing (AC, PDC and DC)	2	2011	2017
32088	Dunford Bridge Car Park	SE1588202433		1	2021	2021
4035	Soughley Farm DON/BT/Q/001	SE1884602802		6	2010	2019
4079	Dunford Bridge (lower site)	SE1633202402		8	2010	2019
4133	Thurlstone	SE2367803542		2	2011	2017
RD2	d/s Windleden Clough	SE1620702412		2	2020	2021
RD3	d/s confluence	SE1666902491		2	2020	2021
RD4	Pylons (right hand bank)	SE1721402687		1	2020	2020
RD5	Holme farm	SE1808702678		3	2020	2021
RD6	u/s Soughley farm	SE1850202816		2	2020	2021
RD7	Soughley Farm	SE1874902876		2	2020	2021

Table B2-26 Don 1 Fish Survey Results

Tolerance Category	Species Name	2010	2011	2012	2013	2015	2017	2018	2019	2020	2021
High tolerance	Roach			X							
High tolerance	3-spined stickleback						X				
Low tolerance	Bullhead	X	X				X				
Low tolerance	Brown trout	X	X	X	X	X	X	X	X	X	X
Low tolerance	Grayling		X				X				

B2.3.4.3 WFD waterbody status

Table B2-27 summarises the WFD Classification of waterbody which contain the impacted reach. **Table B2-27** also displays the objective status for 2027 (Cycle 3) or the predicted status in 2027 where the objective to meet good status has been met in 2022. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-27 WFD classifications

Waterbody ID & Name		GB104027057500 Don from Source to Scout Dyke	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	High
	Macroinvertebrates	Good	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Moderate	
	Macroinvertebrates	Good	

Waterbody ID & Name	GB104027057500 Don from Source to Scout Dyke	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Waterbody Measures	None	

B2.3.5 Invasive non-native species (INNS)

Table B2-28 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-28**).

Table B2-28 INNS Receptors

Site/Receptor 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 -New Zealand mud snail (*Potamopyrgus antipodarum*) - Freshwater shrimp (*Crangonyx pseudogracilis*)	Major	The implementation of this drought option is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – macroinvertebrates -Signal crayfish (*Pacifastacus leniusculus*)	Major	The implementation of this drought option is not anticipated to increase the spread of Invasive non-native species.	Low	No
Invasive non-native species – Terrestrial plants -Himalayan balsam (*Impatiens glandulifera)* - Japanese knotweed (*Fallopia japonica)* - Montbretia (*Crocosmia x crocosmiiflora)* - Rhododendron (*Rhododendron ponticum*)	Major	The implementation of this drought option is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.3.6 Landscape, navigation, recreation and heritage

Table B2-29 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-29**).

Table B2-29 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Trans Pennine Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Sheffield Country Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Barnsley Boundary Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
River Don - canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No
River Don - angling	Major	Receptors club-administered and public angling. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No

B2.4 DON 2

B2.4.1 Statutory designated sites

Table B2-30 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.

No statutory designated sites sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-30**).

Table B2-30 Statutory designated sites

Site/Receptor 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)*
Wharncliffe Crags SSSI	Major	Wharncliffe Crags SSSI comprises natural sandstone outcrops that are of geological interest. The crags here are the best available exposure in the Upper Carboniferous (approximately 300 million years old) sandstones of the Wharncliffe Edge Rock Formation. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
Wharncliffe Heaths LNR	Major	Situated above Wharncliffe Crags overlooking the Don Valley to the northwest of Sheffield. It lies in an area of outstanding local natural history and archaeological interest and protects one of the few remaining remnants of a formerly much larger heathland complex. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
Townend Common LNR	Major	No water dependent receptors	Not sensitive	No

B2.4.2 NERC and local wildlife sites

Table B2-31 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

Two NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-31**).

Table B2-31 NERC habitats and local wildlife sites

Site/Receptor 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)*
Black Moor Common LWS	Major	The site contains lowland mixed deciduous woodland, lowland dry acidic grassland, lowland heathland, scrub and nearby river corridor type habitats.	Not sensitive	No
Romticle Viaduct & Thurgoland Tunnels LWS	Major	Running water, Semi-natural Woodland, Tall Ruderal, scrub. The site encompasses part of a disused railway line forming part of the Trans-Pennine Way. The site includes the River Don which runs through the site.	Medium	Yes
Glow Worm Site LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. The site encompasses part of a disused railway line forming part of the Trans-Pennine Way. Either Semi-natural broadleaved woodlands dominated by oak and birch or ash and sycamore, modified neutral grassland or dense/continuous scrub line the railway. Areas of tall ruderal herbs are present. Up to 150 glowing females have been recorded.	Not sensitive	No
Forge Rocher and Tin Mill Rocher LWS	Major	The River Don runs along the east side of the site and is partially encompasses by the site boundary. Most of the site is ancient or lowland mixed deciduous woodland including wet woodland. Two large ponds are present and potentially connected to the river.	Low	Yes
Wharncliffe Chase and Wood LWS	Major	Wharncliffe Chase and Wood is a located east of the River Don. The site contains ancient woodland, lowland mixed deciduous woodland, lowland dry acid grassland, ponds and running water habitats. The River Don is not within the site boundary and the included running water receptors references to small streams and brooks which flow down into the River Don.	Not sensitive	No

B2.4.3 NERC and other protected species

Table B2-32 summarises the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. No information from survey findings was available for white-clawed crayfish, therefore it was not possible to conclusively rule out their presence. However, the Environment Agency reported that signal crayfish are common in the River Don. Given the dense populations of

signal crayfish in proximity to this reach the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this reach.

Two nationally scarce macroinvertebrate species *Paraleptophlebia cincta and Atherix ibis* were recorded within the impacted reach in 2014 and 2021, respectively. Based on the available information this receptor is considered to be susceptible to drought option impacts and have a **medium** 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 otter in the impacted reach. Review of Environment Agency and YWSL records indicates otters were recorded as present in 2022 within the impacted reach. However, no information from survey findings was available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought option. Based on the available information these species are considered not to be susceptible to drought option impacts and have a **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, although historic data does identify the receptor to have been present in the impacted reach. However, 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 otter 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.**

Four NERC act section 41 and notable fish species have been identified as present in the impacted reach, including two NERC Act Section 41 fish species (brown trout and European eel) and two notable fish species (bullhead and grayling).

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 B2-32 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipe)*	Major	Given the presence of signal crayfish in the River Don the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this reach.	Not sensitive	No
Notable Species - Invertebrates Mayflies *(Paraleptophlebia cincta)* Snipefly	Major	Species associated with fast-flowing water, therefore potentially susceptible to drought option impacts. However, they are relatively tolerant of short-term fluctuations in water levels or flow, as their preferred habitats are naturally dynamic. Low flow impacts of drought option implementation	Medium	Yes

Site/Receptor 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)*
(Atherix ibis)		would occur against a baseline of drought conditions (i.e. compensation flow only) and may therefore not markedly detract from the quality of the supporting environment.		
NERC Species – mammals Otter *(Lutra lutra)*	Major	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 Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish - Brown Trout (*Salmo trutta)* -European Eel *(Anguilla Anguilla)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
Notable Species – Fish Grayling (*Thymallus thymallus)* Bullhead *(Cottus gobio)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
NERC and Notable species – Birds There are many birds species present across the region	Major	The following bird species to varying extents rely on water dependent habitats. However, they are not expected to be impacted severely from implementation of the drought option against a baseline of reduced flows characteristic of drought: - Willow tit (*Parus montanus*) - Lapwing (*Vanellus vanellus*)	Not sensitive	No

Site/Receptor 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)*
Notable Species – Plant Bluebell (*Hyacinthoides non-scripta*)	Major	The current factors affecting this species are: - Habitat loss, particularly woodland and hedgerows - Climate change - Bulb removal for gardens - Trampling -Competition and hybridisation with Spanish bluebell Therefore, this species is unlikely to be significantly affected by hydrological impacts.	Not sensitive	No

B2.4.4 WFD receptors

B2.4.4.1 Macroinvertebrates

The WFD waterbody GB104027057490 Don from Scout Dyke to the Little Don classifies as 'moderate' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by five Environment Agency monitoring sites between 2010 and 2024 (IDs 117, 1010, 1239, 162382 and 202428).

At EA Site Healey (ID 117), baseline surveys were conducted in 2013, 2014, and 2017 with YWSL surveys supplementing data from 2020 to 2023. EA Site 1010 was also surveyed in 2013, 2014, and 2017, with YWSL surveys supplementing data from 2021 to 2023. while EA Site 53 was surveyed in 2013, 2014 and 2017, with additional YWSL surveys in 2020-2022. Site 162382 was surveyed in 2013 and 2014 only, and Site 202428 only in 2021. Generally, these sites provide strong temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors. However, the EA Site 202428 surveyed exclusively in 2021 does not support long-term trend analysis but still provided a valuable snapshot of community composition at the time of sampling.

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A.**

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on four occurrences to Good' on 22 occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was successfully calculated for all sites.

$WHPT_{ASPT}$ scores ranged between 4.69 and 6.72, with the lowest $WHPT_{ASPT}$ score of 4.69 at Site 1010 in Autumn 2021, and the highest score of 6.72 at Site 117 in Spring 2017. The $WHPT_{ASPT}$ expected scores for ranged from 6.57 to 7.31 across the sites, with 21 of the 44 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.68 and 0.97 with the lowest $WHPT_{ASPT}$ EQR of 0.68 at Site 1010 in Autumn 2021, and the highest EQR of 0.97 at Site 117 in Spring 2017.

Survey data identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ scores ranging between 9 and 29 with the lowest $WHPT_{NTAXA}$ score of 9 at Site 1239 in Spring 2022, and the highest score of 29 at Site 1239 in Autumn 2013. The $WHPT_{NTAXA}$ expected scores ranged between 24.34 to 28.77 across the sites, with 11 of the 44 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.32 and 1.1 with the lowest

$WHPT_{NTAXA}$ EQR of 0.32 at Site 1239 in Spring 2022, and the highest EQR of 1.1 at Site 1239 in Autumn 2013.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. See **Table B2-5** for guidance in interpreting raw LIFE scores. $LIFE_{FAMILY}$ scores ranged between 6.5 and 8.24 with the lowest $LIFE_{FAMILY}$ score of 6.5 at Site 117 in Autumn 2020, and the highest score of 8.24 at Site 117 in Autumn 2022. The $LIFE_{FAMILY}$ expected scores ranged from 7.56 to 7.85 across the sites, with 17 of the 44 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.85 and 1.09 with the lowest $LIFE_{FAMILY}$ EQR of 0.85 at Site 1010 in Autumn 2021, and the highest EQR of 1.09 at Site 117 in Autumn 2022.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 33.2 and 85.7 with the lowest PSI_{FAMILY} score of 33.2 at Site 1239 in Autumn 2021, and the highest score of 85.7 at Site 1239 in Spring 2022. The PSI_{FAMILY} expected scores ranged from 64.33 to 73.89 across the sites, with 39 of the 44 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.49 and 1.22 with the lowest PSI_{FAMILY} EQR of 0.49 at Site 1239 in Autumn 2021, and the highest EQR of 1.22 at Site 117 in Autumn 2022.

A total of four INNS, including *Potamopyrgus antipodarum, Crangonyx pseudogracilis, Pacifastacus leniusculus* and *Chelicorophium curvispinum* were recorded as present at three between 2020 and 2023.

One designated species, *Atherix ibis* was recorded as present at two sites in 2021.

Summary

The WFD status of the macroinvertebrate community in Don 2 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

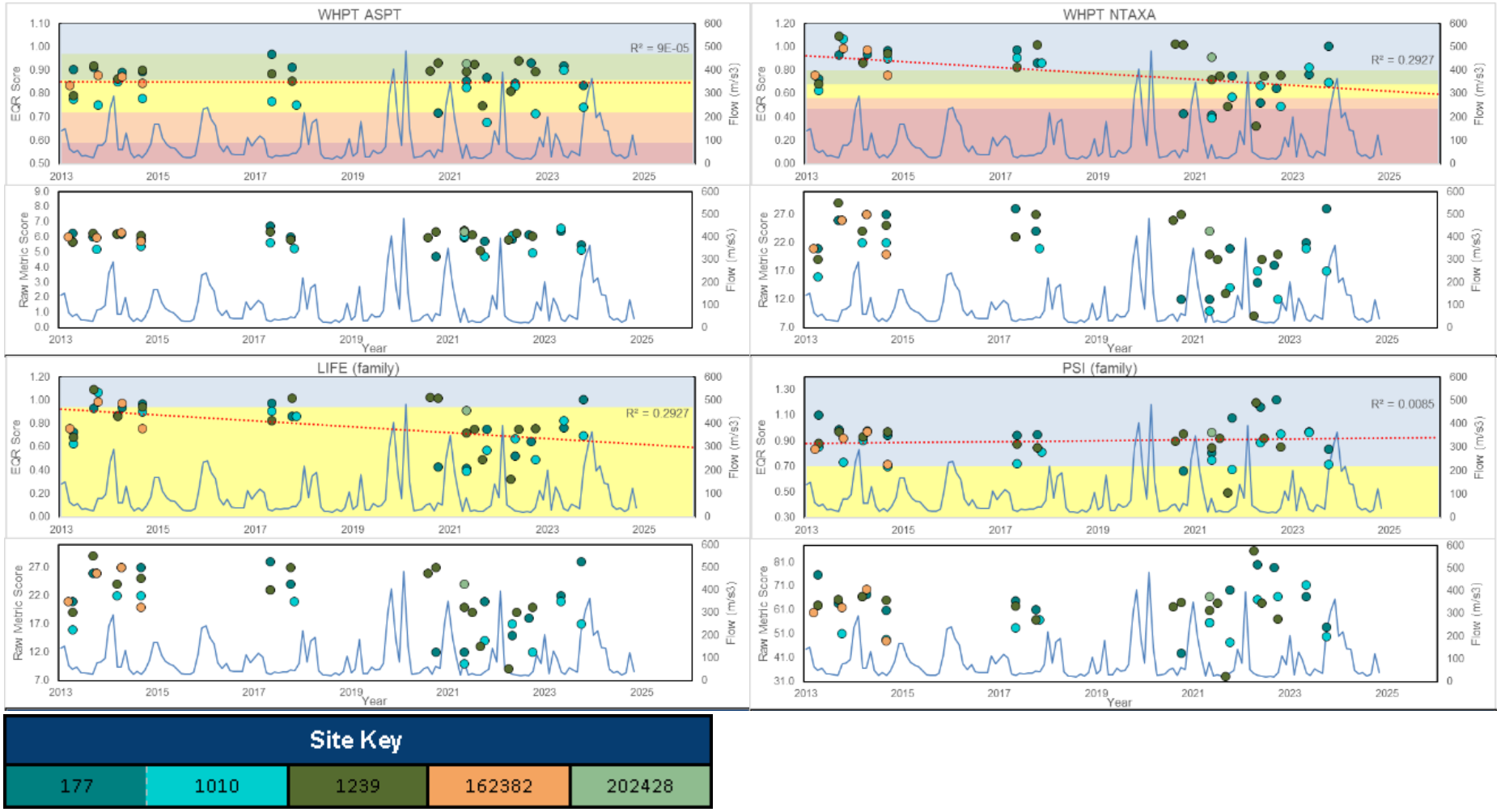
Baseline data indicates that under present conditions, the macroinvertebrate community in Don 2 has medium to high sensitivity to reduced flows (**Figure B2-4**).

A summary of the above data is presented within **Table B2-33**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-33 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
117	SK2925798660	13	2013 to 2023	0.86 - 1.09 (0.97)	6.5 - 8.24 (7.4)	0.67 - 1.22 (0.97)	42.86 - 80 (64.68)	0.72 - 0.97 (0.88)	P - G (G)	4.71 - 6.72 (5.94)	0.42 - 1.01 (0.77)	B - H (G)	12 - 28 (22)
1010	SE2555603330	12	2013 to 2023	0.85 - 1.02 (0.92)	6.64 - 7.9 (7.22)	0.68 - 0.97 (0.81)	47.37 - 71.4 (58.01)	0.68 - 0.9 (0.78)	P - G (M)	4.69 - 6.58 (5.57)	0.39 - 1.07 (0.74)	B - H (G)	10 - 26 (18)
1239	SE2728102086	14	2013 to 2022	0.89 - 0.98 (0.94)	6.8 - 7.59 (7.29)	0.49 - 1.2 (0.9)	33.2 - 85.7 (62.16)	0.75 - 0.94 (0.88)	M - G (G)	5.08 - 6.42 (6.03)	0.32 - 1.1 (0.81)	B - H (H)	9 - 29 (21)
162382	SE2479703836	4	2013 to 2014	0.91 - 0.97 (0.94)	7 - 7.5 (7.28)	0.71 - 0.97 (0.86)	48.15 - 69.77 (59.96)	0.84 - 0.88 (0.86)	M - G (M)	5.74 - 6.27 (6)	0.76 - 0.99 (0.87)	G - H (H)	20 - 27 (24)
202428	SK2876699869	1	2021	0.97	7.5	0.96	66.67	0.93	G	6.34	0.92	H	24

Figure B2-4 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



B2.4.4.2 Fish

Waterbody GB104027057490 Don from Scout Dyke to the Little Don is classified under Cycle 3 (2022) as 'moderate'. This classification is informed by two sites, Wortley (ID 4045) and Oxspring Bridge (ID 11961). Wortley is classified as 'poor' while Oxspring Bridge is classified as 'good'.

EA baseline fisheries data is available for four sites: Wortley, Oxspring Bridge, Cheesebottom STW (ID 4135) and Penistone Cricket Club (ID 4134). All sites were sampled in 2011, with Cheesebottom STW and Penistone Cricket Club also being sampled in 2017. Wortley was additionally sampled in 2023.

YWSL commissioned additional surveys at Wortley, Cheesebottom STW and Oxspring Bridge in 2015, 2016, 2017, 2018 and 2021. Wortley and Oxspring Bridge received additional surveys in 2020.

Table B2-34 details survey sites within the Don 2 reach.

The WFD status of the fish community in Don 2 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site Oxspring Bridge (WR) is individually classified as 'good' with a site EQR of 0.436, based on the FCS2 EQR scores from the 2017 survey. The site has a relatively good diversity, with all four of the four expected species present. The EQR score for trout is low at 0.2527, with an observed density below that of the expected density. Bullhead and stone loach are observed at increased numbers, with an EQR score of 1. Grayling were recorded at the site with a good EQR score of 0.656, though observed densities were lower than expected. The low EQR score for trout had an effect in the overall site classification, however the generally good diversity of the site positively contributed to the 'good' overall site classification.

The site Wortley is individually classified as 'poor' with a site EQR of 0.1064, based on the FCS2 EQR scores from the 2017 survey. The site has a relatively good diversity, with all four of the four expected species present. The EQR score for trout is low at 0.093, with an observed density significantly lower than the expected density. Bullhead and minnow are observed at increased numbers, with an EQR score of 1. Roach were recorded at the site with a high EQR score of 0.8227. Though grayling and stone loach are expected to be present at the site, both at a moderate prevalence of 0.6027 and 0.5102 respectively, neither species were observed. The low EQR for trout and the absence of bullhead and stone loach had a significant overall effect on the site EQR value.

Brown trout and bullhead were present at almost all site for every year surveyed, with the exception of bullhead in 2016 at Oxspring Bridge and brown trout in 2015 at Wortley. Minnow were present every year of survey primarily at Wortley and Oxspring Bridge sites. Grayling and stone loach were present for ever year except in 2016 for stone loach and 2020 for grayling. No perch were captured during 2017 and 2020, while 3-spined stickleback and roach were present sporadically in low numbers.

The highest count for brown trout was 67 in 2018 at Oxspring bridge, with a lowest count of six in 2017 at Wortley. The highest count of bullhead was 113 in 2018 and Oxspring Bridge, whilst the lowest was one in 2015 at Wortley. Grayling were only captured in single-digit numbers, with the highest count of eight in 2017 at Cheesebottom STW. Perch and roach when captured only numbered one or two individuals. The largest count for stone loach was in 2021 at Wortley with 62 individuals, while several other surveys only counted one individual.

Table B2-35 details species presence by year across all sites within the Don 2 reach. All fish counts are available in Annex 1 to this appendix.

Although European eel have not been identified, an absence from the impacted reach is not considered likely as previous historical data obtained from the EA suggested their presence. Therefore, a low abundance of this species has been assumed.

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

Table B2-34 Don 2 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
4045	Wortley	SK2975499085	Electric Fishing (AC, PDC and DC)	14	2011	2023
4134	Penistone Cricket Club	SE2540003400	Electric Fishing (AC, PDC and DC)	2	2011	2017
4135	Cheesebottom STW	SE2790001500	Electric Fishing (AC, PDC and DC)	8	2011	2021
11961	Oxspring Bridge (WR)	SE2731902047	Electric Fishing (AC, PDC and DC)	8	2011	2021

Table B2-35 Don 2 Fish Survey Results

Tolerance Category	Species Name	2011	2015	2016	2017	2018	2020	2021	2023
High tolerance	Perch	X	X	X		X		X	X
High tolerance	3-spined stickleback			X	X	X		X	
High tolerance	Roach			X	X				
Medium tolerance	Stone loach	X	X		X	X	X	X	X
Medium tolerance	Minnow	X	X	X	X	X	X	X	X
Low tolerance	Bullhead	X	X	X	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X	X	X	X
Low tolerance	Grayling	X	X	X	X	X		X	X

B2.4.4.3 WFD waterbody status

Table B2-36 summarises the WFD Classification of waterbody which contain the impacted reach. **Table B2-36** also displays the objective status for 2027 (Cycle 3) or the predicted status in 2027 where the objective to meet good status has been met in 2022. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-36 WFD classifications

Waterbody ID & Name		GB104027057490 Don from Scout Dyke to the Little Don	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	Medium
	Macroinvertebrates	Moderate	Medium
Hydro-morph designation		Not designated artificial or heavily modified	
RBMP3 Waterbody Objective	Overall	Good	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.4.5 Invasive non-native species (INNS)

Table B2-37 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-37**).

Table B2-37 INNS Receptors

Site/Receptor 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 -New Zealand mud snail (*Potamopyrgus antipodarum*) -Freshwater Shrimp (*Crangonyx pseudogracilis*) - Caspian mud shrimp (*Chelicorophium curvispinum*)	Major	The implementation of this drought option is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – macroinvertebrates -Signal crayfish (*Pacifastacus leniusculus*)	Major	The implementation of this drought option is not anticipated to increase the spread of Invasive non-native species.	Low	No
Invasive non-native species – Terrestrial plants -Himalayan balsam (*Impatiens glandulifera)* -Japanese knotweed (*Fallopia japonica*) - Montbretia (*Crocosmia x crocosmiiflora)* - Rhododendron (*Rhododendron ponticum*) - Wall Cotoneaster (*Cotoneaster horizontalis*) - Three-cornered garlic (*Alium triquetum*)	Major	The implementation of this drought option is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Non-native species – Fish -Rainbow Trout (*Oncorhynchus mykiss*)	Major	The implementation of this drought option is not anticipated to increase the spread of non-native species.	Not sensitive	No
Invasive non-native species – Mammals American mink (*Neovision vision*)	Major	The implementation of this drought option is not expected to increase the distribution of these INNS	Not sensitive	No

B2.4.6 Landscape, navigation, recreation and heritage

Table B2-38 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-38**).

Table B2-38 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Trans Pennine Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Sheffield Country Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Stocksbridge and District Golf Course	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Barnsley Boundary Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Wortly Top Forge – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Water powered bloomery, Iron Forge and Rolling Mill at Low Forge – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Romano-British settlement at Finkle Street – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Iron Age and Roman Quern workings on Wharncliffe Rocks – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
River Don - canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No
River Don - angling	Major	Receptors club-administered and public angling. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No

B2.5 DON 3

B2.5.1 Statutory designated sites

Table B2-39 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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-39**).

Table B2-39 Statutory designated sites

Site/Receptor 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)*
Wharncliffe Crags SSSI	Major	Wharncliffe Crags SSSI comprises natural sandstone outcrops that are of geological interest. The crags here are the best available exposure in the Upper Carboniferous (approximately 300 million years old) sandstones of the Wharncliffe Edge Rock Formation. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
Wharncliffe Heaths LNR	Major	Situated above Wharncliffe Crags overlooking the Don Valley to the northwest of Sheffield. It lies in an area of outstanding local natural history and archaeological interest and protects one of the few remaining remnants of a formerly much larger heathland complex. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
Town End Common LNR	Major	No water dependent receptors	Not sensitive	No

B2.5.2 NERC and local wildlife sites

Table B2-40 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

Three NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-40**).

Table B2-40 NERC habitats and local wildlife sites

Site/Receptor 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)*
Wharncliffe Chase and Wood LWS	Major	Unlikely to be in connectivity with impacted reach. Wharncliffe Chase and Wood is a located east of the River Don. The site contains ancient woodland, lowland mixed deciduous woodland, lowland dry acid grassland, ponds and running water habitats. The River Don is not within the site boundary and the included running water receptors references to small streams and brooks which flow down into the River Don.	Not sensitive	No
Lower Ewden Beck LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors. The site is segmented with several areas surrounding the River Don above its confluence with the Little Don. Aerial imagery shows woodland, grassland, pasture and heathland in the upper segments. The southern areas of the site follow Lower Ewden Beck from More Hall Reservoir to its confluence with the Don. Areas of ancient upland oak woodland are present around the river. Some wet woodland is also present and are present.	Low	Yes
Upper River Don: Deepcar to Hillsborough LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors Although the site encompasses the river as it passes through urban areas, the river corridor is very species rich. The river passes close to three major ancient woodlands and the corridor is significant for dispersal and maintenance of a wide range of species. Semi-natural woodland, scrub, other tall herb, flush/spring, marsh and marginal aquatic vegetation habitats are also present.	Low	Yes
Upper River Don: Station Road, Deepcar LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors The site is an unmanaged field on a River Don flood plain hosting springs feeding into a shallow wetland /marsh/ wet grassland. Grassland becomes wetter southwards. The woodland along the banks of the river is ancient.	Low	Yes

B2.5.3 NERC and other protected species

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

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. No information from survey findings was available for white-clawed crayfish, therefore it was not possible to conclusively rule out their presence. However, the Environment Agency reported that signal crayfish are common in the River Don. Given the dense populations of signal crayfish in proximity to this reach the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this reach.

One nationally scarce macroinvertebrate species (*Atherix ibis)* was observed at u/s More Hall Bridge (Site 124) in 2021. Based on the available information this receptor is considered to be susceptible to drought option impacts and have a **medium** 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 otter in the impacted reach. Review of Environment Agency and YWSL records indicates otters were recorded as present in 2022 within the impacted reach. However, no information from survey findings was available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought option. Based on the available information these species are considered not to be susceptible to drought option impacts and have a **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, although historic data does identify the receptor to have been present in the impacted reach. However, 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 otter 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.**

Five NERC act section 41 and notable fish species have been identified as present in the impacted reach, including two NERC Act Section 41 fish species (brown trout and European eel) and three notable fish species (bullhead, barbel and grayling).

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 B2-41 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipe)*	Major	Given the presence of signal crayfish in the River Don the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this reach.	Not sensitive	No
Notable Species – Invertebrates Snipefly *(Atherix ibis)*	Major	Species associated with fast-flowing water, therefore potentially susceptible to drought option impacts. However, they are relatively tolerant of short-term fluctuations in water levels or flow, as their preferred habitats are naturally dynamic. Low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only) and may therefore not markedly detract from the quality of the supporting environment.	Medium	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Major	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 Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish - Brown Trout (*Salmo trutta)* -European Eel *(Anguilla Anguilla)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
Notable Species – Fish Grayling	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence	High	Yes

Site/Receptor 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)*
(*Thymallus thymallus)* Bullhead (*Cottus gobio)* Barbel (*Barbus barbus)* [2]		of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.		
NERC and Notable species – Birds There are many birds species present across the region	Major	The following bird species to varying extents rely on water dependent habitats. However, they are not expected to be impacted severely from implementation of the drought option against a baseline of reduced flows characteristic of drought: - Willow tit (*Parus montanus*) - Lapwing (*Vanellus vanellus*)	Not sensitive	No
Notable Species – Plant Bluebell (*Hyacinthoides non-scripta*)	Major	The current factors affecting this species are: - Habitat loss, particularly woodland and hedgerows - Climate change - Bulb removal for gardens - Trampling -Competition and hybridisation with Spanish bluebell Therefore, this species is unlikely to be significantly affected by hydrological impacts.	Not sensitive	No

B2.5.4 WFD receptors

B2.5.4.1 Macroinvertebrates

The WFD waterbody GB104027057411 Don from the Little Don to River Loxley confluence classifies as 'good' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by one Environment Agency monitoring site within the impacted reach, u/s More Hall Bridge (ID 124). u/s More Hall Bridge has baseline data from monitoring commissioned by YWSL in 2015, 2016 and 2020-2023. This site provides moderate temporal and limited spatial coverage within the baseline period, to support the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors. The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A**.

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on two occurrences to 'Good' on one occurrence. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was successfully calculated for all sites. RICT3 analysis was successfully calculated for the site.

[2] 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.

Data from the monitoring site is temporally limited and shows little variation in $WHPT_{ASPT}$ scores over the period 2015 to 2023 but remain consistent with the standard to achieve moderate WFD status over the monitoring period. $WHPT_{ASPT}$ scores ranged between 5.33 and 6.06 with the lowest $WHPT_{ASPT}$ score of 5.33 at Site 124 in Autumn 2022, and the highest score of 6.06 at Site 124 in Spring 2023. The $WHPT_{ASPT}$ expected score for this site is 6.84, with 8 of the 11 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.78 and 0.89 with the lowest $WHPT_{ASPT}$ EQR of 0.78 at Site 124 in Autumn 2022, and the highest EQR of 0.89 at Site 124 in Spring 2023.

In Don 3 data from the site identifies macroinvertebrate communities which shows a good level of diversity with $WHPT_{NTAXA}$ scores ranging between 10 and 26 with the lowest $WHPT_{NTAXA}$ score of 10 at Site 124 in Spring 2021, and the highest score of 26 at Site 124 in Autumn 2016. The $WHPT_{NTAXA}$ expected score for this site is 26.22, with 5 of the 11 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.38 and 0.99 with the lowest $WHPT_{NTAXA}$ EQR of 0.38 at Site 124 in Spring 2021, and the highest EQR of 0.99 at Site 124 in Autumn 2016.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. See **Table B2-5** for guidance in interpreting raw LIFE scores. $LIFE_{FAMILY}$ scores ranged between 7.05 and 7.88 with the lowest $LIFE_{FAMILY}$ score of 7.05 at Site 124 in Autumn 2023, and the highest score of 7.88 at Site 124 in Spring 2022. The $LIFE_{FAMILY}$ expected score for this site is 7.71, with 5 of the 11 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.91 and 1.02 with the lowest $LIFE_{FAMILY}$ EQR of 0.91 at Site 124 in Autumn 2023, and the highest EQR of 1.02 at Site 124 in Spring 2022.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 51.85 and 80 with the lowest PSI_{FAMILY} score of 51.85 at Site 124 in Spring 2016, and the highest score of 80 at Site 124 in Spring 2022. The PSI_{FAMILY} expected score for this site is 69.09, with 8 of the 11 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.75 and 1.16 with the lowest PSI_{FAMILY} EQR of 0.75 at Site 124 in Spring 2016, and the highest EQR of 1.16 at Site 124 in Spring 2022.

No taxa data was available at the time of writing for the surveys completed in 2025 and 2016. One invasive non-native species, *Potamopyrgus antipodarum*, was recorded at Site 124 between 2020 to 2023. A single designated species, *Atherix ibis* was recorded at Site 124 in 2021.

Summary

The WFD status of the macroinvertebrate community in Don 3 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

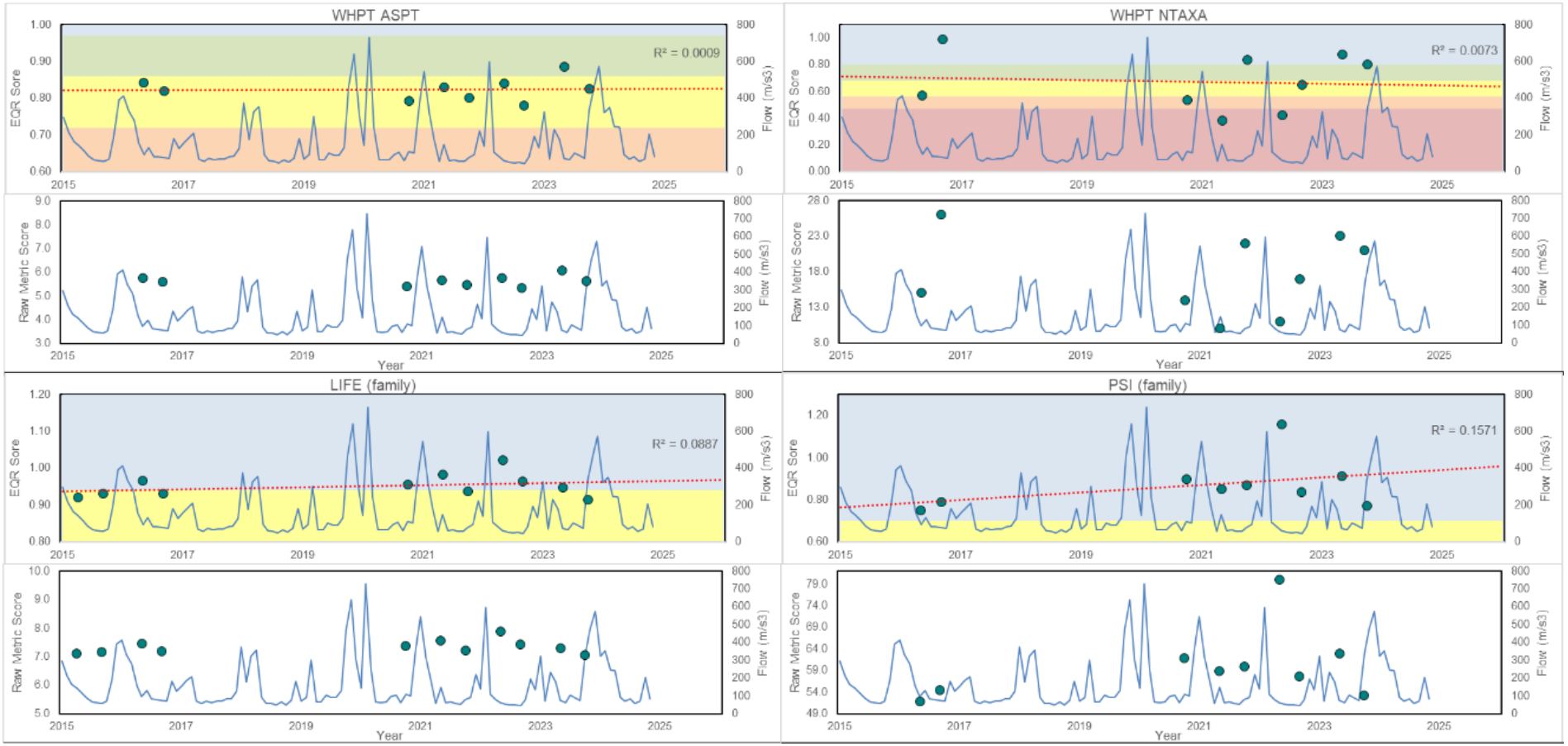
Baseline data indicates that under present conditions, the macroinvertebrate community in Don 3 has a medium to high sensitivity to reduced flows (**Figure B2-5**).

A summary of the above data is presented within **Table B2-42**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-42 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
124	SK2990795549	11	2015-2023	0.91 - 1.02 (0.95)	7.05 - 7.88 (7.34)	0.75 - 1.16 (0.87)	51.85 - 80 (60.11)	0.78 - 0.89 (0.82)	M - G (M)	5.33 - 6.06 (5.63)	0.38 - 0.99 (0.67)	B - H (M)	10 - 26 (18)

Figure B2-5 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



B2.5.4.2 Fish

Waterbody GB104027057411 Don from the Little Don to River Loxley confluence is classified under Cycle 3 (2022) as 'moderate', a deterioration from 'good' in 2019 and 'high' in 2016. The classification is informed by two sites; Beeley Wood D/S Weir (ID 4046) which is classified as 'poor' and Livesey Street-Owlerton (ID16196) which was classified as 'good'.

Baseline fisheries data is informed by one Environment Agency site, U/S Ewden Beck (ID 16238) which was surveyed in 2011, 2017 and 2023. No FCS2 data was available for the Environment Agency monitoring site within the impacted reach, FCS2 data was provided for Beeley Wood d/s weir (ID 4046) and Livesey Street - Owlerton, Sheffield (ID 16196), located downstream of the impacted reach (Don 4). Additional monitoring within Don 3 was undertaken by YWSL at u/s More Hall Bridge (YW15) and Bitholmes (YW16) from 2015 to 2018. **Table B2-43** details survey sites within the Don 3 reach.

YSWL commissioned additional surveys at three sites: Deepcar (ID YW10010), U/S More Hall Bridge (ID YW10011) and Bitholmes (ID YW10012). All sites were surveyed yearly between 2015 and 2018, with Deepcar receiving further surveys in 2021 and 2024.

The WFD status of the fish community in Don 3 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site Beeley Wood d/s weir is individually classified as poor with a site EQR of 0.1738, based on the FCS2 EQR scores from the 2017 survey. The site has a relatively low diversity, with three species present from an expected seven species. Trout had a slightly lower observed density than expected, with a good EQR score of 0.4643. Bullhead are present at a level that meets/exceeds expectations, with an EQR score of 1. Grayling were recorded at the site with a good EQR score of 0.5363, though observed densities were lower than expected. Stone loach, perch, minnow, chub and gudgeon were expected at varying degrees of prevalence at the site but were not observed. Although trout and grayling both had good EQR scores and bullhead were present in increased numbers the overall low diversity of the site had a significant effect on the overall classification of 'poor' for the site.

The site Livesey Street - Owlerton, Sheffield is individually classified as good with a site EQR of 0.6374, based on the FCS2 EQR scores from the 2017 survey. The site has a relatively good diversity, with six species present from an expected eight species. Trout had a slightly higher observed density than expected, with a good EQR score of 0.7153. Bullhead, stone loach, minnow and 3-spined stickleback are all present at a level that meets/exceeds expectations, with an EQR score of 1. Grayling were recorded at the site with a good EQR score of 0.5633, with observed densities much higher than expected. Gudgeon, chub and dace were expected at varying degrees of prevalence at the site but were not observed.

From the data identified in the FCS2, a moderate abundance of brown trout is likely to be present in the downstream reach (Don 4), which is an increased number of trout when compared to the impacted reach (Don3). With both Beeley Wood, d/s weir and Livesey Street - Owlerton, Sheffield being located downstream of the impacted reach in Don 4, the fish community at both sites is significantly different to that of the sites surveyed in the impacted reach, and therefore not representative of the sensitivity of the fish community in the impacted reach.

At U/S Ewden Beck, brown trout and bullhead were counted during every survey year. Minnow were recorded at an estimated count of 10 to 99 in 2023, the first record of minnow at the site. A similar increase is seen with 3-spined stickleback, with one recorded in 2017 and an estimated log abundance of 10 to 99 in 2023. Grayling were counted in low numbers for every survey year,

At YWSL sites, brown trout and bullhead were counted at every site for every survey year. Brown trout numbers were typically low to moderate, with a lowest count of 10 at Deepcar in 2016, whilst at the same site in 2024 192 individuals were counted. The next highest count was in 2015 at Deepcar with 50 individuals, representing a significant increase in the number of brown trout counted. A similar increase was seen in bullhead, with 158 counted at Deepcar in 2024, compared to the second highest count of 85 in 2021. Grayling were present every year but absent from U/S More Hall Bridge in 2015

and 2018, as well as from Bitholmes in 2017 and 2018. Minnow and stone loach were counted every year, primarily at Deepcar. 3-spined stickleback, barbel and rainbow trout counted only one or two individuals sporadically across sites and years.

Table B2-44 details species presence by year across all sites within the Don 3 reach. All fish counts are available in **Annex 1** to this appendix.

Although European eel have not been identified, an absence from the impacted reach is not considered likely as previous historical data obtained from the EA suggested their presence. Therefore, a low abundance of this species has been assumed.

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

Table B2-43 Don 3 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
YW10010	Deepcar (formerly Stocksbridge STW US)	SK290979	Electric Fishing (AC, PDC and DC)	6	2015	2024
YW10011	u/s More Hall Bridge	SK2990795549	Electric Fishing (AC, PDC and DC)	4	2015	2018
YW10012	Bitholmes	SK298957	Electric Fishing (AC, PDC and DC)	4	2015	2018
16238	U/S Ewden Beck	SK2990095500	Electric Fishing (AC, PDC and DC)	3	2011	2023

Table B2-44 Don 3 Fish Survey Results

Tolerance Category	Species Name	2011	2015	2016	2017	2018	2021	2023	2024
High tolerance	3-spined stickleback		X		X			X	
High tolerance	Barbel				X				
Medium tolerance	Minnow		X	X	X	X	X	X	X
Medium tolerance	Stone loach		X	X	X	X	X	X	X
Low tolerance	Bullhead	X	X	X	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X	X	X	X
Low tolerance	Grayling	X	X	X	X	X	X	X	X
Low tolerance	Rainbow trout			X					

B2.5.4.3 WFD waterbody status

Table B2-45 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-45** also displays the objective status for 2022 (Cycle 3) or the predicted status in 2022 where objective to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-45 WFD classifications

Waterbody ID & Name		**GB104027057411 Don from the Little Don to River Loxley confluence**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Moderate	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	Medium
	Macroinvertebrates	Good	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.5.5 Invasive non-native species (INNS)

Table B2-46summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-46**).

Table B2-46 INNS Receptors

Site/Receptor 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 -New Zealand mud snail (*Potamopyrgus antipodarum*) - Freshwater Shrimp (*Crangonyx pseudogracilis*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – Terrestrial plants -Himalayan balsam (*Impatiens glandulifera*) -Japanese knotweed (*Fallopia japonica*) - New Zealand pigmyweed (*Crassula helmsii*) - Rhododendron (*Rhododendron ponticum*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Non-native species – Fish -Rainbow Trout	Major	The implementation of this drought option is not anticipated to increase the	Not sensitive	No

Site/Receptor 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)*
(*Oncorhynchus mykiss*)		spread of non-native species.		

B2.5.6 Landscape, navigation, recreation and heritage

Table B2-47 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-47**).

Table B2-47 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Trans Pennine Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Sheffield Country Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Stocksbridge and District Golf Course	Major	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Barnsley Boundary Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Romano-British settlement at Finkle Street – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Iron Age and Roman Quern workings on Wharncliffe Rocks – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
River Don - canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No
River Don - angling	Major	Receptors club-administered and public angling. Flows during a drought will be low such that further reduction in flows	Low	No

Site/Receptor 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)*
		would not be likely to further reduce the angling quality of the reach.		

B2.6 DON 4

B2.6.1 Statutory designated sites

Table B2-48 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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-48**).

Table B2-48 Statutory designated sites

Site/Receptor 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)*
Wharncliffe Crags SSSI	Major	Wharncliffe Crags SSSI comprises natural sandstone outcrops that are of geological interest. The crags here are the best available exposure in the Upper Carboniferous (approximately 300 million years old) sandstones of the Wharncliffe Edge Rock Formation. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
Wharncliffe Heaths LNR	Major	Situated above Wharncliffe Crags overlooking the Don Valley to the northwest of Sheffield. It lies in an area of outstanding local natural history and archaeological interest and protects one of the few remaining remnants of a formerly much larger heathland complex. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
Town End Common LNR	Major	No water dependent receptors	Not sensitive	No

B2.6.2 NERC and local wildlife sites

Table B2-49 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

Three NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-49**).

Table B2-49 NERC habitats and local wildlife sites

Site/Receptor 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)*
Lower Ewden Beck LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors	Low	Yes

Site/Receptor 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)*
		The site is segmented with several areas surrounding the River Don above its confluence with the Little Don. Aerial imagery shows woodland grassland, pasture and heathland in the upper segments. The southern segments of the site follow Lower Ewden Beck from More Hall Reservoir to its confluence with the Don. Areas of ancient upland oak woodland are present around the river. Some wet woodland is also present and are present.		
Upper River Don: Deepcar to Hillsborough LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors Although the site encompasses the river as it passes through urban areas, the river corridor is very species rich. The river in the site passes close to three major ancient woodland and the corridor is significant for dispersal and maintenance of a wide range of species. Semi-natural woodland, scrub, other tall herb, flush/spring, marsh and marginal aquatic vegetation habitats are also present.	Low	Yes
Middle River Don: Hillsborough to City Centre LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors The banks of the river corridor were previously industrial but are now becoming residential. The woodland on the banks are ancient, containing indicator species such as pendulous sedge, wood anemone and dog's mercury. Island within the river are very species rich with vegetation and wildlife including birds and invertebrates. The islands also host ancient woodland indicator species. Bankside habitats include broad-leaved woodland, scrub, tall and short herbs, built (walls and disused buildings). The river has strong marginal aquatic vegetation and a rich aquatic fauna.	Low	Yes
Wharncliffe Chase and Wood LWS	Major	Warncliffe Chase and Wood is a located on the east bank of the River Don. The site contains ancient woodland, lowland mixed deciduous woodland, lowland dry acid grassland, ponds and river habitats.	Not sensitive	No
Glen Howe Park LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors Large woodland crossed by Tinker Brook.	Not sensitive	No
Usher Wood LWS	Major	The site is a long strip of woodland on a north/north east facing slope. Ancient woodland indicator species are present. A	Not sensitive	No

Site/Receptor 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)*
		small seasonal watercourse is present in a field to the east.		
Beeley and Great Hollins Wood LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors A large woodland and fields on the bank on the River Don.	Not sensitive	No
Birks Wood LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors Predominantly oak woodland with holly shrub. Ancient woodland indicator species are present.	Not sensitive	No
Wardsend Cemetery LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors A cemetery, grassland and woodland areas surrounding allotments	Not sensitive	No

B2.6.3 NERC and other protected species

Table B2-50 summarises the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. No information from survey findings was available for white-clawed crayfish, therefore it was not possible to conclusively rule out their presence. However, the Environment Agency reported that signal crayfish are common in the River Don. Given the dense populations of signal crayfish in proximity to this reach the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this reach.

One notable macroinvertebrate species, caddisfly (*Rhyacophila septentrionis*, has been identified as present in the impacted reach.

Data obtained from the Environment Agency and a review of available data from NBN gateway was used inform the assessment of otter in the impacted reach. Review of Environment Agency and YWSL records indicates otters were recorded as present in 2022 within the impacted reach. However, no information from survey findings was available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought option. Based on the available information these species are considered not to be susceptible to drought option impacts and have a **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, although historic data does identify the receptor to have been present in the impacted reach. However, 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 otter 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.**

Four NERC act section 41 and notable fish species have been identified as present in the impacted reach, including two NERC Act Section 41 fish species (brown trout and European eel) and two notable fish species (bullhead and grayling).

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 B2-50 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipe)*	Major	Given the presence of signal crayfish in this reach the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this reach.	Not sensitive	Yes
Notable Species – Invertebrates Caddisfly *(Rhyacophila septentrionis)*	Major	Flow impacts of the drought option not likely to impact habitat availability. Low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only) and may therefore not markedly detract from the quality of the supporting environment.	Medium	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Major	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 Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish - Brown Trout *(Salmo trutta)* -European Eel *(Anguilla Anguilla)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream	High	Yes

Site/Receptor 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)*
		migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.		
Notable Species – Fish Grayling (*Thymallus thymallus)* Bullhead *(Cottus gobio)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
NERC and Notable species – Birds There are many birds species present across the region	Major	The following bird species to varying extents rely on water dependent habitats. However, they are not expected to be impacted severely from implementation of the drought option against a baseline of reduced flows characteristic of drought: - Willow tit (*Parus montanus*) - Lapwing (*Vanellus vanellus*)	Not sensitive	No

B2.6.4 WFD receptors

B2.6.4.1 Macroinvertebrates

The WFD waterbody GB104027057411 Don from the Little Don to River Loxley confluence classifies as 'good' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by four Environment Agency monitoring sites, U/S Georgia Pacific (ID 74862), D/S Georgia Pacific (ID 74861) and Leppings Lane (ID 1427).

EA Site ID 1427 had baseline survey data for 2010, 2013, 2015 2018 with additional surveys commissioned by YWSL in 2021 and 2023. EA Site ID 74861 had baseline data for 2010-2013 with supplementary surveys by YWSL in 2021 and 2022. EA Site ID 74862 had baseline data for 2010-2013, 2015 and 2018 with supplementary surveys by YWSL in 2020, 2021 and 2024. Generally, these sites provide strong temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors. The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on seven occurrences to 'Good' on fourteen occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification.

$WHPT_{ASPT}$ scores ranged between 2.65 and 7.27 with the lowest $WHPT_{ASPT}$ score of 2.65 at Site 1427 in Autumn 2021, and the highest score of 7.27 at Site 1427 in Spring 2013. The $WHPT_{ASPT}$ expected scores for ranged from 6.35 to 6.98 across the sites, with 22 of the 41 samples below the

'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.42 and 1.08 with the lowest $WHPT_{ASPT}$ EQR of 0.42 at Site 1427 in Autumn 2021, and the highest EQR of 1.08 at Site 1427 in Spring 2013.

In Don 4 data from the monitoring sites identifies macroinvertebrate communities which significantly varies in terms of diversity with $WHPT_{NTAXA}$ scores ranging between 2 and 29 with the lowest $WHPT_{NTAXA}$ score of 2 at Site 1427 in Autumn 2021, and the highest score of 29 at Site 74862 in Spring 2015. The $WHPT_{NTAXA}$ expected scores ranged from 27.34 to 29.49 across the sites, with 17 of the 41 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.07 and 1.02 with the lowest $WHPT_{NTAXA}$ EQR of 0.07 at Site 1427 in Autumn 2021, and the highest EQR of 1.02 at Site 74862 in Spring 2015.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. See **Table B2-5** for guidance in interpreting raw LIFE scores. $LIFE_{FAMILY}$ scores ranged between 6 and 8.5 with the lowest $LIFE_{FAMILY}$ score of 6 at Site 1427 in Autumn 2021, and the highest score of 8.5 at Site 1427 in Spring 2013. The $LIFE_{FAMILY}$ expected scores ranged from 7.45 to 7.68 across the sites, with 16 of the 41 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.81 and 1.12 with the lowest $LIFE_{FAMILY}$ EQR of 0.81 at Site 1427 in Autumn 2021, and the highest EQR of 1.12 at Site 1427 in Spring 2013.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 25 and 90 with the lowest PSI_{FAMILY} score of 25 at Site 1427 in Spring 2021, and the highest score of 90 at Site 1427 in Spring 2013. The PSI_{FAMILY} expected scores ranged from 61.47 to 69.38 across the sites, with 32 of the 41 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.38 and 1.36 with the lowest PSI_{FAMILY} EQR of 0.38 at Site 1427 in Spring 2021, and the highest EQR of 1.36 at Site 1427 in Spring 2013.

A total of three INNS, *Potamopyrgus antipodarum*, *Crangonyx pseudogracilis* and *Dugesia tigrina* were recorded as present at 3 sites between 2020 to 2023. No designated species were recorded during the monitoring period.

Summary

The WFD status of the macroinvertebrate community in Don 4 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

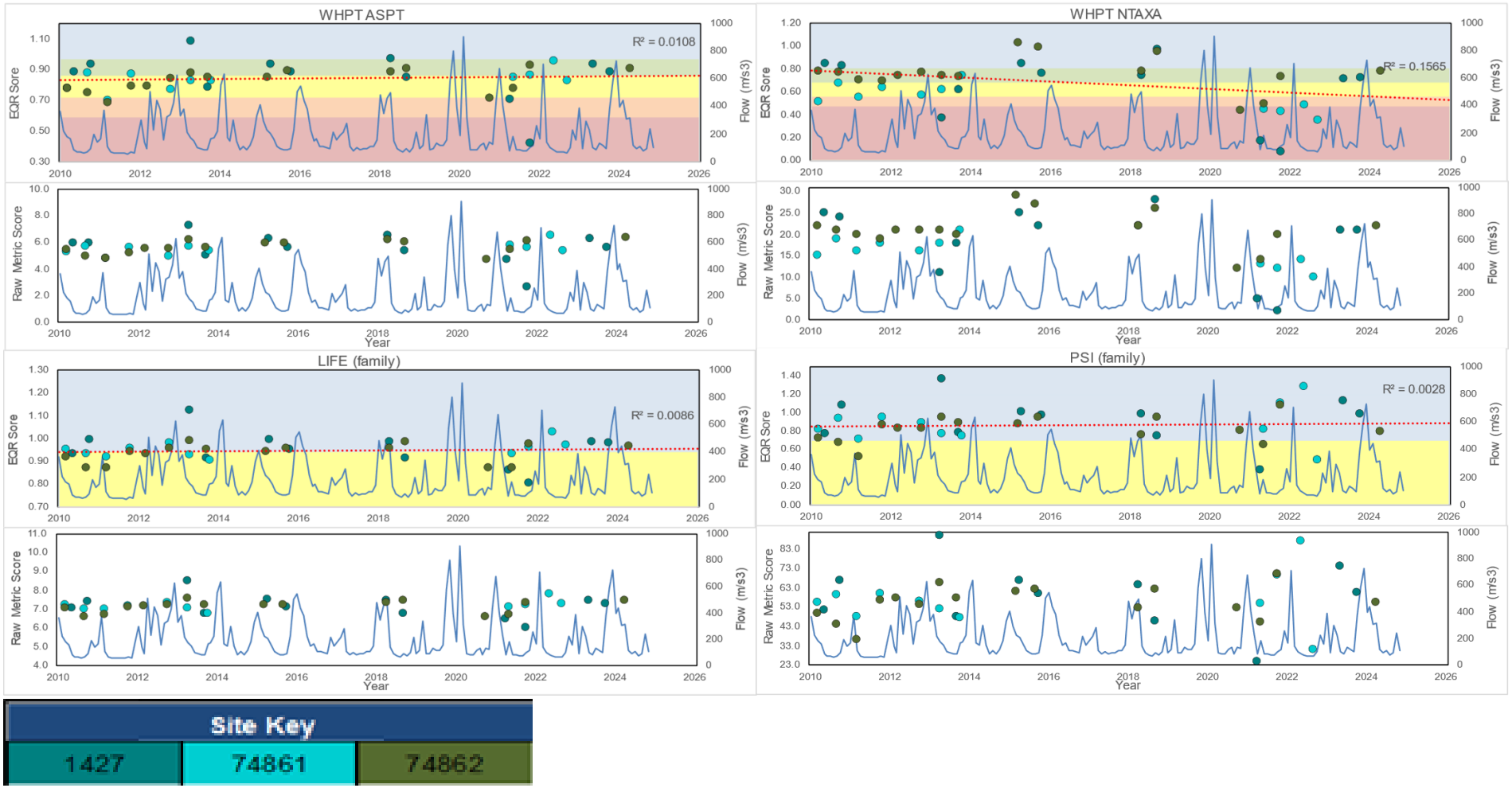
Baseline data indicates that under present conditions, the macroinvertebrate community in Don 4 has a medium to high sensitivity to reduced flows (**Figure B2-6**).

A summary of the above data is presented within **Table B2-51.** Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-51 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
1427	SK3314990658	12	2010 to 2023	0.81 - 1.12 (0.95)	6 - 8.5 (7.16)	0.38 - 1.36 (0.93)	25 - 90 (59.36)	0.42 - 1.08 (0.86)	B - H (M)	2.65 - 7.27 (5.6)	0.07 - 0.97 (0.64)	B - H (M)	2 - 28 (19)
74861	SK3100493755	11	2010 to 2022	0.9 - 1.03 (0.95)	6.79 - 7.83 (7.19)	0.49 - 1.29 (0.87)	30.77 - 86.96 (56.44)	0.7 - 0.96 (0.83)	P - G (M)	4.76 - 6.54 (5.5)	0.35 - 0.74 (0.55)	B - G (P)	10 - 21 (16)
74862	SK3009994780	16	2010 to 2024	0.87 - 0.99 (0.93)	6.6 - 7.59 (7.13)	0.52 - 1.08 (0.82)	36.36 - 70 (55.15)	0.68 - 0.93 (0.83)	P - G (M)	4.72 - 6.31 (5.61)	0.44 - 1.02 (0.76)	B - H (G)	12 - 29 (21)

Figure B2-6 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



B2.6.4.2 Fish

Waterbody GB104027057411 Don from the Little Don to River Loxley confluence is classified under Cycle 3 (2022) as 'moderate'. The classification is informed by two sites; Beeley Wood D/S Weir (ID 4046) which is classified as 'poor' and Livesey Street-Owlerton (ID16196) which was classified as 'good'.

Baseline EA fisheries data is available for three sites, Beeley Wood D/S Weir, Oughtibridge (ID 4253) and Livesey Street- Owlerton. Beeley Wood D/S Weir and Livesey Street – Owlerton were sampled in 2011 and 2017, with Beeley Wood D/S Weir additionally sampled in 2023. Oughtibridge was sampled in 2015.

YSWL commissioned additional surveys for Beeley Wood D/S Weir and Oughtibridge in 2015-2018, and in 2021 which also included Livesey Street – Owlerton. **Table B2-52** details survey sites within the Don 4 reach.

The WFD status of the fish community in Don 4 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site Beeley Wood d/s weir is individually classified as 'moderate' with a site EQR of 0.3902, based on the FCS2 EQR scores from the 2023 survey. The site has a relatively good diversity, with five species present from an expected seven species. Trout had a lower observed density than expected, with a EQR score of 0.2463. Bullhead, perch and stone loach are present at a level that meets/exceeds expectations, with an EQR score of 1. Grayling were recorded at the site with a good EQR score of 0.679, though observed densities were lower than expected. Minnow, chub and gudgeon were expected at varying degrees of prevalence at the site but were not observed.

The site Livesey Street - Owlerton, Sheffield is individually classified as good with a site EQR of 0.6374, based on the FCS2 EQR scores from the 2017 survey. The site has a relatively good diversity, with six species present from an expected eight species. Trout had a slightly higher observed density than expected, with a good EQR score of 0.7153. Bullhead, stone loach, minnow and 3-spined stickleback are all present at a level that meets/exceeds expectations, with an EQR score of 1. Grayling were recorded at the site with a good EQR score of 0.5633, with observed densities were much higher than expected. Gudgeon, chub and dace were expected at varying degrees of prevalence at the site but were not observed.

Fish diversity remained consistent at sites throughout the year, brown trout, grayling, bullhead and stone loach were all present during every year of survey with brown trout and bullhead present at every site. Grayling were not counted at Oughtibridge between 2016 and 2018. Stone loach were not counted at Beeley Wood D/S Weir in 2017. Gudgeon, dace and perch were only counted in 2011 at Livesey Street – Owlerton with three gudgeon and one dace and perch. Rudd were also only seen in 2011, but were also counted at Beeley Wood D/S Weir in addition to Livesey Street – Owlerton. 3-spined stickleback were counted sporadically at the other sites in low numbers.

The highest count for bullhead was in 2021 at Beely Wood D/S weir with 197 individuals, whilst the highest count for brown trout was in 2015 at Oughtbridge with 84 individuals. The lowest count for bullhead was five in 2011 at Livesey Street – Owlerton, however this was only a single catch sample. The lowest count for brown trout was in 2016 at Beeley Wood D/S weir with 2 individuals counted. Grayling are present in low numbers, with the highest count of 28 in 2021 at Oughtibrdige, and lowest count of one in 2016 at Beeley Wood D/S Weir. Stone loach and minnow are typically present in low counts, but the highest estimate abundance was in 2023 at Beeley Wood D/S Weir with 10- 99 stone loach and 100-999 minnow.

Table B2-53 details species presence by year across all sites within the Don 4 reach. All fish counts are available in **Annex 1** to this appendix.

Although European eel have not been identified, an absence from the impacted reach is not considered likely as previous historical data obtained from the EA suggested their presence. Therefore, a low abundance of this species has been assumed.

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

Table B2-52 Don 4 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
4046	Beeley Wood, d/s weir	SK3187191992	Electric Fishing (AC, PDC and DC)	8	2011	2023
4253	Oughtibridge	SK3077993391	Electric Fishing (AC, PDC and DC)	6	2015	2021
16196	Livesey Street - Owlerton, Sheffield	SK3406690207	Electric Fishing (AC, PDC and DC)	3	2011	2021

Table B2-53 Don 4 Fish Survey Results

Tolerance Category	Species Name	2011	2015	2016	2017	2018	2021	2023
High tolerance	Perch	X						
High tolerance	Rudd	X						
High tolerance	3-spined stickleback	X			X	X	X	
Medium tolerance	Stone loach	X	X	X	X	X	X	X
Medium tolerance	Minnow	X			X	X	X	X
Medium tolerance	Gudgeon	X						
Medium tolerance	Dace	X						
Low tolerance	Bullhead	X	X	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X	X	X
Low tolerance	Grayling	X	X	X	X	X	X	X

B2.6.4.3 WFD waterbody status

Table B2-54 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-54** also displays the objective status for 2022 (Cycle 3) or the predicted status in 2022 where objective to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-54 WFD classifications

Waterbody ID & Name		GB104027057411 Don from Little Don to River Loxley confluence	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	Medium
	Macroinvertebrates	Good	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.6.5 Invasive non-native species (INNS)

Table B2-55 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-55**).

Table B2-55 INNS Receptors

Site/Receptor 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 -New Zealand mud snail (*Potamopyrgus antipodarum*) - Freshwater Shrimp (*Crangonyx pseudogracilis*) - American immigrant triclad (*Dugesia tigrina*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – macroinvertebrates -Signal crayfish (*Pacifastacus leniusculus*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Low	No
Invasive non-native species – Terrestrial plants -Himalayan balsam (*Impatiens glandulifera*) -Japanese knotweed (*Fallopia japonica*) - Giant hogweed (*Heracleum mantegazzianum*) - Japanese rose (*Rosa rugosa*) - Giant knotweed (*Fallopia sachalinensis*) - Rhododendron (*Rhododendron ponticum*) - Spanish bluebell (*Hyacinthoides hispanica*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Non-native species – Fish -Rainbow Trout (*Oncorhynchus mykiss*)	Major	The implementation of this drought option is not anticipated to increase the spread of non-native species.	Not sensitive	No
Invasive non-native species – Mammals American mink	Major	The implementation of this drought option is not expected to increase the distribution of these INNS	Not sensitive	No

Site/Receptor 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)*
(*Neovision vision*)				

B2.6.6 Landscape, navigation, recreation and heritage

Table B2-56 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-56**).

Table B2-56 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Trans Pennine Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
River Don – Angling	Major	Receptors club-administered and public angling. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No
River Don – Canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No
Romano-British settlement at Finkle Street – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Iron Age and Roman Quern workings on Wharncliffe Rocks – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Cementation furnace, Hoyle Street – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Bower Spring cementation furnace – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Stocksbridge and District Golf Course	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Sheffield Country Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river	Not sensitive	No

Site/Receptor 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)*
		forms part of the landscape setting of the trail.		

B2.7 DON 5

B2.7.1 Statutory designated sites

Table B2-57 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.

Two statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-57**).

Table B2-57 Statutory designated sites

Site/Receptor 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)*
Salmon Pastures LNR	Major	The site has been taken over by a range of opportunist plants that moved in when industry moved out. The new plant community supports several types of butterfly and other invertebrates such as dragonflies. The site is situated next to the River Don and therefore is likely to have water dependant receptors.	Low	Yes
Centenary Riverside LNR	Major	An urban reserve, part of the pioneering flood alleviation scheme on the banks of the River Don. The habitats are a mixture of wet and dry woodland, wet grassland, meadow, reed bed, marshland and a small pillwort pond. The marshland lagoon contains 3 islands formed by retained slag piles, the islands provide habitat for nesting birds. The site has a number of water dependant receptors and as such will require further assessment to determine the impact of the cumulative effect of the drought options.	Low	Yes

B2.7.2 NERC and local wildlife sites

Table B2-58 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

Nine NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-58**).

Table B2-58: NERC habitats and local wildlife sites

Site/Receptor 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)*
Kelham Island LWS	Major	Kelham Island is situated close to the City Centre alongside the River Don and at the heart of the Don Valley. The site is in the relatively low-lying flood plain of the River Don.	Low	Yes

Site/Receptor 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)*
		The site hosts a good example of biodiversity along the river, including freshwater fish and variety of bird life such as heron, geese and kingfisher		
Lower River Don: River Don (City Centre to Blackburn Meadows) LWS	Major	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.	Low	Yes
Sandersons Mill Race LWS	Major	The Site encompasses the River Don, its banks, a large weir, lowland mixed deciduous woodland and semi-natural woodland, scrub areas, a mosaic habitat and open mosaic habitats on previously developed land. The site hosts aquatic vegetation, including marginal vegetation. A vast amount of in-channel vegetation is present downstream of the weir.	Medium	Yes
Lower Don Valley: Sheffield and Tinsley Canal LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors The site encompasses the canal and banks from the River Don Navigation near Tinsley to Park Hill. The canal banks have a range of habitat from woodland, grassland, scrub, tall herbs and urban common. There is much aquatic vegetation on the canal including submerged, floating-leaved, emergent and marginal aquatic plants. Fresh water jellyfish have been recorded on site.	Low	Yes
Blackburn Meadows LWS	Major	The site boundary encompasses a section of the River Don and its banks, an old disused sewage treatment works, areas of woodland, wet woodland, scrub, grassland, heathland, marsh, urban common, standing water, marginal aquatic vegetation and wet woodland.	Low	Yes
Sheffield & South Yorkshire Navigation LWS	Major	Likely to support aquatic receptors, However the canal is not likely to be in connectivity with the impacted reach and water levels and flow should remain within typical range. The site covers the river and its banks from Jordan Dam to Don Island. The site hosts acid woodland, neutral woodland, neutral grassland and standing water habitats	Not sensitive	No
Centenary Riverside LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors A flooded wetland / wet woodland side adjacent to the rive	Low	Yes
Salmon Pastures LWS	Major	Area of acid heathland, woodland and scrub.	Low	Yes

Site/Receptor 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)*
Middle River Don: Hillsborough to City Centre LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors The banks of the river corridor were previously industrial but are now becoming residential. The woodland on the banks are ancient, containing indicator species such as pendulous sedge, wood anemone and dog's mercury. Island within the river are very species rich with vegetation and wildlife including birds and invertebrates. The islands also host ancient woodland indicator species. Bankside habitats include broad-leaved woodland, scrub, tall and short herbs, built (walls and disused buildings). The river has strong marginal aquatic vegetation and a rich aquatic fauna.	Low	Yes
Deciduous woodland NERC habitat -316929	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors Reedbeds	Not sensitive	No
NERC habitat No main habitat but additional habitats present -452749	Major	Likely to be in connectivity with impacted reach and support aquatic receptors Reedbeds, Deciduous woodland	Low	Yes
NERC habitat No main habitat but additional habitats present -447335	Major	Likely to be in connectivity with impacted reach and support aquatic receptors Reedbeds	Low	Yes

B2.7.3 NERC and other protected species

Table B2-59 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. White-clawed crayfish were recorded as present in Don 5 at Stevenson Road (Site 1429) in July 2021. Based on the available information this receptor is considered to be susceptible to drought option impacts and has a **high** sensitivity to the physical environment impacts identified in **Appendix A**.

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 drought permit. Based on the limited available information otters considered to be susceptible to drought permit 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, although historic data does identify the receptor to have been present in the impacted reach. However, 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 otter 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.**

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

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 B2-59 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipes)*	Major	White-clawed crayfish are sensitive to habitat modification from the management of waterbodies. Therefore, they are considered to be sensitive to hydrological impacts, particularly low flows.	High	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Major	Otters could potentially to use the impacted reach. 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 Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish - Atlantic Salmon	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the	High	Yes

Site/Receptor 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)*
(*Salmo salar)* - Brown trout *(Salmo trutta)* -European Eel *(Anguilla anguilla)*		presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.		
Notable Species – Fish -Grayling (*Thymallus thymallus)* -Bullhead *(Cottus gobio)* -Barbel (*Barbus barbus)* [3]	Major	Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	Medium	Yes
NERC and Notable species – Birds There are many birds species present across the region	Major	The following bird species to varying extents rely on water dependent habitats. However they are not expected to be impacted severely from implementation of the drought option against a baseline of reduced flows characteristic of drought: - Grey Wagtail (*Motacilla cinerea*) - House Martin (*Delichon urbica*) - Swallow (*Hirundo rustica*) - Eurasian Curlew (*Numenius arqauta*)	Not sensitive	No

B2.7.4 WFD receptors

B2.7.4.1 Macroinvertebrates

The WFD waterbody GB104027057412 Don from River Loxley conf to River Don Works classifies as 'good' and GB104027057413 Don from River Don Works to River Rother classifies as 'poor' for macroinvertebrates in 2022, Cycle 3.

Baseline macroinvertebrate data is provided by three Environment Agency monitoring sites, Weedon Street (ID 125) Stevenson Road (ID 1429) and D/S Blackburn Meadows (ID 929). D/S Blackburn Meadows had baseline survey data for 2010, 2013, 2014, 2017 and 2023 with additional surveys commissioned by YWSL in 2020-2023. Stevenson Road had baseline survey data for 2013, 2014 and 2018 with supplementary surveys by YWSL in 2015 and 2020-2022. These sites provide strong temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors. However, the EA Site 125 surveyed exclusively in 2023 does not support long-term trend analysis but still provided a valuable snapshot of community composition at the time of sampling.

[3] 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.

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A.**

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on three occurrences to 'High' on two occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was successfully calculated for all sites.

$WHPT_{ASPT}$ scores ranged between 3.37 and 6.43 with the lowest $WHPT_{ASPT}$ score of 3.37 at Site 929 in Spring 2021, and the highest score of 6.43 at Site 1429 in Spring 2021. The $WHPT_{ASPT}$ expected scores for ranged from 6.08 to 6.66 across the sites, with 17 of the 31 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.53 and 1.01 with the lowest $WHPT_{ASPT}$ EQR of 0.53 at Site 929 in Spring 2021, and the highest EQR of 1.01 at Site 1429 in Autumn 2018.

In Don 5 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ scores ranged between 7 and 27 with the lowest $WHPT_{NTAXA}$ score of 7 at Site 929 in Spring 2022, and the highest score of 27 at Site 929 in Autumn 2017. The $WHPT_{NTAXA}$ expected scores ranged from 25.78 to 28.88 across the sites, with 15 of the 31 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.24 and 0.95 with the lowest $WHPT_{NTAXA}$ EQR of 0.24 at Site 929 in Spring 2022, and the highest EQR of 0.95 at Site 1429 in Autumn 2018.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. See **Table B2-5** for guidance in interpreting raw LIFE scores. $LIFE_{FAMILY}$ scores ranged between 5.92 and 8.17 with the lowest $LIFE_{FAMILY}$ score of 5.92 at Site 929 in Spring 2023, and the highest score of 8.17 at Site 1429 in Summer 2021. The $LIFE_{FAMILY}$ expected scores ranged from 7.28 to 7.59 across the sites, with 14 of the 31 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.79 and 1.08 with the lowest $LIFE_{FAMILY}$ EQR of 0.79 at Site 929 in Spring 2023, and the highest EQR of 1.08 at Site 1429 in Summer 2021.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 4.55 and 85.7 with the lowest PSI_{FAMILY} score of 4.55 at Site 929 in Autumn 2021, and the highest score of 85.7 at Site 1429 in Spring 2022. The PSI_{FAMILY} expected scores ranged from 56.83 to 65.28 across the sites, with 21 of the 31 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.08 and 1.31 with the lowest PSI_{FAMILY} EQR of 0.08 at Site 929 in Autumn 2021, and the highest EQR of 1.31 at Site 1429 in Spring 2022.

A total of five INNS; *Potamopyrgus antipodarum*, *Dugesia tigrina*, *Crangonyx pseudogracilis*, *Pacifastacus leniusculus* and *Dykerogammarus haemobaphes* were recorded as present at 2 sites between 2020 to 2023.

A single designated species, *Austropotamobius pallipes*, was recorded at Site 1429 in 2021.

Summary

The WFD status of the macroinvertebrate community in Don 5 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

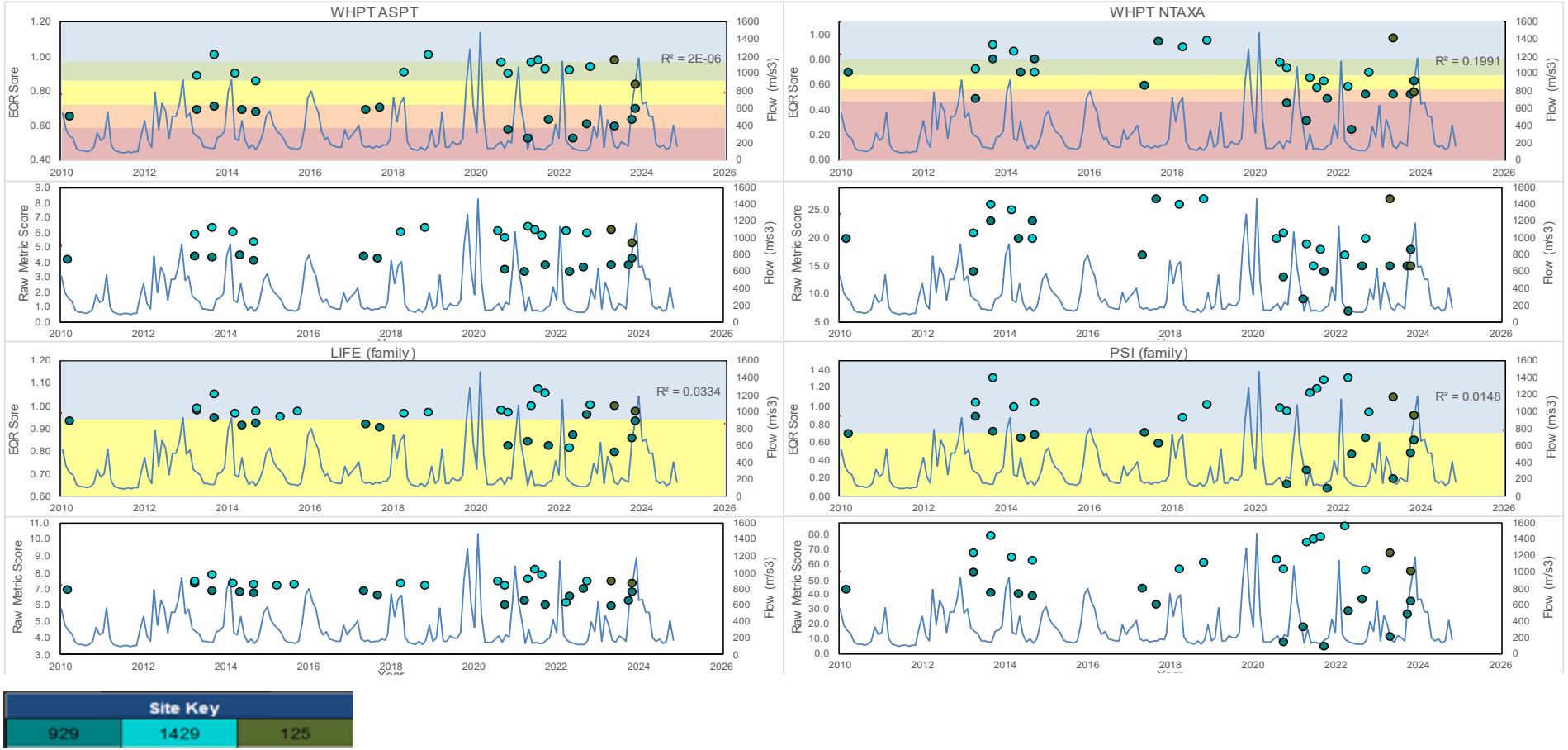
Assessment of the sensitivity of the macroinvertebrate community was undertaken by analysis of recorded LIFE scores. Baseline data indicates that under present conditions, the macroinvertebrate community in Don 5 has a medium to high sensitivity to reduced flows.

A summary of the above data is presented within **Table B2-60** Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-60 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
929	SK4185791912	16	2010 to 2023	0.79 - 0.98 (0.9)	5.92 - 7.3 (6.61)	0.08 - 0.88 (0.52)	4.55 - 54.55 (31.16)	0.53 - 0.71 (0.65)	B - P (P)	3.37 - 4.46 (4.03)	0.24 - 0.94 (0.58)	B - H (M)	7 - 27 (17)
1429	SK3742189041	15	2013 to 2022	0.81 - 1.08 (0.98)	6.14 - 8.17 (7.38)	0.87 - 1.31 (1.08)	56.1 - 85.7 (68.09)	0.86 - 1.01 (0.94)	M - H (G)	5.4 - 6.43 (6.03)	0.58 - 0.95 (0.75)	M - H (G)	15 - 27 (21)
125	SK3853590447	2	2023	0.96 - 0.98 (0.97)	7.29 - 7.48 (7.39)	0.84 - 1.02 (0.93)	55.17 - 67.39 (61.28)	0.8 - 0.93 (0.87)	M - G (G)	5.29 - 6.17 (5.73)	0.55 - 0.98 (0.76)	P - H (G)	15 - 27 (21)

Figure B2-7 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



B2.7.4.2 Fish

Waterbody GB104027057412 Don from River Loxley conf to River Don Works and GB104027057413 Don from River Don Works to River Rother are both classified under Cycle 3 (2022) as 'poor'. GB104027057412 classification is informed by one site, Effingham Street Sheffield (ID 36760), which was classified as 'good' in 2019. GB104027057413 classification is informed by one site, Blackburn Meadows D/S Weir (ID 644), which was classified as 'good'.

Baseline EA fisheries data is available for seven sites: Blackburn Meadows d/s weir DON/CO/TEMP/001 (ID 644), Kelham Island Museum (ID 17371), Effingham Street, Sheffield (ID 36760), Kelham Island (Channel 2) (ID 38246), Nursery Street, Sheffield (ID 41166), Blonk Street, Sheffield (ID 41167), and Firth Rixon (ID 52747). Blackburn Meadows d/s weir DON/CO/TEMP/001 was sampled from 2010 to 2017 and in 2024. Kelham Island Museum was sampled in 2011, 2012, and 2023. Effingham Street, Sheffield was sampled from 2011 to 2014 and in 2023. Kelham Island (Channel 2) was sampled in 2011 and 2012. Nursery Street, Sheffield was sampled in 2011 and 2012. Blonk Street, Sheffield was sampled from 2011 to 2014. Firth Rixon was sampled in 2013.

YSWL commissioned additional surveys for Blackburn Meadows d/s weir DON/CO/TEMP/001 in 2020 and for Blonk Street, Sheffield in 2021, 2022, and 2023. **Table B2-61** details site survey information within the Don 5 reach.

The WFD status of the fish community in Don 5 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site Effingham Street, Sheffield is individually classified as moderate with a site EQR of 0.2844, based on the FCS2 EQR scores from the 2023 survey. The site has a relatively good diversity, with eight species present from an expected ten species. Trout had a lower observed density than expected, with a low EQR score of 0.3943. Bullhead, stone loach, stickleback and minnow are observed at increased numbers, with an EQR score of 1. Grayling were recorded at the site with a good EQR score of 0.7373, with observed densities slightly lower than expected. Pike, roach, dace and perch were expected but not observed at the site during the survey.

The site Kelham Island Museum is individually classified as high with a site EQR of 0.7768, based on the FCS2 EQR scores from the 2023 survey. The site has a relatively good diversity, with six species present from an expected eight species. Trout had a higher observed density than expected, with a good EQR score of 0.9317. Bullhead, stone loach and minnow are observed at increased numbers, with an EQR score of 1. Grayling were recorded at the site with a good EQR score of 0.8087, with observed densities higher than expected. Gudgeon were also recorded at the site though observed densities were slightly lower than expected.

The site Blackburn Meadows d/s weir is individually classified as good with a site EQR of 0.6374, based on the FCS2 EQR scores from the 2017 survey. The site has a relatively good diversity, with ten species present from an expected eleven species. Trout had a slightly lower observed density than expected, with a good EQR score of 0.411. Bullhead, stone loach, 3-spined stickleback and minnow are observed at increased numbers, with an EQR score of 1. Grayling were recorded at the site with an EQR score of 0.4033, with barbel, gudgeon, dace and perch also recorded at the site though observed densities were slightly lower than expected. Roach were recorded at the site with an EQR score of 0.4803, observed densities were higher than expected.

Bullhead, grayling, minnow and stone loach were counted every year of surveys. Brown trout were counted every survey year except for in 2020, however only one survey took place utilising a CPUE sampling strategy which are typically constrained by lacking stop nets and high-water depth. Dace, perch, barbel, roach, 3-spined stickleback, chub, ruffe and pike were counted in the majority of years. Rainbow trout, lampetra sp., European eel, roach x common bream hybrids and orfe/ide were counted in only one or two years.

The highest count of brown trout was 163 in 2023 at Kelham Island Museum, for grayling the highest count was 369 in 2014 at Effingham Street, Sheffield, for bullhead the highest count was 200 in 2021

at Blonk Street. The lowest count for brown trout and grayling 2022 at Blonk Street along with two brown trout and one grayling. The lowest count for bullhead was in 2013 at Firth Rixon with one individual. One lampetra sp. individual was counted in 2012 at Nursery Street, Sheffield. European eel were captured during three surveys, two times with only one individual and one time with nine individuals in 2013 at Blackburn Meadows d/s weir. Minnow and stone loach were typically counted in high numbers, with estimated abundances of 100-999 and 1000-9999, although some sites counted much lower numbers. Pike, chub, dace, gudgeon, perch, barbel and roach were present more often than not, but counted in low numbers.

Table B2-62 details species presence by year across all sites within the Don 5 reach. All fish counts are available in **Annex 1** to this appendix.

Although Atlantic Salmon have not been identified, information provided by Dan Smallwood (Environment Agency) suggests that there is increasing evidence from angling community of salmon being present with some evidence of natural recruitment too. In January 2019, the Environment Agency confirmed the discovery of a 79 cm adult salmon at Salmon Pastures in Sheffield, marking the species' return to the city centre after an absence of 150 years[4]. The fish had recently spawned, indicating potential natural recruitment within the river system. Don Catchment Rivers Trust (DCRT)'s "Salmon Recorder" citizen science initiative has further supported these findings, with reports of juvenile salmon (parr) sightings and DNA evidence confirming their presence in the catchment within Don 5. Therefore, a low abundance of this species has been assumed.

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

Table B2-61 Don 5 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
644	Blackburn Meadows d/s weir DON/CO/TEMP/001	SK4026992088	Electric Fishing (AC, PDC and DC)	10	2010	2024
17371	Kelham Island Museum	SK3509388264	Electric Fishing (AC, PDC and DC)	3	2011	2023
36760	Effingham Street, Sheffield	SK3640088100	Electric Fishing (AC, PDC and DC)	5	2011	2023
38246	Kelham Island (Channel 2)	SK3501288310	Electric Fishing (AC, PDC and DC)	2	2011	2012
41166	Nursery Street, Sheffield	SK3560087900	Electric Fishing (AC, PDC and DC)	2	2011	2012
41167	Blonk Street, Sheffield	SK3590087800	Electric Fishing (AC, PDC and DC)	7	2011	2023
52747	Firth Rixon	SK4184391906	Electric Fishing (AC, PDC and DC)	1	2013	2013

Table B2-62 Don 5 Fish Survey Results

Tolerance Category	Species Name	2010	2011	2012	2013	2014	2015	2016	2017	2020	2021	2022	2023	2024
High tolerance	Perch	X	X	X	X	X			X	X				X
High tolerance	Barbel	X	X	X	X	X	X	X	X					X
High tolerance	Roach	X	X	X	X	X	X	X	X	X				X
High tolerance	3-spined stickleback	X	X	X	X		X	X	X	X		X	X	X
High tolerance	European eel			X	X									

[4] Environment Agency. (2019, January 18). *Salmon found in River Don at Sheffield*. GOV.UK. Retrieved from https://www.gov.uk/government/news/salmon-found-in-river-don-at-sheffield

Tolerance Category	Species Name	2010	2011	2012	2013	2014	2015	2016	2017	2020	2021	2022	2023	2024
High tolerance	Orfe / Ide			X										
High tolerance	Roach x bream hybrid		X											
Medium tolerance	Chub	X	X	X	X	X	X						X	X
Medium tolerance	Dace	X	X	X	X	X	X		X	X	X		X	X
Medium tolerance	Ruffe	X	X	X	X	X		X		X				
Medium tolerance	Gudgeon	X	X	X	X	X	X	X	X	X		X	X	X
Medium tolerance	Pike	X		X	X	X		X		X			X	X
Medium tolerance	Minnow	X	X	X	X	X	X	X	X	X	X	X	X	X
Medium tolerance	Stone loach	X	X	X	X	X	X	X	X	X	X	X	X	X
Medium tolerance	Common bream		X	X										
Low tolerance	Bullhead	X	X	X	X	X	X	X	X	X	X	X	X	X
Low tolerance	Grayling	X	X	X	X	X	X	X	X	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X	X	X	X		X	X	X	X
Low tolerance	Rainbow trout	X												
Low tolerance	Lamprey sp.			X										

B2.7.4.3 WFD waterbody status

Table B2-63 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-63** also displays the objective status for 2022 (Cycle 3) or the predicted status in 2022 where objective to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-63 WFD classifications

Waterbody ID & Name		GB104027057412 Don from River Loxley confl to River Don Works	GB104027057413 Don from River Don Works to River Rother	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	Major	
RBMP Cycle 3 Status/ Potential	Overall	Poor	Poor	
	Fish	Good	Good	Medium
	Macroinvertebrates	Good	Good	Medium
Hydro-morph designation		Heavily modified	Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	Moderate	
	Fish	Good	Good	
	Macroinvertebrates	Good	Moderate	
Waterbody Measures		None	None	

B2.7.5 Invasive non-native species (INNS)

Table B2-64 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-64**).

Table B2-64 INNS Receptors

Site/Receptor 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 -New Zealand mud snail (*Potamopyrgus antipodarum*) - Freshwater Shrimp (*Crangonyx pseudogracilis*) - American immigrant triclad (*Dugesia tigrina)* - Demon shrimp (*Dykerogammarus haemobaphes*) - Caspian mud shrimp (*Chelicorophium curvispinum*) - Tiger scud (*Gammarus tigrinus*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – macroinvertebrates - Signal crayfish (*Pacifastacus leniusculus*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Low	No
Invasive non-native species – Terrestrial plants -Himalayan balsam (*Impatiens glandulifera*) -Japanese knotweed (*Fallopia japonica*) - Giant Hogweed (*Heracleum mantegazzianum*) - Rhododendron (*Rhododendron ponticum*) - New Zealand pigmyweed (*Crassula helmsii*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Non-native species – Fish -Rainbow Trout (*Oncorhynchus mykiss*) -Ide (L*euciscus idus)*	Major	The implementation of this drought option is not anticipated to increase the spread of non-native species.	Not sensitive	No
Invasive non-native species – Mammals American mink (*Neovision vision*)	Major	The implementation of this drought option is not expected to increase the distribution of these INNS	Not sensitive	No

B2.7.6 Landscape, navigation, recreation and heritage

Table B2-65 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

One receptor that is sensitive or susceptible to drought permit impacts has been identified (see **Table B2-65**).

Table B2-65 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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 Don – Angling	Major	Receptors club-administered and public angling. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Moderate	Yes
River Don – Canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No
Cementation furnace, Hoyle Street – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Bower Spring cementation furnace – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No

B2.8 SCOUT DIKE 1

B2.8.1 Statutory designated sites

Table B2-66 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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-66**).

Table B2-66 Statutory designated sites

Site/Receptor 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)*
Wharncliffe Crags SSSI	Major	Wharncliffe Crags SSSI comprises natural sandstone outcrops that are of geological interest. The crags here are the best available exposure in the Upper Carboniferous (approximately 300 million years old) sandstones of the Wharncliffe Edge Rock Formation. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
Wharncliffe Heaths LNR	Major	Situated above Wharncliffe Crags overlooking the Don Valley to the northwest of Sheffield. It lies in an area of outstanding local natural history and archaeological interest and protects one of the few remaining remnants of a formerly much larger heathland complex. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
The Dark Peak SSSI	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
South Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Peak District Moors (South Pennine Moors Phase 1) SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No

B2.8.2 NERC and local wildlife sites

Table B2-67 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

No NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-67**).

Table B2-67 NERC habitats and local wildlife sites

Site/Receptor 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)*
Scout Dyke Reservoir LWS	Major	The site contains the reservoir, lowland heathland, purple moor grass and rush pasture and river habitats.	Not sensitive	No
Black Moor Common LWS	Major	The site contains lowland mixed deciduous woodland, lowland dry acidic grassland, lowland heathland, scrub and nearby river corridor type habitats.	Not sensitive	No

B2.8.3 NERC and other protected species

Table B2-68 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. No information from survey findings was available for white-clawed crayfish, therefore it was not possible to conclusively rule out their presence. However, the Environment Agency reported that signal crayfish are present in Scout Dyke in 2018 and 2019. Given population of signal crayfish in this reach the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this 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 drought permit. Based on the limited available information otters considered to be susceptible to drought permit 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, although suitable habitat has been identified as present in the impacted reach. However, 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 otter 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.**

Two NERC act section 41 and notable fish species have been identified as present in the impacted reach, including two NERC Act Section 41 fish species (brown trout and European eel) and two notable fish species (bullhead and grayling).

Table B2-68 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipes)*	Major	Given the presence of signal crayfish in this reach the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this reach.	Not sensitive	No
NERC Species – mammals Otter *(Lutra lutra)*	Major	Limited data is available for the impacted reach. Otters could potentially to use the impacted reach. 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 Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish - Brown trout *(Salmo trutta)* -European Eel *(Anguilla Anguilla*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
Notable Species – Fish -Bullhead (*Cottus gobio)* *-Grayling (Thymallus thymallus)*	Major	Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	Medium	Yes

B2.8.4 WFD receptors

B2.8.4.1 Macroinvertebrates

The WFD waterbody GB104027057530 Scout Dyke from Source to River Don classifies as 'moderate' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by four Environment Agency monitoring sites: D/S Scout Dyke STW (ID 191975), D/S Scout Dyke Reservoir (ID 157414), U/S Scout Bridge (ID74827) and U/S River Don (261).

U/S River Don had baseline survey data for two seasonal samples for 2012 to 2014 and 2017 to 2019 with additional six surveys commissioned by YWSL in 2020-2024. U/S Scout Bridge had baseline survey data for two seasonal samples for 2019, with an additional five YWSL surveys between 2020 and 2022. Scout Dyke Reservoir had baseline survey data for 2010, 2012- 2014 and 2018 to 2019, with additional monitoring was undertaken by YWSL in 2015 and 2020. D/S Scout Dyke STW had baseline survey data for two seasonal samples for only 2019 with an additional five YWSL surveys between 2020-2022. These sites provide strong temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors.

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A.**

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on two occurrences to 'Good' on three occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was calculated for Sites 261 and 191975. However, no physical environmental (River depth, width, alkalinity or sediment composition) data was able for the Sites 74827, therefore no site specific EQR value could be calculated in RICT3. For sites without physical environmental data, an average expected score has been derived from those sites within the reach which expected scores were calculated. Though the EQR's for these sites are presented, it is noted they will likely have a reduced confidence in the final EQRs.

$WHPT_{ASPT}$ scores ranged between 3.87 and 7.22 with the lowest $WHPT_{ASPT}$ score of 3.87 at Site 261 in Autumn 2022, and the highest score of 7.22 at Site 191975 in Spring 2021. The $WHPT_{ASPT}$ expected scores for ranged from 6.86 to 7.35 across the sites, with 40 of the 45 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.56 and 0.98 with the lowest $WHPT_{ASPT}$ EQR of 0.56 at Site 261 in Autumn 2022, and the highest EQR of 0.98 at Site 191975 in Spring 2021.

In Scout Dike 1 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ scores ranging between 7 and 31 with the lowest $WHPT_{NTAXA}$ score of 7 at Site 261 in Autumn 2022, and the highest score of 31 at Site 261 in Spring 2018. The $WHPT_{NTAXA}$ expected scores ranged from 24.84 to 26.65 across the sites, with 9 of the 45 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.28 and 1.16 with the lowest WHPT NTAXA EQR of 0.28 at Site 261 in Autumn 2022, and the highest EQR of 1.16 at Site 261 in Spring 2018.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. See **Table B2-5** for guidance in interpreting raw LIFE scores. $LIFE_{FAMILY}$ scores ranged between 6.11 and 8.13 with the lowest $LIFE_{FAMILY}$ score of 6.11 at Site 157414 in Autumn 2020, and the highest score of 8.13 at Site 191975 in Spring 2021. The $LIFE_{FAMILY}$ expected scores ranged from 7.73 to 7.85 across the sites, with 42 of the 45 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.79 and 1.04 with the lowest $LIFE_{FAMILY}$ EQR of 0.79 at Site 157414 in Autumn 2020, and the highest EQR of 1.04 at Site 191975 in Spring 2021.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 18.2 and 78.1 with the lowest PSI_{FAMILY} score of 18.2 at Site 261 in Autumn 2022, and the highest score of 78.1 at Site 191975 in Spring 2021. The PSI_{FAMILY} expected scores ranged from 68.44 to 74.11 across the sites, with 41 of the 45 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.27 and 1.05 with the lowest PSI_{FAMILY} EQR of 0.27 at Site 261 in Autumn 2022, and the highest EQR of 1.05 at Site 191975 in Spring 2021.

A total of three INNS, including *Potamopyrgus antipodarum*, *Pacifastacus leniusculus* and *Dreissena polymorpha* were recorded as present at 3 sites in 2021. No designated species were recorded during the monitoring period.

Summary

The WFD status of the macroinvertebrate community in Scout Dike 1 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

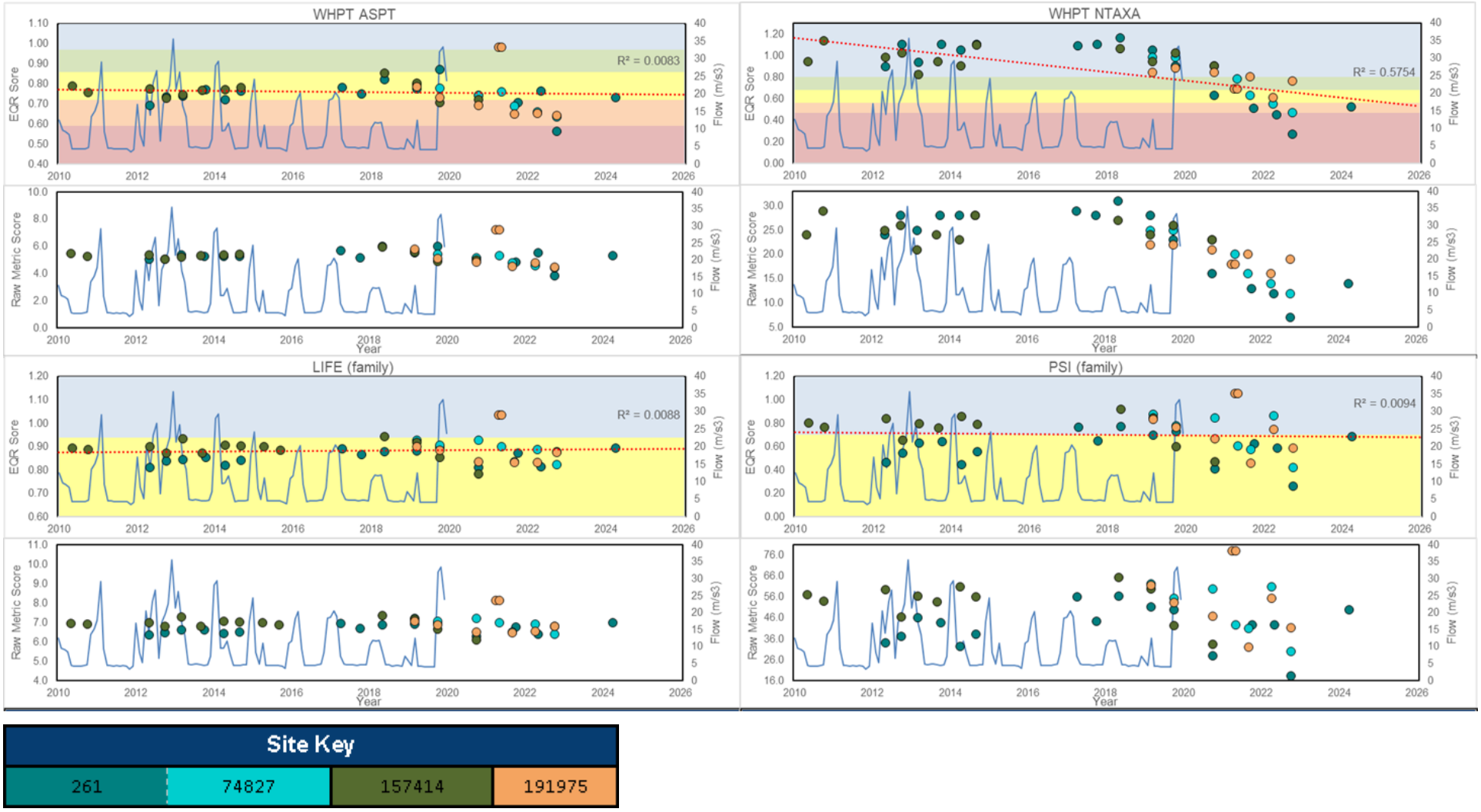
Baseline data indicates that under present conditions, the macroinvertebrate community in Scout Dike 1 has medium to high sensitivity to reduced flows (**Figure B2.6**).

A summary of the above data is presented within **Table B2-69.** Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-69 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
261	SE2460203882	16	2012 to 2020	0.81 - 0.9 (0.86)	6.27 - 7 (6.66)	0.27 - 0.77 (0.59)	18.2 - 56.36 (42.02)	0.56 - 0.87 (0.75)	B - G (M)	3.87 - 5.99 (5.28)	0.28 - 1.16 (0.87)	B - H (H)	7 - 31 (23)
74827	SE2398704430	7	2019 to 2020	0.82 - 0.93 (0.89)	6.4 - 7.23 (6.9)	0.42 - 0.88 (0.71)	30 - 62.22 (50.34)	0.64 - 0.8 (0.72)	P - M (M)	4.43 - 5.56 (5.05)	0.47 - 0.98 (0.76)	P - H (G)	12 - 25 (19)
157414	SE2367004597	14	2010 to 2020	0.79 - 0.94 (0.89)	6.11 - 7.35 (6.93)	0.47 - 0.92 (0.76)	33.33 - 65.31 (53.82)	0.71 - 0.86 (0.77)	P - M (M)	4.92 - 5.96 (5.34)	0.83 - 1.14 (0.98)	H - H (H)	21 - 29 (25)
191975	SE2374104560	8	2019 to 2020	0.83 - 1.04 (0.9)	6.47 - 8.13 (7.07)	0.46 - 1.05 (0.77)	32 - 78.1 (55.89)	0.64 - 0.98 (0.77)	P - H (M)	4.49 - 7.22 (5.5)	0.61 - 0.89 (0.77)	M - H (G)	16 - 22 (20)

Figure B2-8 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



B2.8.4.2 Fish

Waterbody GB104027057530 Scout Dyke from Source to River Don is classified under Cycle 3(2022) as 'moderate'. This classification is informed by two sites, D/S B6462 (ID 4340) which is classed as 'bad' and Nether Mill Fishery (ID 29872) which is classed as 'good'.

Baseline EA fisheries data is available for both D/S B6462 and Nether Mill Fishery, both of which were surveyed in 2011 and 2017. Additional data is available for Nether Mill Fishery in 2023.

YSWL commissioned additional surveys at D/S B6462 between 2020 and 2023 and in 2021 and 2022 for Nether Mill Fishery.

Table B2-70 details site survey information within the Scout Dike 1 reach.

The WFD status of the fish community in Scout Dike 1 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site D/S B6462 is individually classified as bad with a site EQR of 0.005, based on the FCS2 EQR scores from the 2017 survey. The site has a relatively good diversity, with three species present from an expected three species, though this includes a non-native species (Golden orfe which likely escaped from the upstream pond. Trout were not observed in this reach, although they are expected to be present, resulting in a low EQR score of 0.022. Additionally, bullhead are not observed in this reach, although they are expected to be present, resulting in a low EQR score of 0.4796. Chub, perch and roach were also recorded at the site with higher than expected densities. Though chub, perch and roach were observed at the site, the absence of trout and bullhead had an effect in the overall site classification, with the moderate diversity also contributing to the overall 'bad' classification of the site.

The site Nether Mill Fishery is individually classified as moderate with a site EQR of 0.2628, based on the FCS2 EQR scores from the 2023 survey. The site has a high diversity, with nine species present from an expected three species. Trout had a significantly lower observed density than expected, with an EQR score of 0.094. Bullhead, stone loach and minnow are observed at increased numbers, with an EQR score of 1.

Brown trout and bullhead were present for every survey year, but not at both sites, both species were not counted at D/S B6462 in 2017. Nether Mill Fishery has counted minnow, stone loach, gudgeon, grayling and common bream, which were not captured at D/S B6462. Chub, orfe/ide and rainbow trout were all only counted at D/S B6462, with both rainbow trout and orfe/ide classed as non-native.

Only bullhead are present in moderate numbers at D/S B6462, with 110 counted in 2022. All other species were counted in low numbers, with the next highest count being 28 perch in 2017. Nether mill fishery counted low bullhead numbers, but more moderate brown trout numbers, with the highest count of 34 in 2021 compared to the highest of 11 in 2021 at B6462. Minnow were present at Nether mill fishery with an estimated log abundance of 100-999, and moderate estimated log abundance of stone loach of 10-99.

Table B2-71 details fish survey data from sites within the Scout Dike 1 reach by year. All fish counts are available in **Annex 1** to this appendix.

Although European eel have not been identified, an absence from the impacted reach is not considered likely as previous historical data obtained from the EA suggested their presence. Therefore, a low abundance of this species has been assumed.

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

Table B2-70 Scout Dike 1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
4340	D/S B6462	SE2396004470	Electric Fishing (AC, PDC and DC)	6	2011	2023

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
29872	Nether Mill Fishery	SE2457603946	Electric Fishing (AC, PDC and DC)	5	2011	2023

Table B2-71 Scout Dike 1 Fish Survey Results

Tolerance Category	Species Name	2011	2017	2020	2021	2022	2023
High tolerance	Perch	X	X			X	X
High tolerance	3-spined stickleback	X					
High tolerance	Orfe / Ide	X	X				
High tolerance	Roach		X		X	X	X
Medium tolerance	Chub	X	X				
Medium tolerance	Minnow	X	X		X	X	X
Medium tolerance	Stone loach	X	X		X	X	X
Medium tolerance	Gudgeon				X	X	X
Medium tolerance	Common bream						X
Low tolerance	Bullhead	X	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X	X
Low tolerance	Grayling						X
Low tolerance	Rainbow trout				X		

B2.8.4.3 WFD waterbody status

Table B2-72 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-72** also displays the objective status for 2022 (Cycle 3) or the predicted status in 2022 where objective to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-72 WFD classifications

Waterbody ID & Name		GB104027057530 Scout Dyke from Source to River Don	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	Medium
	Macroinvertebrates	Moderate	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.8.5 Invasive non-native species (INNS)

Table B2-73 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-73**).

Table B2-73 INNS Receptors

Site/Receptor 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 -Signal crayfish (*Pacifastacus leniusculus*) -New Zealand mud snail (*Potamopyrgus antipodarum*) - Zebra mussel (*Dreissena polymorpha*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – macroinvertebrates -Signal crayfish (*Pacifastacus leniusculus*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Low	No
Invasive non-native species – Terrestrial plants -Himalayan Balsam (*Impatiens glandulifera*) - Rhododendron (*Rhododendron ponticum*) - New Zealand pigmyweed (*Crassula helmsii*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Non-native species – Fish -Rainbow trout (*Oncorhynchus mykiss*) -Ide (L*euciscus idus)*	Major	The implementation of this drought option is not anticipated to increase the spread of non-native species.	Not sensitive	No

B2.8.6 Landscape, navigation, recreation and heritage

Table B2-74 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

One receptor that is sensitive or susceptible to drought permit impacts has been identified (see **Table B2-74**).

Table B2-74 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Trans Pennine Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Scout Dyke Reservoir Walk/Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Scout Dyke - Angling	Major	Receptors members club-administered angling. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce angling quality.	Low	No
Scout Dyke - Canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No
Nether Mill Fishery	Major	Stillwater waterbody fed by Scout Dyke Beck, which ensures a constant flow of fresh water through the fishery.	Uncertain	Yes

B2.9 LITTLE DON 0

B2.9.1 Statutory designated sites

Table B2-75 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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-75**).

Table B2-75 Statutory designated sites

Site/Receptor 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)*
The Dark Peak SSSI	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
South Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Peak District Moors (South Pennine Moors Phase 1) SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Little Don Stream Section SSSI	Major	Little Don Stream Section SSSI is an internationally significant area of geological interest as the reference section for one of the major units (Westphalian A) of the Carboniferous System where Pot Clay Coal and the *Gastrioceras subcrenatum* Marine Band are exposed along the banks of the river. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No

B2.9.2 NERC and local wildlife sites

Table B2-76 summarises the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

No NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-76**).

Table B2-76 NERC habitats and local wildlife sites

Site/Receptor 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)*
Underbank Reservoir LWS	Major	The site encompasses some of Underbank Reservoir, its slipway, the Little Don River and the surrounding area. The south bank of the reservoir is host to plantation woodland, reed canary grass and a rocky drawdown zone. The northern bank of the reservoir hosts a mixture of woodland types.	Not sensitive	No

B2.9.3 NERC and other protected species

Table B2-77 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. One record of white-clawed crayfish was available in the reach, dating back to 1991 between Underbank reservoir and Langsett reservoir. One recent record for signal crayfish is available, recorded in 2019 downstream of Underbank reservoir. Despite the presence of signal crayfish downstream, the barrier posed by Underbank reservoir means their presence cannot be confirmed within the reach and white-clawed crayfish cannot be assumed absent.

three nationally scarce macroinvertebrate species (*Atherix ibis)* was observed at u/s More Hall Bridge (Site 124) in 2021. Based on the available information this receptor is considered to be susceptible to drought option impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

four nationally scarce macroinvertebrate species; including *Paraleptophlebia cincta*, *Potamophylax rotundipennis*, *Tinodes assimilis* and *Sialis nigripes* were observed within Little Don 0 between 2013 to 2016. Based on the available information these receptors are considered to be susceptible to drought option impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

Data obtained from a review of NBN gateway was used inform the assessment of otter in the impacted reach. No records are available within 500m of the impacted reach. Furthermore, no information from survey findings was available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought option. Based on the available information these species are considered not to be susceptible to drought option impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Data obtained from a review of available data from NBN gateway was used inform the assessment of water vole in the impacted reach. The data showed one record within the impacted reach, recorded in 1991. Although no recent records are available, their historic presence within the reach means that 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.**

Two NERC act section 41 and notable fish species have been identified as present in the impacted reach, including one NERC Act Section 41 fish species (brown trout) and one notable fish species (bullhead).

Table B2-77 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipes)*	Major	Limited data is available for the impacted reach. White-clawed crayfish could potentially to use the impacted reach. Further consideration would be necessary to determine to what extent or how they may be impacted by reduced flows caused by the drought option.	Not sensitive	Yes
Notable species – Blue-winged mayfly (*Paraleptophlebia cincta)* Caddisflies *(Potamophylax rotundipennis) (Tinodes assimilis)* Black alderfly *(Sialis nigripes)*	Major	Flow impacts of the drought option not likely to impact habitat availability. Low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only) and may therefore not markedly detract from the quality of the supporting environment.	Medium	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Major	Limited data is available for the impacted reach. Otters could potentially to use the impacted reach. 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 Water vole (*Arvicola amphibious)*	Major	Limited data is available for the impacted reach. Water vole could potentially to use the impacted reach changes in water level are the most important factor influencing water vole populations, with species readily inhabiting areas of slow flowing and standing water. As such hydrological and associated impacts as a result of this drought permit may reduce habitat availability and alter the species food supply.	Uncertain	Yes
NERC Species – Fish Brown trout *(Salmo trutta)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
Notable Species – Fish Bullhead *(Cottus gobio)*	Major	Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be	Medium	Yes

Site/Receptor 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)*
		damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.		

B2.9.4 WFD receptors

B2.9.4.1 Macroinvertebrates

The WFD waterbody GB104027057460 Little Don from Source to River Don classifies as 'High' for macroinvertebrates in 2022, Cycle 3. Classification is based on two EA monitoring Sites ID 199 and ID 1240, though ID 1240 is located outside the impacted reach. Site ID 199 is located in the impacted reach and classified as moderate with the latest site classification in 2019.

Baseline macroinvertebrate data is provided by three Environment Agency monitoring sites: Site ID 199, ID 176947 and ID 176948.

Site ID 176947 and ID 176948 had seasonal samples for 2013 to 2016, while Site ID 199 had surveys in 2012, 2015 and 2018. These sites provide good temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors.

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A.**

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Moderate' on ten occurrences to 'Good' on ten occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was calculated for Site ID 199. However, no physical environmental (River depth, width, alkalinity or sediment composition) data was able for the Sites ID 176947 and ID 176948, therefore no site specific EQR value could be calculated in RICT3. Since sites ID 176947 and ID 176948 are without physical environmental data an average expected score has been derived from those sites within the reach which expected scores were calculated. Though the EQR's for these sites are presented, it is noted they will likely have a reduced confidence in the final EQRs.

$WHPT_{ASPT}$ scores ranged between 5.36 - 6.64 (6.11) with the lowest $WHPT_{ASPT}$ score of 5.36 at Site 176947 in Autumn 2016, and the highest score of 6.64 at Site 176947 in Summer 2015. The WHPT ASPT expected scores for ranged between 6.94 to 7.33 across the sites, with 9 of the 20 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.77 - 0.95 (0.87) with the lowest $WHPT_{ASPT}$ EQR of 0.77 at Site 176947 in Autumn 2016, and the highest EQR of 0.95 at Site 176947 in Summer 2015.

$WHPT_{NTAXA}$ scores ranged between 16 - 35 (23.5) with the lowest $WHPT_{NTAXA}$ score of 16 at Site 176947 in Autumn 2013, and the highest score of 35 at Site 176947 in Autumn 2015. The $WHPT_{NTAXA}$ expected scores ranged between 25.24 to 26.59 across the sites, with 4 of the 20 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.63 - 1.37 (0.92) with the lowest $WHPT_{NTAXA}$ EQR of 0.63 at Site 176947 in Autumn 2013, and the highest EQR of 1.37 at Site 176947 in Autumn 2015.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. See **Table B2-5** for guidance in interpreting raw LIFE scores. $LIFE_{FAMILY}$ scores ranged between 6.73 - 7.84 (7.33) with the lowest $LIFE_{FAMILY}$ score of 6.73 at Site 176947 in Autumn 2016, and the highest score of 7.84 at Site 176948 in Spring 2014. The $LIFE_{FAMILY}$ expected scores ranged between 7.76 to 7.84 across the sites, with 11 of the 20 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.86 - 1.01 (0.94) with the lowest

$LIFE_{FAMILY}$ EQR of 0.86 at Site 176947 in Autumn 2016, and the highest EQR of 1.01 at Site 176948 in Spring 2014.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 51.85 - 77.78 (61.92) with the lowest PSI_{FAMILY} score of 51.85 at Site 176947 in Autumn 2016, and the highest score of 77.78 at Site 176948 in Summer 2015. The PSI_{FAMILY} expected scores ranged between 69.5 to 73.77 across the sites, with 18 of the 20 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.73 - 1.09 (0.87) with the lowest PSI(family) EQR of 0.73 at Site 176947 in Autumn 2016, and the highest EQR of 1.09 at Site 176948 in Summer 2015.

A total of two INNS species, including *Crangonyx pseudogracilis/floridanus* and *Potamopyrgus antipodarum* were recorded as present at three sites between 2012 to 2018.

A total of four designated species, including *Paraleptophlebia cincta*, *Potamophylax rotundipennis*, *Tinodes assimilis* and *Sialis nigripes* were recorded as present at two sites (Detailed in Table 3) between 2013 to 2016.

Summary

The WFD status of the macroinvertebrate community in Little Don 0 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

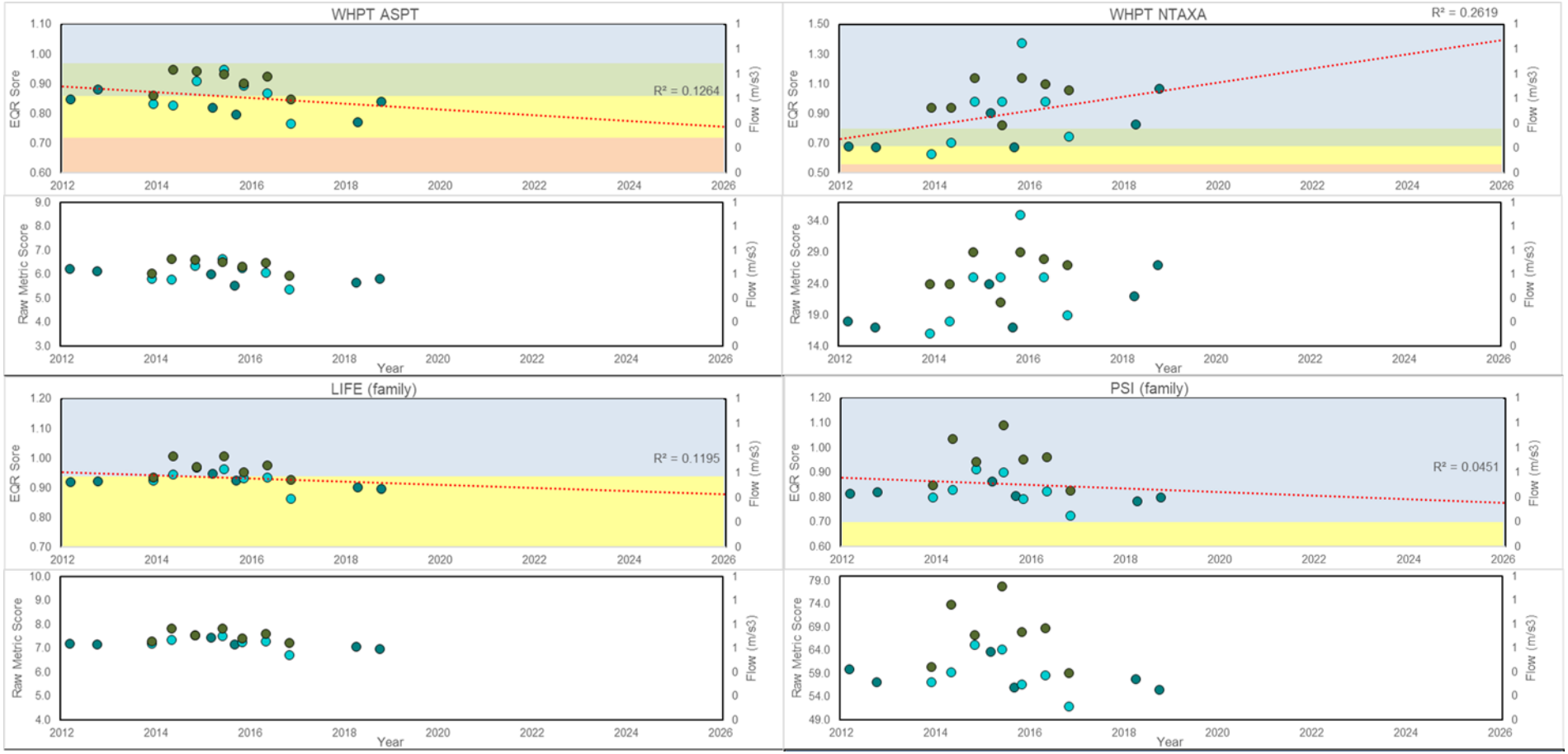
Baseline data indicates that under present conditions, the macroinvertebrate community in Little Don 0 has medium to high sensitivity to reduced flows (**Figure B2-9**).

A summary of the above data is presented within **Table B2-78.** Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-78 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	LIFE (Family) Score Min - Max (AVG.)	PSI (Family) EQR Score Min - Max (AVG.)	PSI (Family) Score Min - Max (AVG.)	WHPT ASPT EQR Score Min - Max (AVG.)	WHPT ASPT EQR Class Min - Max (AVG.) *B/P/M/G/H*	WHPT ASPT Score Min - Max (AVG.)	WHPT NTAXA EQR Score Min - Max (AVG.)	WHPT NTAXA EQR Class Min - Max (AVG.) *B/P/M/G/H*	WHPT NTAXA Score Min - Max (AVG.)
199	SE2192800404	6	2012 to 2018	0.9 - 0.95 (0.92)	6.96 - 7.44 (7.17)	0.78 - 0.86 (0.81)	55.56 - 63.64 (58.37)	0.77 - 0.88 (0.83)	M - G (M)	5.52 - 6.22 (5.89)	0.67 - 1.07 (0.8)	M - H (H)	17 - 27 (21)
176947	SK2294199970	7	2013 to 2016	0.86 - 0.97 (0.93)	6.73 - 7.55 (7.27)	0.73 - 0.91 (0.83)	51.85 - 65.12 (59)	0.77 - 0.95 (0.86)	M - G (G)	5.36 - 6.64 (6.05)	0.63 - 1.37 (0.91)	M - H (H)	16 - 35 (23)
176948	SE2289500075	7	2013 to 2016	0.93 - 1.01 (0.97)	7.23 - 7.84 (7.54)	0.83 - 1.09 (0.95)	59.09 - 77.78 (67.88)	0.85 - 0.95 (0.91)	M - G (G)	5.93 - 6.64 (6.36)	0.82 - 1.14 (1.02)	H - H (H)	21 - 29 (26)

Figure B2-9 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



Site Key		
199	176947	176948

B2.9.4.2 Fish

Waterbody GB104027057460 Little Don from Source to River Don is classified under Cycle 3 (2022) as 'Poor'. This classification is informed by two sites, Downstream Underbank Reservoir (ID 31624) located in Little Don 1 and Downstream Langsett Reservoir (ID 11957) within the impacted reach both sites are classed as 'Poor'.

Baseline EA fisheries data is informed by one site Downstream Langsett reservoir (ID 11957), which was surveyed in 2011,2015 and 2017.

YSWL commissioned additional surveys at d/s Water works (ID LD1), Gas main gorge (ID LD2), Bend U/S Uskers Barn (ID LD3), D/S ford – new gateway (ID – LD4), U/S Hand Bank, west bend (ID LD5) and U/S Hand Bank, east bend (ID LD6) in 2020 and 2021.

Table B2-79 details site survey information within the Little Don 0 reach.

The WFD status of the fish community in Little Don 0 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site Downstream Langsett Reservoir is individually classified as poor with a site EQR of 0.1086, based on the FCS2 EQR scores from the 2023 survey. The site has a relatively good diversity, with two species present from an expected three species. Trout had a lower observed density than expected, with a low EQR score of 0.184. Stone loach and bullhead were expected but not present at this site. 3-spined stickle back were observed at increased numbers, with an EQR score of 1, though not expected.

Brown trout were present for every survey year at all sites. Bullhead were present every year but not at all sites, Bullhead were not captured at Downstream Langsett Reservoir (ID 11957), U/S Uskers Barn (ID LD3) and D/S ford – new gateway (ID – LD4). Bullhead were captured at d/s Water works (ID LD1) but only during 2021. 3-spined stickle back were captured at every site but not every year no stickleback were captured at U/S Hand Bank, west bend (ID LD5) during 2020.

Brown trout were captured in low to moderate numbers being recorded at all sites with the highest abundance being 68 individuals captured at U/S Hand Bank, west bend (ID LD5). Bullhead are present in low numbers across sites d/s Water works (LD1), D/S ford – new gateway (LD4) and U/S Hand Bank, west bend (LD5) with moderate numbers at east bend (ID LD6), with 152 counted in 2021. 3-spined stickleback were counted in low numbers across all sites, with the highest count being 32 in 2015 at Downstream Langsett Reservoir.

Table B2-80 details fish survey data from sites within the Little Don 0 reach by year. All fish counts are available in **Annex 1** to this appendix.

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

Table B2-79 Little Don 0 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
11957	Downstream Langsett Reservoir	SE2187500411	Electric Fishing (AC, PDC and DC)	1	2011	2011
11957	Downstream Langsett Reservoir	SE2190000400	Electric Fishing (AC, PDC and DC)	2	2015	2017
LD1	d/s Water works	SE2189900421	Electric Fishing (AC, PDC and DC)	3	2020	2021
LD2	Gas main – gorge	SE2232800295	Electric Fishing (AC, PDC and DC)	2	2020	2021
LD3	Bend u/s Uskers Barn	SE2253900190	Electric Fishing (AC, PDC and DC)	2	2020	2021
LD4	d/s ford – new gateway	SE2276300177	Electric Fishing (AC, PDC and DC)	3	2020	2021

LD5	u/s Hand Bank, west bend	SK2294999974	Electric Fishing (AC, PDC and DC)	2	2020	2021
LD6	u/s Hand Bank, east bend	SK2304999888	Electric Fishing (AC, PDC and DC)	2	2020	2021

Table B2-80 Little Don 0 Fish Survey Results

Tolerance Category	Species Name	2011	2015	2017	2020	2021
High tolerance	3-spined stickleback	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X
Low tolerance	Bullhead				X	X

B2.9.4.3 WFD waterbody status

Table B2-81 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-81** also displays the objective status for 2022 (Cycle 3) or the predicted status in 2022 where objective to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-81 WFD classifications

Waterbody ID & Name		GB104027057460 Little Don from Source to River Don	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Poor	Medium
	Macroinvertebrates	High	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.9.5 Invasive non-native species (INNS)

Table B2-82 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-82**).

Table B2-82 INNS Receptors

Site/Receptor 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 -New Zealand mud snail (*Potamopyrgus antipodarum*) - Zebra mussel (*Dreissena polymorpha*) - Freshwater shrimp (*Crangonyx pseudogracilis/floridanus)*	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – macroinvertebrates -Signal crayfish (*Pacifastacus leniusculus*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Low	No
Invasive non-native species – Terrestrial plants -Himalayan Balsam (*Impatiens glandulifera*) - Rhododendron (*Rhododendron ponticum*) - Japanese knotweed (*Fallopia japonica*) - New Zealand pigmyweed (*Crassula helmsii*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.9.6 Landscape, navigation, recreation and heritage

Table B2-83 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-83**).

Table B2-83 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Stocksbridge and District Golf Course	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Sheffield Country Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Barnsley Boundary Walk – National Trail	Major	The route of the trail runs in close proximity to the Little Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Little Don River - Angling	Major	Recreational angling takes place on Little Don River. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No
Little Don River – Canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No

B2.10 LITTLE DON 1

B2.10.1 Statutory designated sites

Table B2-84 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. No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-84**).

Table B2-84 Statutory designated sites

Site/Receptor 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)*
Wharncliffe Crags SSSI	Major	Wharncliffe Crags SSSI comprises natural sandstone outcrops that are of geological interest. The crags here are the best available exposure in the Upper Carboniferous (approximately 300 million years old) sandstones of the Wharncliffe Edge Rock Formation. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
Wharncliffe Heaths LNR	Major	Situated above Wharncliffe Crags overlooking the Don Valley to the northwest of Sheffield. It lies in an area of outstanding local natural history and archaeological interest and protects one of the few remaining remnants of a formerly much larger heathland complex. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
The Dark Peak SSSI	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
South Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Peak District Moors (South Pennine Moors Phase 1) SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Little Don Stream Section SSSI	Major	Little Don Stream Section SSSI is an internationally significant area of geological interest as the reference section for one of the major units (Westphalian A) of the Carboniferous System where Pot Clay Coal and the *Gastrioceras subcrenatum* Marine Band are exposed along the banks of the river. The site is unlikely to be affected by	Not sensitive	No

		hydrological changes within the zone of influence.		

B2.10.2 NERC and local wildlife sites

Table B2-85 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

Two NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-85**).

Table B2-85 NERC habitats and local wildlife sites

Site/Receptor 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)*
Underbank Reservoir LWS	Major	The site encompasses some of Underbank Reservoir, its slipway, the Little Don River and the surrounding area. The south bank of the reservoir is host to plantation woodland, reed canary grass and a rocky drawdown zone. The northern bank of the reservoir hosts a mixture of woodland types.	Not sensitive	No
Lower Little Don, Stocksbridge LWS	Major	Contains the Lower Little Don River and fringing surrounding areas. As well as the river habitats, the site includes areas of semi-natural woodland, ancient woodland, unimproved grassland neutral grassland, lowland heath and improved grassland on regenerating brownfield sites. The river corridor has been altered by industry and has been culverted in other sections.	Low	Yes
New Hall Wood and Brook LWS	Major	Predominantly oak/ash woodland (semi natural and ancient). Habitats present include ancient woodland, unimproved grassland and rivers/running water, scrub, other tall herbs, dry dwarf scrub heath, flush/spring and hedgerows habitats are also present.	Not sensitive	No
Knoll Top LWS	Major	Unlikely to be in connectivity with impacted reach. Contains a variety of habitats including lowland mixed deciduous woodland, running water, scrub, springs and dry-stone walls. A beck runs north toward the river and is added to by two small springs in the site.	Not sensitive	No
Old Haywoods LWS	Major	Old Haywoods is an agricultural site with a variety of habitats including species rich unimproved acidic and neural grassland, scrubland and semi-natural woodland. The site forms a woodland corridor linking other LWS and woodland.	Not Sensitive	No
Upper River Don: Deepcar to	Major	Likely to be in connectivity with impacted reach and support aquatic receptors	Low	Yes

Site/Receptor 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)*
Hillsborough LWS		Although the site encompasses the river as it passes through urban areas, the river corridor is very species rich. The river in the site passes close to three major ancient woodland and the corridor is significant for dispersal and maintenance of a wide range of species. Semi-natural woodland, scrub, other tall herb, flush/spring, marsh and marginal aquatic vegetation habitats are also present.		
Upper River Don: Station Road, Deepcar LWS	Major	The site is located downstream of the impacted reach on the eastern bank of the River Don. The site does support aquatic receptors but doesn't include the impacted reach. The site is an unmanaged field on a River Don flood plain hosting springs feeding into a shallow wetland /marsh/ wet grassland. Grassland becomes wetter southwards. The woodland along the banks of the river is ancient.	Not Sensitive	No

B2.10.3 NERC and other protected species

Table B2-86 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. No information from survey findings was available for white-clawed crayfish, therefore it was not possible to conclusively rule out their presence. However, the Environment Agency reported that signal crayfish are present within the impacted reach in 2018, 2019, and 2020. Given population of signal crayfish in this reach the Environment Agency considers it unlikely that white-clawed crayfish are present, and they are not considered further for this reach.

Data obtained from the Environment Agency and a review of available data from NBN gateway was used inform the assessment of otter in the impacted reach. Review of Environment Agency and YWSL records indicates the presence of otter within the impacted reach. However, no information from survey findings was available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought option. Based on the available information these species are considered not to be susceptible to drought option impacts and have a **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, although suitable habitat has been identified as present in the impacted reach. However, 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 otter 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.**

Two NERC act section 41 and notable fish species have been identified as present in the impacted reach, including one NERC Act Section 41 fish species (brown trout) and three notable fish species (bullhead, grayling and barbel).

Table B2-86 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipes)*	Major	Limited data is available for the impacted reach. White-clawed crayfish could potentially to use the impacted reach. Further consideration would be necessary to determine to what extent or how they may be impacted by reduced flows caused by the drought option.	Not sensitive	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Major	Limited data is available for the impacted reach. Otters could potentially to use the impacted reach. 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 Water vole (*Arvicola amphibious)*	Major	Limited data is available for the impacted reach. Water vole could potentially to use the impacted reach Changes in water level are the most important factor influencing water vole populations, with species readily inhabiting areas of slow flowing and standing water. As such hydrological and associated impacts as a result of this drought permit may reduce habitat availability and alter the species food supply.	Uncertain	Yes
NERC Species – Fish Brown trout *(Salmo trutta)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
Notable Species – Fish Grayling (*Thymallus thymallus)*	Major	Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the	Medium	Yes

Site/Receptor 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)*
Bullhead *(Cottus gobio)*		change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.		

B2.10.4 WFD receptors

B2.10.4.1 Macroinvertebrates

The WFD waterbody GB104027057460 Little Don from Source to River Don classifies as 'high for macroinvertebrates in 2019, Cycle 3. The WFD classification of High for macroinvertebrates in 2022 was informed by one Environment Agency monitoring site, located upstream of the impacted reach, ID 1240.

Baseline macroinvertebrate data is provided by two Environment Agency monitoring sites, Deepcar (ID 198) and D/S Underbank Reservoir (ID 200).

Deepcar had baseline survey data for 2012 – 2015, with five additional surveys commissioned by YWSL in 2020-2022. D/S Underbank Reservoir had baseline survey data for samples from 2010, 2015 to 2021 and 2023, with supplementary surveys from YWSL in 2022.

These sites provide limited temporal coverage within the baseline period, restricting the ability to assess long-term trends and macroinvertebrate community responses to flow variations and other stressors.

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A**.

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on seven occurrences to 'Moderate' on twelve occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was successfully calculated for both sites.

$WHPT_{ASPT}$ scores ranged between 3.96 and 6.25 with the lowest $WHPT_{ASPT}$ score of 3.96 at Site 198 in Autumn 2012, and the highest score of 6.25 at Site 200 in Spring 2021. The $WHPT_{ASPT}$ expected scores for ranged from 6.88 to 7.34 across the sites, with 30 of the 32 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.57 and 0.88 with the lowest WHPT ASPT EQR of 0.57 at Site 198 in Spring 2021, and the highest EQR of 0.88 at Site 200 in Autumn 2021.

In Little Don 1 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ scores ranging between 6 and 23 with the lowest $WHPT_{NTAXA}$ score of 6 at Site 198 in Spring 2022, and the highest score of 23 at Site 198 in Autumn 2013. The WHPT NTAXA expected scores ranged from 25.55 to 27.39 across the sites, with 24 of the 32 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.22 and 0.89 with the lowest $WHPT_{NTAXA}$ EQR of 0.22 at Site 198 in Spring 2022, and the highest EQR of 0.89 at Site 198 in Autumn 2013.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. $LIFE_{FAMILY}$ scores ranged between 6.43 and 7.56 with the lowest $LIFE_{FAMILY}$ score of 6.43 at Site 200 in Autumn 2018, and the highest score of 7.56 at Site 198 in Spring 2015. The $LIFE_{FAMILY}$ expected scores ranged from 7.72 to 7.83 across the sites, with 28 of the 32 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.83 and 0.97 with the lowest $LIFE_{FAMILY}$ EQR of 0.83 at Site 200 in Autumn 2018, and the highest EQR of 0.97 at Site 198 in Spring 2015.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 25 and 73.68 with the lowest PSI_{FAMILY} score of 25 at Site 198 in Autumn 2012, and the highest score of 73.68 at Site 200 in Spring 2015. The PSI_{FAMILY} expected scores ranged from 68.53 to 73.67 across the sites, with 31 of the 32 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.36 and 1 with the lowest PSI_{FAMILY} EQR of 0.36 at Site 198 in Autumn 2012, and the highest EQR of 1 at Site 200 in Spring 2015.

A total of two INNS, including *Potamopyrgus antipodarum* and *Crangonyx pseudogracilis* were recorded as present at Site ID 198 between 2020 to 2021. No designated species were recorded during the monitoring period.

Summary

The WFD status of the macroinvertebrate community in Little Don 1 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

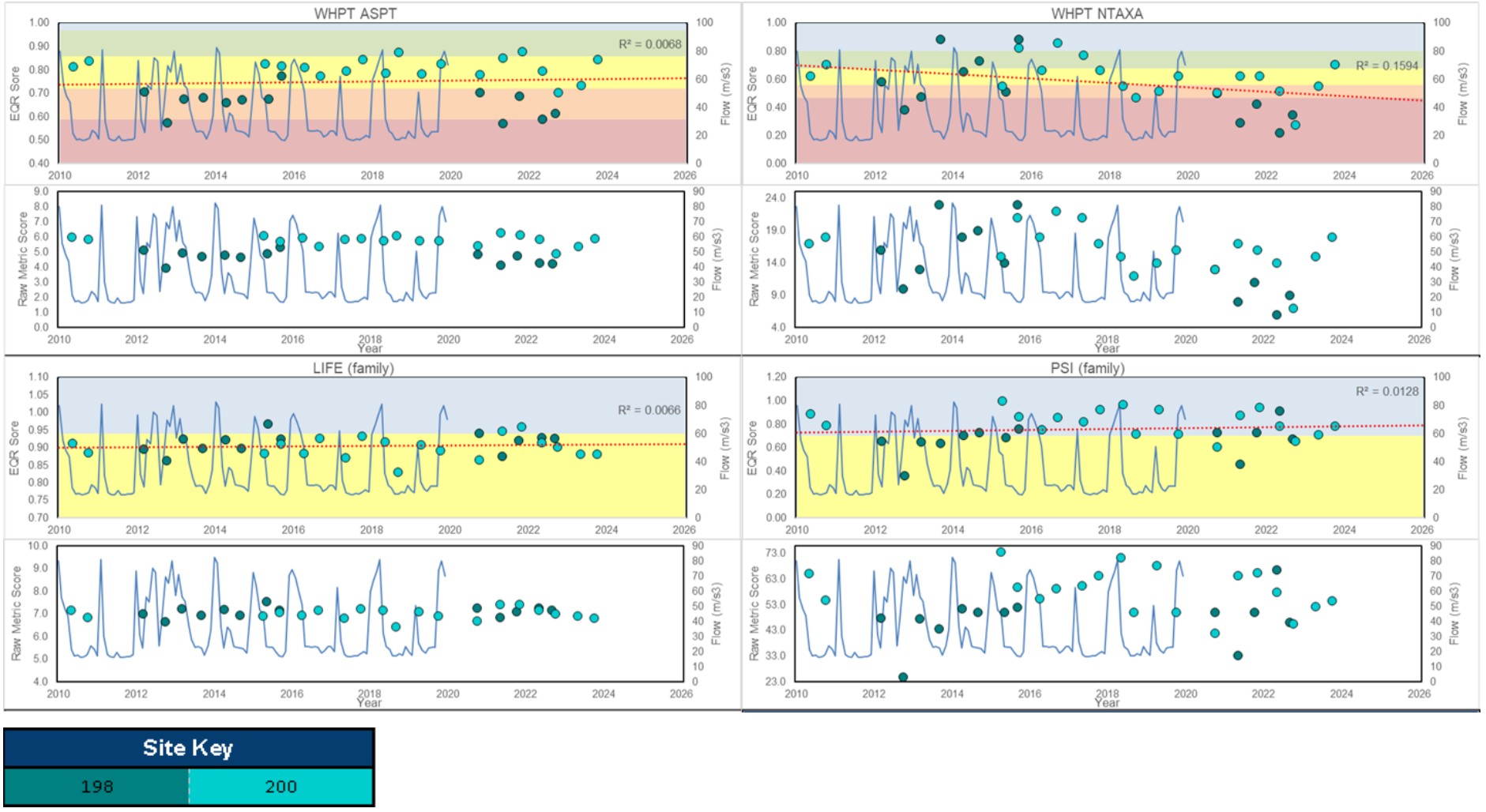
Baseline data indicates that under present conditions, the macroinvertebrate community in Little Don 1 is highly sensitive to reduced flows (**Figure B2-10**). See **Table B2-5** for guidance in interpreting raw LIFE scores.

A summary of the above data is presented within **Table B2-87**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-87 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
198	SK2894598061	13	2012 to 2022	0.86 - 0.97 (0.92)	6.67 - 7.56 (7.1)	0.36 - 0.91 (0.67)	25 - 66.67 (47.23)	0.57 - 0.78 (0.66)	B - M (P)	3.96 - 5.34 (4.66)	0.22 - 0.89 (0.53)	B - H (P)	6 - 23 (14)
200	SK2562399069	19	2010 to 2022	0.83 - 0.96 (0.9)	6.43 - 7.43 (7.01)	0.61 - 1 (0.82)	42.11 - 73.68 (58.74)	0.7 - 0.88 (0.81)	P - G (M)	4.89 - 6.25 (5.78)	0.27 - 0.86 (0.61)	B - H (M)	7 - 22 (16)

Figure B2-10 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



B2.10.4.2Fish

Waterbody GB104027057460 Little Don from Source to River Don is classified under Cycle 3 (2022) as 'poor'. Baseline fisheries data is informed by two sites, Downstream Underbank Reservoir (ID 31624) and Downstream Langsett Reservoir (ID 11058), both classified as 'poor'.

Baseline Environment Agency data is available for two sites, Deepcar (formerly Stocksbridge STW US) (ID 4342) and Downstream Underbank Reservoir. Both sites were surveyed in 2011 and 2023. Downstream Underbank Reservoir received an additional survey in 2017.

YWSL commissioned additional surveys at Downstream Underbank Reservoir in 2021 and 2022.

Table B2-88 details site survey information within the Little Don 1 reach.

The WFD status of the fish community in Little Don 1 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site Deepcar (formerly Stocksbridge STW US) is individually classified as high with a site EQR of 0.9084, based on the FCS2 EQR scores from the 2023 survey. The site has a relatively good diversity, with four species present from an expected six species. Trout had a lower observed density than expected, with a low EQR score of 0.5273. Stone loach, bullhead, stickleback and minnow were observed at increased numbers, with an EQR score of 1. Grayling had a lower observed density than expected, with a high EQR score of 0.6883.

The site Downstream Underbank is individually classified as moderate with a site EQR of 0.308, based on the FCS2 EQR scores from the 2023 survey. The site has a relatively good diversity, with two species present from an expected four species. Trout had a lower observed density than expected, with a low EQR score of 0.287. Bullhead are observed at increased numbers, with an EQR score of 1. Stone loach were expected at the site but not present during the survey.

Brown trout and bullhead were counted at every site for every survey year. The highest count for brown trout was 112 in 2021 at Downstream Underbank Reservoir during a catch depletion sample. The lowest count of four was during a single catch sample at the Downstream Underbank Reservoir in 2017, on the contrary, the highest count of bullhead was at the same survey with 108 individuals. The lowest count of bullhead was at Downstream Underbank Reservoir in 2011 with seven individuals counted. Roach were counted in low numbers at Downstream Underbank Reservoir in 2017, 2021 and 2022. Grayling, minnow and 3-spined stickleback were counted at Deepcar (formerly Stocksbridge STW US) in both 2011 and 2023, whilst stone loach were only present in low numbers in 2023.

Table B2-89 details fish survey data from sites within the Little Don 1 reach, by year. All fish counts are available in **Annex 1** to this appendix.

Additional baseline fish data for little Don 1, Deepcar (formerly Stocksbridge STW US), showed an increased species diversity when compared to the site further upstream, Downstream Underbank. Deepcar (formerly Stocksbridge STW US) observed a moderate abundance of trout and Bullhead, and a low abundance of grayling recorded. Additional YWSL monitoring at Deepcar (formerly Stocksbridge STW US) showed increased species diversity when compared to the survey in 2011 by the Environment Agency, though the survey methodology differed (Catch Depletion Sample) in 2015 to 2017.

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

Table B2-88 Little Don 1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
4342	Deepcar (formerly Stocksbridge STW US)	SK2900698026	Electric Fishing (AC, PDC and DC)	2	2011	2023

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
31624	Downstream Underbank Reservoir	SK2550599142	Electric Fishing (AC, PDC and DC)	5	2011	2023

Table B2-89 Little Don 1 Fish Survey Data

Tolerance Category	Species Name	2011	2017	2021	2022	2023
High tolerance	3-spined stickleback	X				X
High tolerance	Roach		X	X	X	
Medium tolerance	Minnow	X				X
Medium tolerance	Stone loach					X
Low tolerance	Bullhead	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X
Low tolerance	Grayling	X				X

B2.10.4.3WFD waterbody status

Table B2-90 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-90** also displays the objective status for 2022 (Cycle 3) or the predicted status in 2022 where objective to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-90 WFD classifications

Waterbody ID & Name		GB104027057460 Little Don from Source to River Don	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Poor	Medium
	Macroinvertebrates	High	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.10.5 Invasive non-native species (INNS)

Table B2-91 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-91**).

Table B2-91 INNS Receptors

Site/Receptor 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 - New Zealand mud snail (*Potamopyrgus antipodarum*) - Freshwater Shrimp (*Crangonyx pseudogracilis*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – macroinvertebrates - Signal crayfish (*Pacifastacus leniusculus*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Low	No
Invasive non-native species – Terrestrial plants - Japanese knotweed (*Fallopia japonica*) - Himalayan Balsam (*Impatiens glandulifera*) - Rhododendron (*Rhododendron ponticum*) - New Zealand pigmyweed (*Crassula helmsii*) - Montbretia (*Crocosmia pottsii x aurea = C. x crocosmiiflora*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.10.6 Landscape, navigation, recreation and heritage

Table B2-92 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-92**)

Table B2-92 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Stocksbridge and District Golf Course	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No

Site/Receptor 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)*
Sheffield Country Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Barnsley Boundary Walk – National Trail	Major	The route of the trail runs in close proximity to the Little Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Little Don River - Angling	Major	Recreational angling takes place on Little Don River. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No
Little Don River – Canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No

B2.11 EWDEN BECK 1

B2.11.1 Statutory designated sites

Table B2-93 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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-93**).

Table B2-93 Statutory designated sites

Site/Receptor 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)*
South Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Peak District Moors (South Pennine Moors Phase 1) SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No

B2.11.2 NERC and local wildlife sites

Table B2-94 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

Two NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-94**).

Table B2-94 NERC habitats and local wildlife sites

Site/Receptor 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)*
More Hall Reservoir LWS	Major	The site compasses the large standing water expanse of More Hall reservoir, its surrounding areas including the slipway, offtake and section of the Little Don River immediately downstream. Present habitats are wooded areas, possibly wet woodland. Areas of grassland are present of the reservoir slopes. The upstream end shows uncovered sediment,	Not sensitive	No

Site/Receptor 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)*
		likely hosting inundation vegetation. The banks of the reservoir are wooded. There is some vegetation within the water.		
Lower Ewden Beck LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors. The site is segmented with several areas surrounding the River Don above its confluence with the Little Don. Aerial imagery shows woodland grassland, pasture and heathland in the upper segments. The southern segments of the site follow Lower Ewden Beck from More Hall Reservoir to its confluence with the Don. Areas of ancient upland oak woodland are present around the river. Some wet woodland is also present and are present.	Low	Yes
Upper River Don: Deepcar to Hillsborough LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors. Although the site encompasses the river as it passes through urban areas, the river corridor is very species rich. The river in the site passes close to three major ancient woodland and the corridor is significant for dispersal and maintenance of a wide range of species. Semi-natural woodland, scrub, other tall herb, flush/spring, marsh and marginal aquatic vegetation habitats are also present.	Low	Yes
Good quality semi-improved grassland NERC habitat -365508 -365511	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
No main habitat but additional habitats present- Good quality semi-improved grassland NERC habitat -454463	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No

B2.11.3 NERC and other protected species

Table B2-95 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. However, no information from survey findings was available for white-clawed crayfish, therefore it was not possible to conclusively rule out their presence. Based on the available information

this receptor is considered to be susceptible to drought option impacts and has a **medium/high** sensitivity to the physical environment impacts identified in **Appendix A**.

Two nationally scarce species *Riolus subviolaceus* and *Potamophylax rotundipennis* were identified as being present in Ewden Beck 1 in 2014 and 2018, respectively. Based on the available information these recptors are considered to be susceptible to drought permit impacts and have a **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 otter in the impacted reach. Review of Environment Agency and YWSL records indicates the presence of otter within the impacted reach. However, no information from survey findings was available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought option. Based on the available information these species are considered not to be susceptible to drought option impacts and have a **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, although historic data does identify the receptor to have been present in the impacted reach. However, 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 otter 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.**

Three NERC act section 41 and notable fish species have been identified as present in the impacted reach, including one NERC Act Section 41 fish species (brown trout) and one notable fish species (bullhead and grayling).

Table B2-95 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipe)*	Major	Limited data is available for the impacted reach. White-clawed crayfish could potentially to use the impacted reach. Further consideration would be necessary to determine to what extent or how they may be impacted by reduced flows caused by the drought option.	Medium/ high	Yes
Notable Species – Invertebrates Riffle beetle (*Riolus subviolaceus*) Caddisfly (*Potamophylax rotundipennis*)	Major	This riffle beetle species is moderately tolerant/sensitive of pollution (WHPT scores of 6.4) and such water quality pressures are unlikely to impact the species. *P. rotundipennis* is a tolerant species which favours moderate flow rates unlikely to be impacted by reduced flows.	Low	Yes
NERC Species – mammals	Major	Limited data is available for the impacted reach. Otters could potentially to use the impacted reach. Further consideration	Low	Yes

Site/Receptor 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)*
Otter *(Lutra lutra)*		would be necessary to determine to what extent or how they may be impacted by reduced flows caused by the drought option.		
NERC Species – mammals Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish Brown trout *(Salmo trutta)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
Notable Species – Fish Bullhead (*Cottus gobio)* Grayling (*Thymallus thymallus)*	Major	Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	Medium	Yes

B2.11.4 WFD receptors

B2.11.4.1 Macroinvertebrates

The WFD waterbody GB104027057400 Ewden Beck from Source to River Don classifies as ‘high’ for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by two Environment Agency monitoring sites, D/S Dam (1585) and U/S River Don (148).

U/S River Don had baseline survey data for samples from 2010, and 2012 to 2021 and 2023, with two YWSL commissioned surveys in 2022. D/S Dam had baseline survey data for two seasonal samples for 2010, 2012 to 2015 and 2018.

These sites provide strong temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors.

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A.**

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Moderate' on two occurrences to 'High' on fifteen occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was successfully calculated for all sites.

$WHPT_{ASPT}$ scores ranged between 6 and 7.72 with the lowest $WHPT_{ASPT}$ score of 6 at Site 148 in Autumn 2023, and the highest score of 7.72 at Site 148 in Spring 2022. The $WHPT_{ASPT}$ expected scores for ranged from 6.91 to 7.35 across the sites, with 1 of the 37 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.84 and 1.06 with the lowest $WHPT_{ASPT}$ EQR of 0.84 at Site 148 in Spring 2023, and the highest EQR of 1.06 at Site 148 in Spring 2022.

In Ewden Beck 1 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ scores ranged between 18 and 33 with the lowest $WHPT_{NTAXA}$ score of 18 at Site 148 in Spring 2022, and the highest score of 33 at Site 1585 in Spring 2015. The $WHPT_{NTAXA}$ expected scores ranged from 25.39 to 27.15 across the sites, with 1 of the 37 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.66 and 1.23 with the lowest $WHPT_{NTAXA}$ EQR of 0.66 at Site 148 in Spring 2022, and the highest EQR of 1.23 at Site 1585 in Spring 2015.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. $LIFE_{FAMILY}$ scores ranged between 7.29 and 8 with the lowest $LIFE_{FAMILY}$ score of 7.29 at Site 148 in Autumn 2023, and the highest score of 8 at Site 148 in Autumn 2021. The $LIFE_{FAMILY}$ expected scores ranged from 7.73 to 7.84 across the sites, with 1 of the 37 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.93 and 1.03 with the lowest $LIFE_{FAMILY}$ EQR of 0.93 at Site 1585 in Spring 2018, and the highest EQR of 1.03 at Site 148 in Autumn 2021.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 59.18 and 93.5 with the lowest PSI_{FAMILY} score of 59.18 at Site 148 in Autumn 2023, and the highest score of 93.5 at Site 148 in Spring 2022. The PSI_{FAMILY} expected scores ranged from 68.88 to 73.86 across the sites, with 11 of the 37 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.86 and 1.28 with the lowest PSI_{FAMILY} EQR of 0.86 at Site 148 in Autumn 2023, and the highest EQR of 1.28 at Site 148 in Spring 2022.

No INNS or designated species were recorded during the monitoring period.

Summary

The WFD status of the macroinvertebrate community in Ewden Beck 1 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

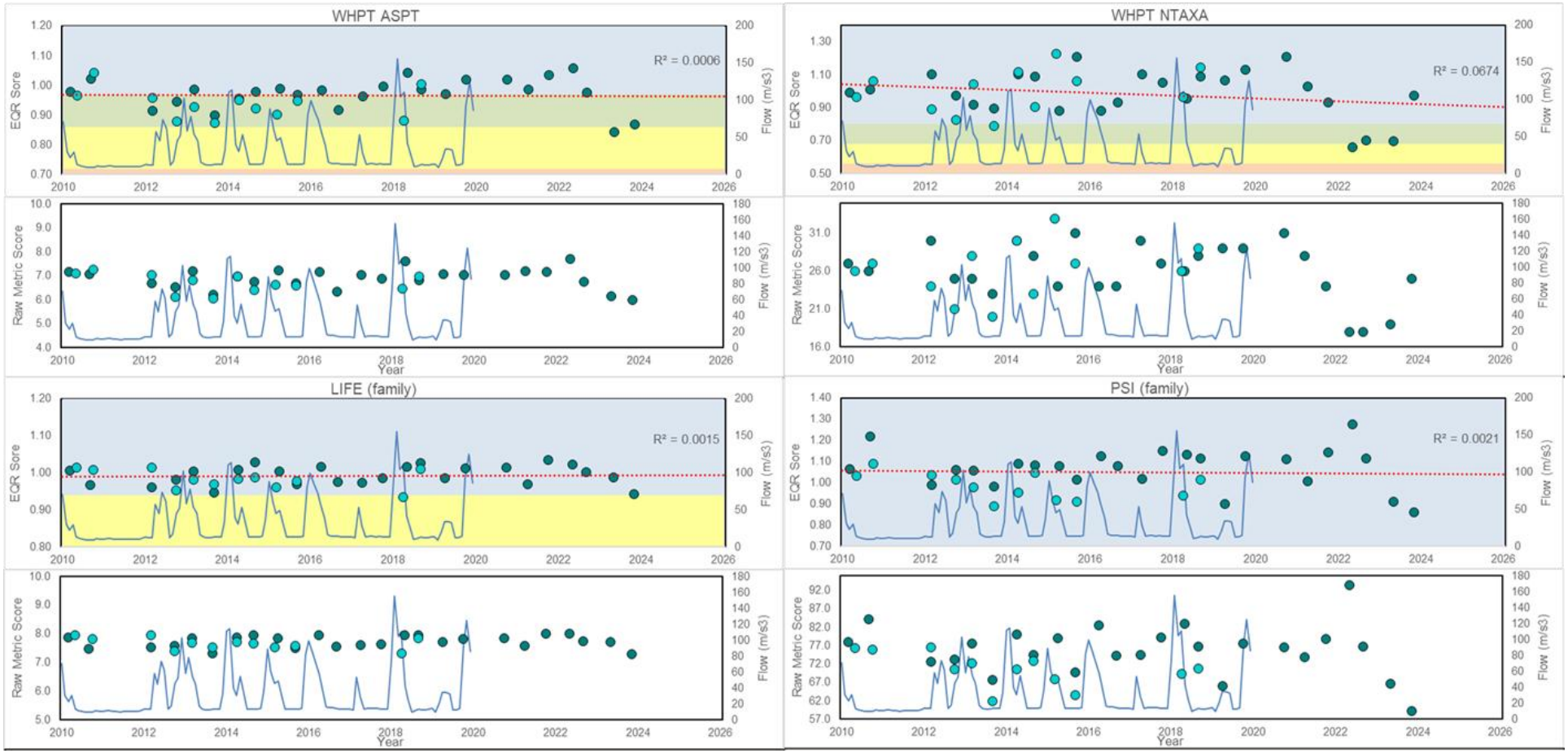
Baseline data indicates that under present conditions, the macroinvertebrate community in Ewden Beck 1 is highly sensitive to reduced flows (**Figure B2-11**). See **Table B2-5** for guidance in interpreting raw LIFE scores.

A summary of the above data is presented within **Table B2-96** Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-96 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
148	SK2983695522	25	2010 to 2022	0.94 - 1.03 (0.99)	7.29 - 8 (7.73)	0.86 - 1.28 (1.07)	59.18 - 93.5 (75.82)	0.84 - 1.06 (0.97)	M - H (H)	6 - 7.72 (6.9)	0.66 - 1.21 (0.98)	M - H (H)	18 - 31 (26)
1585	SK2912695638	12	2010 to 2018	0.93 - 1.01 (0.98)	7.32 - 7.95 (7.67)	0.89 - 1.09 (0.99)	61.9 - 76.47 (70.68)	0.87 - 1.04 (0.94)	G - H (G)	6.07 - 7.25 (6.71)	0.79 - 1.23 (1)	G - H (H)	20 - 33 (26)

Figure B2-11 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



B2.11.4.2Fish

Waterbody GB104027057400 Ewden Beck from Source to River Don is classified under Cycle 3 (2022) as 'moderate'. Baseline fisheries data is informed by two sites, D/S Dupont Abstraction (ID 11997) and U/S Broomhead (ID 30283). D/S Dupont Abstraction was classified as 'good' in 2019, deteriorating to 'moderate' in 2022. U/S Broomhead was classified as 'poor' in 2019.

Baseline fisheries data is available for two sites, D/S Morehall Res (WR) (ID 11987) and D/S Dupont Abstraction). D/S Morehall Res (WR) and D/S Dupont Abstraction were both surveyed in 2010, 2011, 2012 and 2015. **Table B2-97** details fish survey information within the Ewden Beck 1 reach.

The WFD status of the fish community in Ewden Beck 1 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site D/S Dupont Abstraction is individually classified as good with a site EQR of 0.3504, based on the FCS2 EQR scores from the 2023 survey. The site has a relatively good diversity, with three species present from an expected six species. Trout had a lower observed density than expected, with a good EQR score of 0.781. Bullhead are observed at increased numbers, with an EQR score of 1. Grayling were recorded, with good EQR scores of 0.575. Stone loach, perch and minnow are not observed in this reach, although they are expected to be present.

Brown trout and bullhead were counted during every survey year, with brown trout present at every site. Bullhead were not counted at D/S Morehall Res (WR) during any survey. Roach and perch were counted at D/S Morehall Res (WR) for every survey year in low numbers, with the exception of 34 perch counted in 2015. Perch were also counted at D/S Dupont Abstraction between 2011 and 2015 in low numbers, with a maximum count of five. One minnow was counted at D/S Dupont Abstraction in 2020. Rainbow trout have been counted sporadically in the reach, once in 2012 at D/S Morehall Res (WR) and once in 2020 and D/S Dupont Abstraction, both in low numbers. One Orfe was counted at D/S Morehall Res (WR) in 2015.

Table B2-98 details fish survey data from sites within the Ewden Beck 1 reach, by year. All fish counts are available in **Annex 1** to this appendix.

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

Table B2-97 Ewden Beck 1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
11987	D/S Morehall Res (WR)	SK2899895624	Electric Fishing (AC, PDC and DC)	4	2010	2015
11997	d/s Dupont Abstraction	SK2985595514	Electric Fishing (AC, PDC and DC)	7	2010	2021

Table B2-98 Ewden Beck 1 Fish Survey Results

Tolerance Category	Species Name	2010	2011	2012	2015	2020	2021
High tolerance	Perch	X	X	X	X		
High tolerance	Roach	X	X	X	X		
High tolerance	Orfe / Ide				X		
Medium tolerance	Minnow					X	
Low tolerance	Bullhead	X	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X	X
Low tolerance	Rainbow trout			X		X	

B2.11.4.3 WFD waterbody status

Table B2-99 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-99** also displays the objective status for 2022 (Cycle 3) or the predicted status in 2022 where objective to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-99 WFD classifications

Waterbody ID & Name		**GB104027057400 Ewden Beck from Source to River Don**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	Medium
	Macroinvertebrates	High	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Moderate	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.11.5 Invasive non-native species (INNS)

Table B2-100 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-100**).

Table B2-100 INNS Receptors

Site/Receptor 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 - Freshwater Shrimp (*Crangonyx pseudogracilis*) - New Zealand mud snail (*Potamopyrgus antipodarum*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – Terrestrial plants - Japanese knotweed (*Fallopia japonica)* - Himalayan Balsam (*Impatiens glandulifera*) - Giant hogweed	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

Site/Receptor 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)*
(*Heracleum mantegazzianum*) - Japanese rose (*Rosa rugosa*) - Rhododendron (*Rhododendron ponticum*) - New Zealand pigmweed (*Crassula helmsii*) - Montbretia (*Crocosmia pottsii x aurea = C. x crocosmiiflora)*				
Non-native species – Fish -Rainbow Trout (*Oncorhynchus mykiss*)	Major	The implementation of this drought option is not anticipated to increase the spread of non-native species.	Not sensitive	No

B2.11.6 Landscape, navigation, recreation and heritage

Table B2-101 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-101**).

Table B2-101 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Sheffield Country Walk – National Trail	Major	The route of the trail runs in close proximity to the River Don. The river forms part of the landscape setting of the trail.	Not sensitive	No
Ewden Beck – Angling	Major	Recreational angling takes place on Ewden Beck. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No

B2.12 DALE DIKE 1

B2.12.1 Statutory designated sites

Table B2-102 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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-102**).

Table B2-102 Statutory designated sites

Site/Receptor 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)*
South Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Peak District Moors (South Pennine Moors Phase 1) SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Eastern Peak District Moors SSSI	Major	Located upstream of the impacted reach, the Eastern Peak District Moors are of special interest for their upland vegetation, lower plants, invertebrates and geological receptors. The combination of blanket bog, wet and dry heaths, acid grasslands and small flushes, together with gritstone edges, cliffs and boulder slopes, streams and moorland reservoirs, and fringing woodland represents the full range of upland vegetation characteristic of the South Pennines and supports several important species assemblages. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
Dark Peak SSSI	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No

B2.12.2 NERC and local wildlife sites

There are no NERC Act Section 41 or other notable and/or protected habitats (e.g. LWS) located on or within 500m of the impacted reach. NERC and other protected species

B2.12.1 NERC and other protected species

Four NERC act section 41 and notable fish species have been identified as present in the impacted reach, including one NERC Act Section 41 fish species (brown trout) and three notable fish species (brook lamprey, bullhead and grayling).

Table B2-103 summarises the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. However, no information from survey findings was available for white-clawed crayfish, therefore it was not possible to conclusively rule out their presence. Based on the available information this receptor is considered to be susceptible to drought option impacts and has a **Medium/high** sensitivity to the physical environment impacts identified in **Appendix A**.

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 YWSL 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 drought permit. Based on the limited available information otters considered to be susceptible to drought permit impacts and have a **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. Therefore, absence cannot be confirmed. It was considered appropriate, following the precautionary principle, to consider otter 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.**

Two NERC act section 41 and notable fish species have been identified as present in the impacted reach, including one NERC Act Section 41 fish species (brown trout) and one notable fish species (bullhead).

Table B2-103 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipes)*	Major	Limited data is available for the impacted reach. White-clawed crayfish could potentially use the impacted reach. Further consideration would be necessary to determine to what extent or how they may be impacted by reduced flows caused by the drought option.	Medium/ high	Yes

Site/Receptor 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)*	Major	Limited data is available for the impacted reach. Otters could potentially use the impacted reach. 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 Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish Brown trout *(Salmo trutta)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
Notable Species – Fish Bullhead (*Cottus gobio)*	Major	Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	Medium	Yes

B2.12.2 WFD receptors

B2.12.2.1 Macroinvertebrates

The WFD waterbody GB104027057380 Dale Dike 1 from Strines Dyke to River Loxley classifies as 'good' for macroinvertebrates in 2019, Cycle 3. Baseline macroinvertebrate data is provided by four Environment Agency monitoring sites, Site 1244, Site 75092, Site 150923, and Site 158949

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A.**

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Poor' on two occurrences and 'High' on 16 occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was successfully calculated for all sites. RICT3 analysis was successfully calculated for the site.

Data from the monitoring shows variation in $WHPT_{ASPT}$ scores over the period 2012 to 2023 but remain consistent with the standard to achieve 'Good' WFD status over the monitoring period. $WHPT_{ASPT}$ scores ranged between 4.76 and 7.9 with the lowest $WHPT_{ASPT}$ score of 4.76 at Site 150923 in Autumn 2016, and the highest score of 7.9 at Site 75902 in Autumn 2021. The $WHPT_{ASPT}$ expected score for this site ranged between 6.8 to 7.35, with 9 of the 30 samples below the 'Good/ Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.7 and 1.13 with the lowest $WHPT_{ASPT}$ EQR of 0.7 at Site 150923 in Autumn 2016, and the highest EQR of 1.13 at Site 75902 in Autumn 2021.

In Dale Dike 1, monitoring data identifies macroinvertebrate communities which show a good level of diversity with $WHPT_{NTAXA}$ scores ranging between 13 and 33 with the lowest $WHPT_{NTAXA}$ score of 13 at Site 1244 in Autumn 2013, and the highest score of 33 at Site 75902 in Spring 2018. The $WHPT_{NTAXA}$ expected scores ranged between 24.85 to 27.16 across the sites, with 1 of the 30 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.51 - 1.27 (0.96) with the lowest $WHPT_{NTAXA}$ EQR of 0.51 at Site 1244 in Autumn 2013, and the highest EQR of 1.27 at Site 75902 in Autumn 2014.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. $LIFE_{FAMILY}$ scores ranged between 6.33 and 8.44, with the lowest $LIFE_{FAMILY}$ score of 6.33 at Site 150923 in Autumn 2016, and the highest score of 8.44 at Site 75902 in Autumn 2021. The $LIFE_{FAMILY}$ expected scores ranged between 7.71 to 7.83 across the sites, with 8 of the 30 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.82 and 1.09, with the lowest $LIFE_{FAMILY}$ EQR of 0.82 at Site 150923 in Autumn 2016, and the highest EQR of 1.09 at Site 75902 in Autumn 2021.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} ranged between 28.95 and 90.24 with the lowest PSI_{FAMILY} score of 28.95 at Site 150923 in Autumn 2016, and the highest score of 90.24 at Site 75902 in Autumn 2021. The PSI_{FAMILY} expected scores ranged between 68.12 and 73.82 across the sites, with 11 of the 30 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.42 and 1.29 with the lowest PSI_{FAMILY} EQR of 0.42 at Site 150923 in Autumn 2016, and the highest EQR of 1.29 at Site 75902 in Autumn 2021.

A total of two INNS, including *Potamopyrgus antipodarum* and *Crangonyx pseudogracilis* were recorded as present at four sites between 2012 and 2023. A single designated species, *Stictonectes lepidus*, was recorded at Site 150923 between 2014 and 2016.Summary

The WFD status of the macroinvertebrate community in Dale Dike 1 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

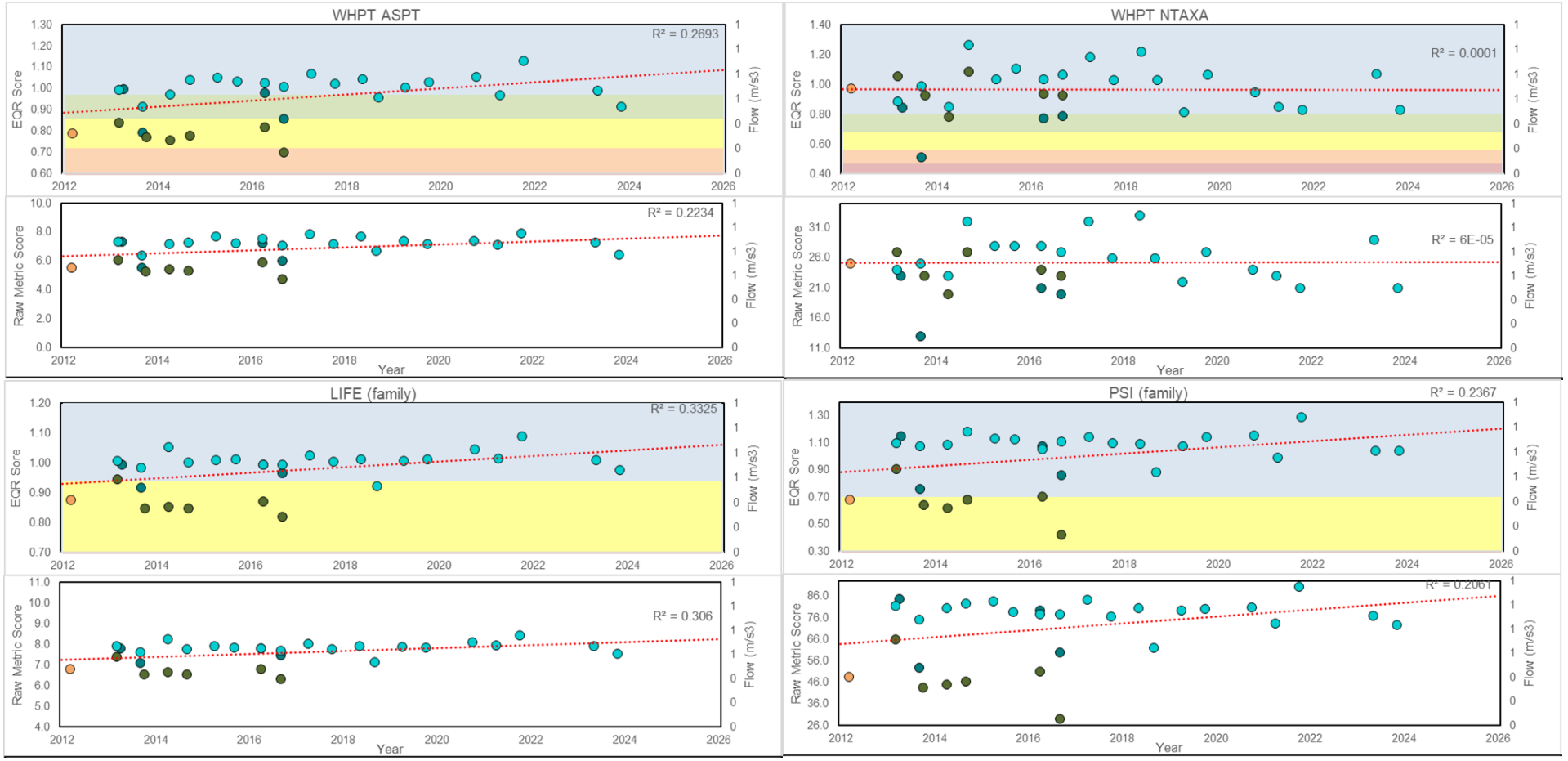
Baseline data indicates that under present conditions, the macroinvertebrate community in Dale Dike 1 is medium to high sensitivity to reduced flows (**Figure B2-12**). See **Table B2-5** for guidance in interpreting raw LIFE scores.

A summary of the above data is presented within **Table B2-104**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-104 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	LIFE (Family) Score Min - Max (AVG.)	PSI (Family) EQR Score Min - Max (AVG.)	PSI (Family) Score Min - Max (AVG.)	WHPT ASPT EQR Score Min - Max (AVG.)	WHPT ASPT EQR Class Min - Max (AVG.) *B/P/M/G/H*	WHPT ASPT Score Min - Max (AVG.)	WHPT NTAXA EQR Score Min - Max (AVG.)	WHPT NTAXA EQR Class Min - Max (AVG.) *B/P/M/G/H*	WHPT NTAXA Score Min - Max (AVG.)
1244	SK2628291803	4	2013 to 2016	0.92 - 0.99 (0.97)	7.1 - 7.79 (7.54)	0.76 - 1.15 (0.96)	52.94 - 84.85 (69.3)	0.79 - 1 (0.91)	M - H (G)	5.54 - 7.35 (6.53)	0.51 - 0.85 (0.73)	P - H (G)	13 - 23 (19)
75902	SK2552791819	19	2013 to 2023	0.92 - 1.09 (1.01)	7.14 - 8.44 (7.86)	0.89 - 1.29 (1.1)	61.9 - 90.24 (78.65)	0.91 - 1.13 (1.01)	G - H (H)	6.39 - 7.9 (7.25)	0.81 - 1.27 (1.01)	H - H (H)	21 - 33 (26)
150923	SK2623592001	6	2013 to 2016	0.82 - 0.94 (0.86)	6.33 - 7.38 (6.71)	0.42 - 0.91 (0.66)	28.95 - 65.91 (46.82)	0.7 - 0.84 (0.78)	P - M (M)	4.76 - 6.04 (5.45)	0.78 - 1.09 (0.95)	G - H (H)	20 - 27 (24)
158949	SK2645691801	1	2012	0.88	6.81	0.68	48.65	0.79	M	5.53	0.98	H	25

Figure B2-12 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



Site Key			
1244	75902	150923	158949

B2.12.2.2Fish

The WFD waterbody GB104027057380 Dale Dike 1 from Strines Dyke to River Loxley is classified under Cycle 3 (2022) as 'good'. The classification is informed by one site, Old Wheel Farm (ID 14182), which was classified as 'good' in both 2019 and 2022.

No Environment Agency fisheries monitoring sites were present in the impacted reach, FCS2 data was provided by Old Wheel Farm, located downstream of the impacted reach dale dyke 1, below Damfask reservoir in Calder 1 reach.

Baseline fisheries data is informed by one Environment Agency sites, D/S Dale Dike Reservoir (ID 4347) surveyed in 2011.

YWSL commissioned additional surveys at six sites, Walker House Farm (ID DD1), D/S weir 300m d/s DD2 (ID DD2), U/S Blindside lane bridge (ID DD3), D/S Blindside lane bridge (ID DD4), U/S sewage works (ID DD5) and U/S Mill Lee road bridge (ID DD6) all sites were surveyed in 2020 and 2021.

Table B2-105 details site survey information within the Dale Dike 1 reach.

The WFD status of the fish community in Loxley 1 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site Old Wheel Farm is individually classified as moderate with a site EQR of 0.3846, based on the FCS2 EQR scores from the 2023 survey. The site has a moderate diversity, with two species present from an expected four species. Trout had a slightly lower observed density than expected, with a good EQR score of 0.4657. Bullhead are observed at increased numbers, with an EQR score of 1. Stone loach are not observed in this reach, although they are expected to be present.

Sites within the impacted reach Dale Dike 1 showed fish populations similar the classification site, with a moderate to high abundance of trout and low to moderate abundance of bullhead.

Additional baseline fish data for Dale Dike 1 from YWSL U/S and D/S blindside lane. The number of brown trout and bullhead present were comparable to those observed within the reach by the Environment Agency.

Brown trout were observed at all surveyed sites every year, while bullhead were consistently captured at all sites except at Walker House Farm, where no bullhead were recorded during the 2020 and 2021 surveys. The highest number of brown trout, 95 individuals, was recorded at Walker House Farm in 2020, while the lowest count, 21 individuals, was observed at the upstream sewage works in the same year. In contrast, no bullhead were recorded at Walker House Farm during both the 2020 and 2021 surveys. The lowest recorded count of bullhead, 17 individuals, was at the upstream Mill Lee Road Bridge in 2021. The highest count of bullhead, 138 individuals, was recorded at the upstream Blindside Lane Bridge in 2021.

No other species were captured during the survey's only two species were captured withing the reach brown trout and bullhead. This is inline with FCS2 site Old Wheel Farm. The observed fish community is typical of an upland stream of this nature. the presence of species such as brown trout and bullhead reflects the ecological conditions common to this type of watercourse, where cool, well-oxygenated waters support a resilient fish community. Despite variations in individual counts between sites and years, the consistent species presence highlights the community's adaptability and resilience to environmental charges in the baseline period.

Table B2-106 details fish survey data from sites within the Dale Dike 1 reach, by year. All fish counts are available in **Annex 1** to this appendix.

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

Table B2-105 Dale Dike Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
4347	D/S Dale Dike Reservoir	SK2553091819	Electric Fishing (AC, PDC and DC)	1	2011	2011
DD1	Walker House Farm	SK2498591796	Electric Fishing (AC, PDC and DC)	2	2020	2021
DD2	d/s weir 300m d/s DD2	SK2521191736	Electric Fishing (AC, PDC and DC)	2	2020	2021
DD3	u/s Blindside lane bridge	SK2545791829	Electric Fishing (AC, PDC and DC)	2	2020	2021
DD4	d/s Blindside lane bridge	SK2556391795	Electric Fishing (AC, PDC and DC)	2	2020	2021
DD5	u/s sewage works	SK2594591753	Electric Fishing (AC, PDC and DC)	3	2020	2021
DD6	u/s Mill Lee road bridge	SK2617091760	Electric Fishing (AC, PDC and DC)	3	2020	2021

Table B2-106 Dale Dike 1 Fish Survey Results

Tolerance Category	Species Name	2011	2020	2021
Low tolerance	Bullhead	X	X	X
Low tolerance	Brown trout	X	X	X

B2.12.2.3 WFD waterbody status

Table B2-107 summarises the WFD classification of the waterbody within the impacted reach. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2019 (Cycle 3) status as this waterbody was not assessed in 2022 (Cycle 3). The table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-107 WFD classifications

Waterbody ID & Name		GB104027057380 Strines Dyke from Source to River Loxley	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	High	Medium
	Macroinvertebrates	Good	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.12.3 Invasive non-native species (INNS)

Table B2-108 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-108**).

Table B2-108 INNS Receptors

Site/Receptor 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 - New Zealand mud snail (*Potamopyrgus antipodarum*) - Freshwater shrimp *(Crangonyx pseudogracilis/floridanus)*	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – Terrestrial plants - Japanese knotweed (*Fallopia japonica*) - Rhododendron (*Rhododendron ponticum*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.12.4 Landscape, navigation, recreation and heritage

Table B2-109 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-109**).

Table B2-109 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Dale Dike – Public footpaths	Major	The route of public walking trails run in close proximity to the impacted reach.	Low	No
Dale Dike tributary - Angling	Major	Recreational angling takes place along the Dale Dike tributary from the Dale Dike Reservoir downstream to the Damflask Reservoir. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No

B2.13 LOXLEY 1

B2.13.1 Statutory designated sites

Table B2-110 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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-110**).

Table B2-110 Statutory designated sites

Site/Receptor 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)*
South Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Peak District Moors (South Pennine Moors Phase 1) SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Eastern Peak District Moors SSSI	Major	Located upstream of the impacted reach, the Eastern Peak District Moors are of special interest for their upland vegetation, lower plants, invertebrates and geological receptors. The combination of blanket bog, wet and dry heaths, acid grasslands and small flushes, together with gritstone edges, cliffs and boulder slopes, streams and moorland reservoirs, and fringing woodland represents the full range of upland vegetation characteristic of the South Pennines and supports several important species assemblages. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No

B2.13.2 NERC and local wildlife sites

Table B2-111 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

Four NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-111**).

Table B2-111 NERC habitats and local wildlife sites

Site/Receptor 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)*
Dam Flask to Rowel Bridge LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors The site includes the slipway of the Damflask reservoir, the River Loxley immediately downstream, areas of fields, broadleaved woodland (mature, wet, semi-natural) and agricultural grassland (unimproved, semi-improved, improved, acid, neutral) around the Rover Loxley and Storrs Brook. Also present are areas of standing water, marsh, health/grassland mosaic, western gorse shrub, bracken, tall herbs, springs and hedgerows. A silted-up mill/damn has been colonised by alder and willow carr.	Low	Yes
Acorn Hill and Little Matlock Wood LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors Contains the Loxley River, areas of standing water (mill ponds) and ancient woodland and associated woodland species, lowland dry acid grassland (UKBAP habitat), unimproved grassland, semi-improved grassland and neutral grassland. Some areas of grassland are grazed, others have become overgrown and are now covered in scrub. Other habitats present include semi-natural woodland, flush/spring, cliff/rock face/outcrop and quarry	Low	Yes
Broadhead Dam to Malin Bridge LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors The site covers a former mill pond on the River Loxley and Broadhead Dam. The dam hosts sensitive wetland habitats. Wet woodlands are present. The riparian zone hosts large alders. Areas of scrub, springs and tall herbs are also present as well as areas of marginal aquatic vegetation.	Low	Yes
Lower Rivelin Valley LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors The site encompasses the River Rivelin and immediate areas until its confluence with the River Loxley. The area is used for recreation, flood control and nature conservation. Areas wet woodland/alder carr are present, typically at the sites of silted mill ponds. Along with the carr areas, the bankside vegetation among the trees supports ancient woodland indicator species	Low	Yes
Deciduous woodland NERC habitat	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors Good quality semi-improved grassland	Not sensitive	No

Site/Receptor 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)*
-322455 -322454 -322457 -322456				
Deciduous woodland NERC habitat -322461	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors Good quality semi-improved grassland, Lowland meadows and pastures	Not sensitive	No
Good quality semi-improved grassland NERC habitat -365514	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors Lowland meadows and pastures, Restoration of species-rich, semi-natural grassland	Not sensitive	No
Good quality semi-improved grassland NERC habitat -365515	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors Lowland meadows and pastures; Restoration of species-rich, semi-natural grassland Deciduous woodland	Not sensitive	No
Good quality semi-improved grassland NERC habitat -365513	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors Restoration of species-rich, semi-natural grassland	Not sensitive	No
Good quality semi-improved grassland NERC habitat -364115	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors Lowland meadows and pastures; Restoration of species-rich, semi-natural grassland	Not sensitive	No

B2.13.3 NERC and other protected species

Table B2-112 summarises the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. However, no information from survey findings was available for white-clawed crayfish, therefore it was not possible to conclusively rule out their presence. Based on the available information this receptor is considered to be susceptible to drought option impacts and has a **Medium/high** sensitivity to the physical environment impacts identified in **Appendix A**.

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 YWSL 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 drought permit. Based on the limited available information otters considered to be susceptible to drought permit impacts and have a **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. Therefore, absence cannot be confirmed. It was considered appropriate, following the precautionary principle, to consider otter 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.**

Four NERC act section 41 and notable fish species have been identified as present in the impacted reach, including one NERC Act Section 41 fish species (brown trout) and three notable fish species (brook lamprey, bullhead and grayling).

Table B2-112 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipes)*	Major	Limited data is available for the impacted reach. White-clawed crayfish could potentially to use the impacted reach. Further consideration would be necessary to determine to what extent or how they may be impacted by reduced flows caused by the drought option.	Medium/ high	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Major	Limited data is available for the impacted reach. Otters could potentially to use the impacted reach. 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 Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish Brown trout *(Salmo trutta)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition the scale of the change is very high over a long reach of	High	Yes

Site/Receptor 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)*
		the watercourse. Predation could occur on fish stranded in pools in high densities.		
Notable Species – Fish Bullhead (*Cottus gobio)* Grayling (*Thymallus thymallus)* Brook lamprey *(Lampetra planeri)*	Major	Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	Medium	Yes

B2.13.4 WFD receptors

B2.13.4.1 Macroinvertebrates

The WFD waterbody GB104027057370 Loxley from Strines Dyke to River Don classifies as 'good' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by two Environment Agency monitoring sites, Rowell Lane (ID 1245), and D/S Weir (ID 142369).

Rowell Lane had baseline survey data for samples from 2012 to 2021 and 2023, with supplementary surveys commissioned by YWSL in 2022 and 2024. D/S Weir had baseline survey data for samples from 2010, 2012 to 2021 and 2023, with additional monitoring undertaken by YWSL in 2022. These sites provide strong temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors.

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A.**

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on two occurrences to 'Good' on ten occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was successfully calculated for all sites.

$WHPT_{ASPT}$ scores ranged between 4.61 and 6.89 with the lowest WHPT ASPT score of 4.61 at Site 142369 in Autumn 2022, and the highest score of 6.89 at Site 1245 in Spring 2021. The $WHPT_{ASPT}$ expected scores for ranged from 6.9 to 7.38 across the sites, with 34 of the 48 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.66 and 0.95 with the lowest $WHPT_{ASPT}$ EQR of 0.66 at Site 142369 in Autumn 2022, and the highest EQR of 0.95 at Site 1245 in Spring 2021.

In Loxley 1 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ ranging between 10 and 29 with the lowest $WHPT_{NTAXA}$ score of 10 at Site 142369 in Autumn 2022, and the highest score of 29 at Site 1245 in Spring 2017. The $WHPT_{NTAXA}$ expected scores ranged from 25.13 to 27.28 across the sites, with 9 of the 48 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.4 and 1.06 with the lowest $WHPT_{NTAXA}$ EQR of 0.4 at Site 142369 in Autumn 2022, and the highest EQR of 1.06 at Site 1245 in Spring 2017.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. $LIFE_{FAMILY}$ scores ranged between 6.88 and 8.31 with the lowest $LIFE_{FAMILY}$ score of 6.88 at Site 1245 in Autumn 2015, and the highest score

of 8.31 at Site 1245 in Spring 2021. The $LIFE_{FAMILY}$ expected scores ranged from 7.72 to 7.85 across the sites, with 14 of the 48 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.89 and 1.06 with the lowest $LIFE_{FAMILY}$ EQR of 0.89 at Site 1245 in Autumn 2015, and the highest EQR of 1.06 at Site 1245 in Spring 2021.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 50.98 and 82.76 with the lowest PSI_{FAMILY} score of 50.98 at Site 142369 in Spring 2010, and the highest score of 82.76 at Site 1245 in Autumn 2021. The PSI_{FAMILY} expected scores ranged between 68.65 to 74.24 across the sites, with 38 of the 48 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.69 and 1.21 with the lowest PSI_{FAMILY}) EQR of 0.69 at Site 142369 in Spring 2010, and the highest EQR of 1.21 at Site 1245 in Autumn 2021.

No INNS or designated species were recorded during the monitoring period.

Summary

The WFD status of the macroinvertebrate community in Loxley 1 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

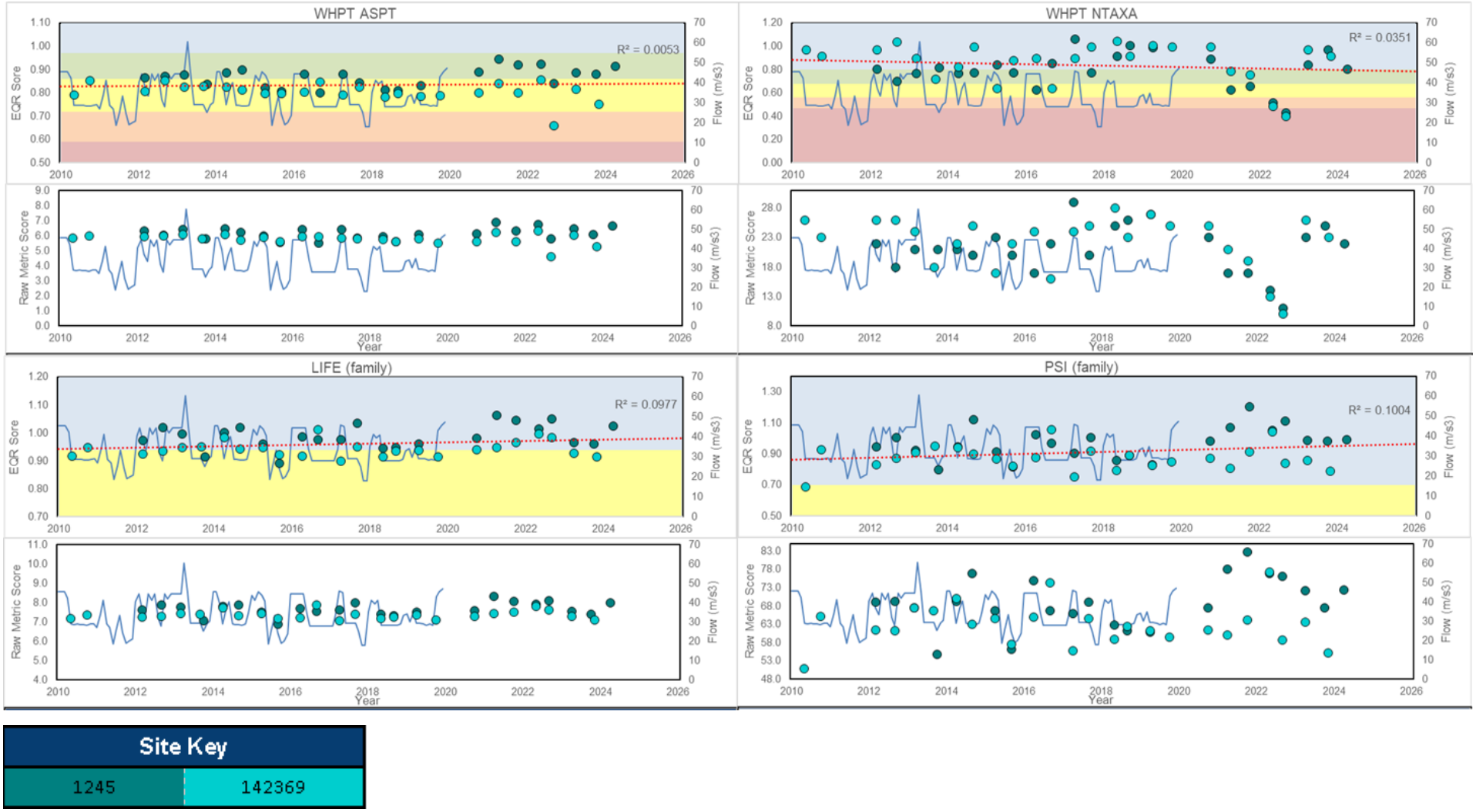
Baseline data indicates that under present conditions, the macroinvertebrate community in Loxley 1 is medium to high sensitivity to reduced flows (**Figure B2-13**). See **Table B2-5** for guidance in interpreting raw LIFE scores.

A summary of the above data is presented within **Table B2-113.** Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-113 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
1245	SK2987889521	23	2012 to 2024	0.89 - 1.06 (0.99)	6.88 - 8.31 (7.67)	0.8 - 1.21 (0.97)	54.84 - 82.76 (68.91)	0.8 - 0.95 (0.87)	M - G (G)	5.53 - 6.89 (6.16)	0.43 - 1.06 (0.79)	B - H (G)	11 - 29 (21)
142369	SK2878390301	25	2010 to 2022	0.9 - 1.01 (0.94)	7.05 - 7.86 (7.36)	0.69 - 1.06 (0.87)	50.98 - 77.3 (62.81)	0.66 - 0.86 (0.81)	P - M (M)	4.61 - 6.32 (5.79)	0.4 - 1.05 (0.86)	B - H (H)	10 - 28 (22)

Figure B2-13 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



B2.13.4.2Fish

Waterbody GB104027057370 Loxley from Strines Dyke to River Don is classified under Cycle 3 (2022) as 'good'. The classification is informed by one site, Old Wheel Farm (ID 14182), which was classified as 'good' in both 2019 and 2022.

No Environment Agency fisheries monitoring sites were present in the impacted reach, FCS2 data was provided by Old Wheel Farm, located upstream of the impacted reach (Calder 1).

Baseline fisheries data is informed by two Environment Agency sites, Old Wheel Farm and Proroll (ID 128753), both surveyed in 2011 and 2017.

YWSL commissioned additional surveys at three sites, D/S Malin Bridge (ID YW10016), Stacey Lane (ID RL144069) and Storrs Bridge Works (ID RL244069). D/S Malin Bridge was surveyed in 2015, 2016, 2017, 2018, 2021 and 2024. Stacey lane, Proroll, Storrs Bridge Works and Old Wheel Farm were surveyed in 2020 and 2021.

Table B2-114 details site survey information within the Loxley 1 reach.

The WFD status of the fish community in Loxley 1 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site Old Wheel Farm is individually classified as good with a site EQR of 0.4468, based on the FCS2 EQR scores from the 2017 survey. The site has a moderate diversity, with two species present from an expected four species. Trout had a slightly lower observed density than expected, with a good EQR score of 0.5677. Bullhead are observed at increased numbers, with an EQR score of 1. Stone loach are not observed in this reach, although they are expected to be present.

Sites within the impacted reach (Loxley 1) showed fish populations similar to the classification sites, with a moderate to high abundance of trout and low to moderate abundance of bullhead. Chub, perch and pike were intermittently recorded at Olive Cottage and Proroll, with a single pike recorded at Old Wheel Farm.

Additional baseline fish data for Loxley1 from YWSL at D/S Malin Bridge. The number of brown trout and bullhead present were comparable to those observed within the reach by the Environment Agency.

Brown trout and bullhead were counted at all sites for every year surveyed. The highest count for brown trout was 84 at Stacey Lane in 2021, the lowest count of 16 was at Old Wheel Farm in 2011, the same site and year also had the lowest count for bullhead, with 8 individuals counted. The highest count of bullhead was 100 in 2024 at D/S Malin Bridge.

Other species captured were counted sporadically temporally and spatially in very low numbers, with a highest count of five for minnow in 2016 at D/S Malin Bridge. Other species counted include brook lamprey, grayling, pike, stone loach, perch and 3-spined stickleback.

Table B2-115 details fish survey data from sites within the Loxley 1 reach, by year. All fish counts are available in **Annex 1** to this appendix.

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

Table B2-114 Loxley 1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
14130	Storrs Bridge Works	SK2930090100	Electric Fishing (AC, PDC and DC)	2	2020	2021
14182	Old Wheel Farm	SK2954989835	Electric Fishing (AC, PDC and DC)	5	2011	2021

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
14184	Proroll	SK3090089400	Electric Fishing (AC, PDC and DC)	4	2011	2021
14191	Stacey Lane	SK2869090491	Electric Fishing (AC, PDC and DC)	3	2020	2021
YW10016	D/S Malin Bridge	SK32578932	Electric Fishing (AC, PDC and DC)	6	2015	2024

Table B2-115 Loxley 1 Fish Survey Results

Tolerance Category	Species Name	2011	2015	2016	2017	2018	2020	2021	2024
High tolerance	Perch	X	X	X	X	X			
High tolerance	3-spined stickleback					X		X	X
Medium tolerance	Pike	X							
Medium tolerance	Stone loach		X		X	X		X	
Medium tolerance	Minnow			X	X				
Low tolerance	Bullhead	X	X	X	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X	X	X	X
Low tolerance	Brook lamprey							X	X
Low tolerance	Grayling							X	

B2.13.4.3WFD waterbody status

Table B2-116 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-116** also displays the objective status for 2022 (Cycle 3) or the predicted status in 2022 where objective to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-116 WFD classifications

Waterbody ID & Name		GB104027057370 Loxley from Strines Dyke to River Don	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Good	Medium
	Macroinvertebrates	Good	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.13.5 Invasive non-native species (INNS)

Table B2-117 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-117**).

Table B2-117 INNS Receptors

Site/Receptor 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 - Freshwater Shrimp (*Crangonyx pseudogracilis*) -New Zealand mud snail (*Potamopyrgus antipodarum*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – Terrestrial plants -Himalayan balsam (*Impatiens glandulifera*) - Japanese knotweed (*Fallopia japonica*) - Three-cornered garlic (*Alium triquetum*) - Rhododendron (*Rhododendron ponticum*) - Montbretia (*Crocosmia pottsii x aurea = C. x crocosmiiflora*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.13.6 Landscape, navigation, recreation and heritage

Table B 2-118 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B 2-118**).

Table B 2-118 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Little Matlock Rolling Mill immediately south and east of olive terrace –	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No

Site/Receptor 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)*
Scheduled Ancient Monument				
Mousehole Forge, Malin Bridge – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
River Loxley - Angling	Major	Recreational angling takes place on the River Loxley. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No
River Loxley - Canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No

B2.14 LOXLEY 2

B2.14.1 Statutory designated sites

Table B2-119 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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-119**).

Table B2-119 Statutory designated sites

Site/Receptor 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)*
South Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Peak District Moors (South Pennine Moors Phase 1) SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Eastern Peak District Moors SSSI	Major	Located upstream of the impacted reach, the Eastern Peak District Moors are of special interest for their upland vegetation, lower plants, invertebrates and geological receptors. The combination of blanket bog, wet and dry heaths, acid grasslands and small flushes, together with gritstone edges, cliffs and boulder slopes, streams and moorland reservoirs, and fringing woodland represents the full range of upland vegetation characteristic of the South Pennines and supports several important species assemblages. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No

B2.14.2 NERC and local wildlife sites

Table B2-120 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

One NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-120**).

Table B2-120 NERC habitats and local wildlife sites

Site/Receptor 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)*
Malin Bridge to River Don LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors. The site covers the River Loxley to its confluence with the Don, and the surrounding margins and woodland habitat. The woodlands are semi-natural. Tall herb habitats also exist, as well as marginal aquatic vegetation.	Low	Yes

B2.14.3 NERC and other protected species

Table B2-121 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 white-clawed crayfish in the impacted reach. The data showed surveys were completed historically by YWSL and the Environment Agency, no records have been recorded in the impacted reach, although suitable habitat has been identified as present in the impacted reach. However, 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 white-clawed crayfish likely to be present in the reach at the time of the implementation of a drought permit. Based on the available information this species is considered to be susceptible to drought permit impacts and have a **medium/high** sensitivity to the physical environment impacts identified in **Appendix A.**

One vulnerable (*Baetis digitatus*) and two nationally scarce species *(Potamophylax rotundipennis* and *Atherix ibis)* and were identified as being present within the impacted reach. Based on the available information these species are considered to be potentially susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

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 drought permit. Based on the limited available information otters considered to be susceptible to drought permit 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. Therefore, absence cannot be confirmed. It was considered appropriate, following the precautionary principle, to consider otter 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.**

Four NERC act section 41 and notable fish species have been identified as present in the impacted reach, including one NERC Act Section 41 fish species (brown trout) and three notable fish species (brook lamprey, bullhead and grayling).

Table B2-121 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipes)*	Major	Limited data is available for the impacted reach. White-clawed crayfish could potentially to use the impacted reach. Further consideration would be necessary to determine to what extent or how they may be impacted by reduced flows caused by the drought option.	Medium/High	Yes
Notable Species – Invertebrates Snipefly *(Atherix ibis)* Caddisfly (*Potamophylax rotundipennis)* Mayflies *(Baetis digitatus)*	Major	Snipe fly and mayfly species associated with fast-flowing water, therefore potentially susceptible to drought option impacts. However, they are relatively tolerant of short-term fluctuations in water levels or flow, as their preferred habitats are naturally dynamic. Low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only) and may therefore not markedly detract from the quality of the supporting environment. *P. rotundipennis* is a tolerant species which favours moderate flow rates unlikely to be impacted by reduced flows.	Medium	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Major	Limited data is available for the impacted reach. Otters could potentially to use the impacted reach. 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 Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish Brown trout *(Salmo trutta)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition the	High	Yes

Site/Receptor 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)*
		scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.		
Notable Species – Fish Bullhead (*Cottus gobio)* Grayling (*Thymallus thymallus)* Brook lamprey *(Lampetra planeri)*	Major	Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	Medium	Yes

B2.14.4 WFD receptors

B2.14.4.1 Macroinvertebrates

The WFD waterbody GB104027057370 Loxley from Strines Dyke to River Don classifies as 'good' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by one Environment Agency monitoring site, A61 (Sheffield) (ID204) and one YWSL sites, Park and Ride d/s Rivelin Confluence (ID 1).

Park and Ride d/s Rivelin Confluence only had baseline survey data from YWSL commissioned additional monitoring, undertaken in 2017, 2018 and 2021-2023. A61 (Sheffield) had baseline survey data for samples from 2013 and 2015 with additional monitoring undertaken on behalf of YWSL in 2021 and 2022. These sites provide strong temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors.

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A.**

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on one occurrence to 'Good' on eight occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was successfully calculated for all sites.

$WHPT_{ASPT}$ scores ranged between 5.53 and 6.88 with the lowest $WHPT_{ASPT}$ score of 5.53 at Site 1 in Autumn 2021, and the highest score of 6.88 at Site 204 in Spring 2021. The $WHPT_{ASPT}$ expected scores for ranged from 6.69 to 7.19 across the sites, with 2 of the 18 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.83 and 0.99 with the lowest $WHPT_{ASPT}$ EQR of 0.83 at Site 1 in Autumn 2021, and the highest EQR of 0.99 at Site 1 in Autumn 2023.

In Loxley 2 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ ranging between 12 and 35 with the lowest $WHPT_{NTAXA}$ score of 12 at Site 1 in Autumn 2022, and the highest score of 35 at Site 204 in Spring 2015. The $WHPT_{NTAXA}$ expected scores ranged from 26.38 to 27.76 across the sites, with 9 of the 18 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.45 and 1.26 with the lowest $WHPT_{NTAXA}$ EQR of 0.45 at Site 1 in Autumn 2022, and the highest EQR of 1.26 at Site 204 in Spring 2015.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. $LIFE_{FAMILY}$ scores ranged between 7.25 and 8.14 with the lowest $LIFE_{FAMILY}$ score of 7.25 at Site 1 in Autumn 2021, and the highest score of 8.14 at Site 204 in Spring 2013. The $LIFE_{FAMILY}$ expected scores ranged from 7.62 to 7.77 across the sites, with all samples above the 'Good/Moderate boundary' $LIFE_{FAMILY}$ EQR scores ranged between 0.95 and 1.05 with the lowest $LIFE_{FAMILY}$ EQR of 0.95 at Site 1 in Autumn 2021, and the highest EQR of 1.05 at Site 204 in Spring 2013.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 57.6 and 90.5 with the lowest PSI_{FAMILY} score of 57.6 at Site 1 in Autumn 2021, and the highest score of 90.5 at Site 204 in Spring 2022. The PSI_{FAMILY} expected scores ranged from 66.2 to 71.8 across the sites, with 5 of the 18 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.86 and 1.3 with the lowest PSI_{FAMILY} EQR of 0.86 at Site 1 in Spring 2018, and the highest EQR of 1.3 at Site 204 in Autumn 2021.

One INNS, *Potamopyrgus antipodarum,* was recorded at Site 204 between 2020 to 2021. A single designated species, *Atherix ibis*, was recorded at Site 204 in 2021.

Summary

The WFD status of the macroinvertebrate community in Loxley 2 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

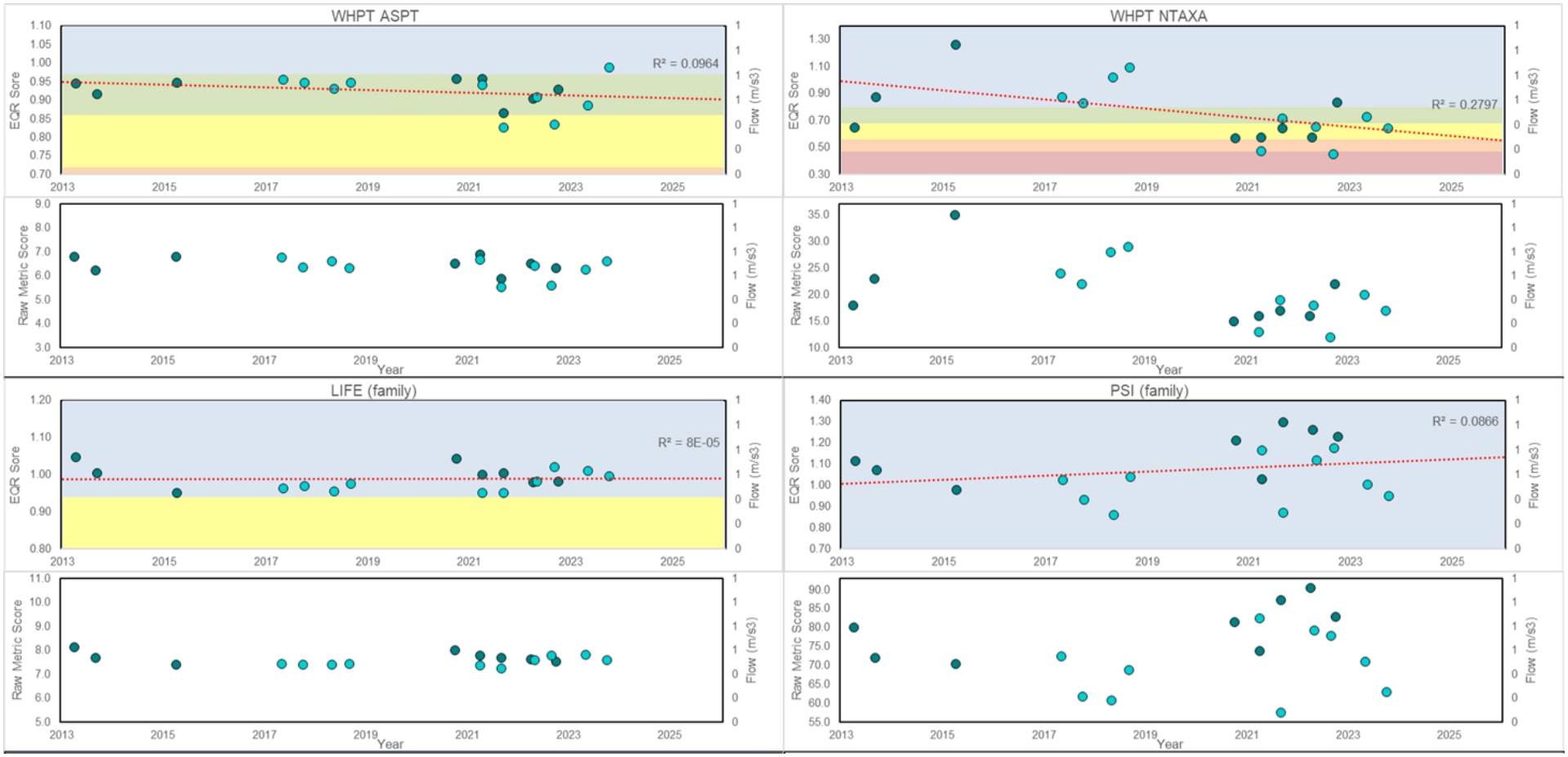
Baseline data indicates that under present conditions, the macroinvertebrate community in Loxley 2 is highly sensitive to reduced flows (**Figure B2-14**). See **Table B2-5** for guidance in interpreting raw LIFE scores.

A summary of the above data is presented within **Table B2-122**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-122 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
204	SK3384689733	8	2013 to 2022	0.95 - 1.05 (1)	7.39 - 8.14 (7.73)	0.98 - 1.3 (1.15)	70.37 - 90.5 (79.82)	0.87 - 0.96 (0.93)	G - G (G)	5.89 - 6.88 (6.5)	0.57 - 1.26 (0.75)	M - H (G)	15 - 35 (20)
1	SK3272089327	10	2017 to 2023	0.95 - 1.02 (0.98)	7.25 - 7.81 (7.51)	0.86 - 1.18 (1.01)	57.6 - 82.4 (69.5)	0.83 - 0.99 (0.92)	M - H (G)	5.53 - 6.77 (6.32)	0.45 - 1.1 (0.75)	B - H (G)	12 - 29 (20)

Figure B2-14 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



B2.14.4.2Fish

Waterbody GB104027057370 Loxley from Strines Dyke to River Don is classified under Cycle 3 (2022) as 'good'. The classification is informed by one site, Old Wheel Farm (ID 14182), which was classified as 'good' in both 2019 and 2022.

No Environment Agency fisheries monitoring sites were present in the impacted reach, FCS2 data was provided by Old Wheel Farm, located upstream of the impacted reach (Calder 1).

YWSL commissioned baseline surveys at two sites within the reach, Owlerton (ID YW10018) and Livesey Street (ID YW10017). Both sites were surveyed in 2015, 2016, 2017, 2018, and 2021. Livesey street was also surveyed in 2024.

Table B2-123 details site survey information within the Loxley 2 reach.

The WFD status of the fish community in Loxley 2 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site Old Wheel Farm is individually classified as good with a site EQR of 0.4468, based on the FCS2 EQR scores from the 2017 survey. The site has a moderate diversity, with two species present from an expected four species. Trout had a slightly lower observed density than expected, with a good EQR score of 0.5677. Bullhead are observed at increased numbers, with an EQR score of 1. Stone loach are not observed in this reach, although they are expected to be present.

Brown trout and bullhead were counted at both sites during every survey year. The highest count of brown trout was 97 in 2015 at Livesey street during a single-catch sample. The lowest count for brown trout was three at Owlerton in 2017, which was also a single-catch sample. The highest count of bullhead was 100 at Livesey Street in 2024 utilising catch-depletion sampling, whilst the lowest count of three was also at Owlerton in 2017 during a single-catch sample. Grayling were present in low numbers for every year, but were not counted at Livesey Street in 2024 and Owlerton in 2016, with a highest catch of 39 at Owlerton in 2021. Two brook Lamprey were observed counted at Livesey Street in 2024. Pike and perch were counted in low numbers at Owlerton in 2021, whilst minnow, stone loach, gudgeon, perch and 3-spined stickleback have been counted at Livesey Street in low numbers across a number of years.

Table B2-124 details fish survey data from sites within the Loxley 2 reach, by year. All fish counts are available in **Annex 1** to this appendix.

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

Table B2-123 Loxley 2 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
YW10017	Livesey Street	SK338899	Electric Fishing (AC, PDC and DC)	8	2015	2024
YW10018	Owlerton	SK338896	Electric Fishing (AC, PDC and DC)	5	2015	2021

Table B2-124 Loxley 2 Fish Survey Results

Tolerance Category	Species Name	2015	2016	2017	2018	2021	2024
High tolerance	Perch	X				X	
High tolerance	3-spined stickleback			X	X		X
Medium tolerance	Pike					X	
Medium tolerance	Minnow	X	X	X	X		
Medium tolerance	Stone loach	X	X	X	X		
Medium tolerance	Gudgeon		X				
Low tolerance	Bullhead	X	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X	X
Low tolerance	Grayling	X	X	X	X	X	
Low tolerance	Brook lamprey						X

B2.14.4.3 WFD waterbody status

Table B2-125 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-125** also displays the objective status for 2022 (Cycle 3) or the predicted status in 2022 where objective to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-125 WFD classifications

Waterbody ID & Name		**GB104027057370 Loxley from Strines Dyke to River Don**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Good	Medium
	Macroinvertebrates	Good	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.14.5 Invasive non-native species (INNS)

Table B2-126 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-126**).

Table B2-126 INNS Receptors

Site/Receptor 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 New Zealand mud snail (*Potamopyrgus antipodarum*) Caspian mud snail (*Chelicorophium curvispinum*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – Terrestrial plants Himalayan balsam (*Impatiens glandulifera*) Japanese knotweed (*Fallopia japonica*) Three-cornered garlic (*Alium triquetum*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – Mammals American mink (*Neovision vision*)	Major	The implementation of this drought option is not expected to increase the distribution of these INNS	Not sensitive	No

B2.14.6 Landscape, navigation, recreation and heritage

Table B2-127 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (**Table B2-127**).

Table B2-127 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Little Matlock Rolling Mill immediately south and east of olive terrace – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Mousehole Forge, Malin Bridge – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No

Site/Receptor 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 Loxley - Angling	Major	Recreational angling takes place on the River Loxley. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No

B2.15 RIVELIN 1

B2.15.1 Statutory designated sites

Table B2-128 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.

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-128**).

Table B2-128 Statutory designated sites

Site/Receptor 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)*
Eastern Peak District Moors SSSI	Major	Located upstream of the impacted reach, the Eastern Peak District Moors are of special interest for their upland vegetation, lower plants, invertebrates and geological receptors. The combination of blanket bog, wet and dry heaths, acid grasslands and small flushes, together with gritstone edges, cliffs and boulder slopes, streams and moorland reservoirs, and fringing woodland represents the full range of upland vegetation characteristic of the South Pennines and supports several important species assemblages. The site is unlikely to be affected by hydrological changes within the zone of influence.	Not sensitive	No
South Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Peak District Moors (South Pennine Moors Phase 1) SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
Fox Hagg LNR	Major	No water dependent receptors	Not sensitive	No

B2.15.2 NERC and local wildlife sites

Table B2-129 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

Four NERC Act Section 41 or other notable and/or protected habitats that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-129**).

Table B2-129 NERC habitats and local wildlife sites

Site/Receptor 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)*
Fox Hagg LWS	Major	The site covers the River Rivelin immediately downstream of the Riveline Dams as it flows through a large expanse of woodland. Areas of grassland area also present. Bracken, heather, birch, scrub, woodland and moorland habitats are also present, as well as a pond. Allen Sike stream runs through the site to connect with the River Riveline.	Medium	Yes
Middle Rivelin Valley LWS	Major	Is in connectivity with impacted reach and support aquatic receptors. Encompasses a long stretch of the River Rivelin and adjacent habitats. The adjacent habitats are predominately woodland (wet alder, semi-natural, ancient, plantation). Area of grassland are present (unimproved, semi-improved, acid, improved) as well las bracken, tall herb, marsh, flush/spring, marginal aquatic vegetation and hedgerows. There are many areas of standing water from working mill ponds and areas where former mill ponds have silted up.	Medium	Yes
Millstone Edge Rough and Fields LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. The site has a wide variety of habitats, including upland heathland mosaic, secondary and semi-natural woodland, plantation woodland, grassland (unimproved, semi-improved, acid, neutral, grazed), bracken, tall herb, spring, and cliff/rock face/outcrop).	Not sensitive	No
The Reaps LWS	Major	The sites contain 3 areas of mature oak dominated woodland with several ancient woodland indicator species, a large grassland area which is gradually turning into scrub, springs and flushes within the grassland with stands of tall herbs and a stream feeding into a pond. Also present are amenity grass and ornamental planting around 3 burial grounds.	Not sensitive	No
Walkley Bank Plantation LWS	Major	An area of plantation woodland of predominately mature even-aged beech with sections of coppiced oak. There are two flushes within the site.	Not sensitive	No
Roscoe Plantation LWS	Major	A stream runs through the large mill dam, now silted up and overgrown with mature woodland including Alder, Beech, Sycamore and Willow. The site borders the impacted reach.	Medium	Yes
Lower Rivelin Valley LWS	Major	Is in connectivity with impacted reach and support aquatic receptors. The site	Medium	Yes

Site/Receptor 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)*
		encompasses the River Rivelin and immediate areas until its confluence with the River Loxley. The area is used for recreation, flood control and nature conservation. Areas wet woodland/alder carr are present, typically at the sites of silted mill ponds. Along with the carr areas, the bankside vegetation among the trees supports ancient woodland indicator species		

B2.15.3 NERC and other protected species

Table B2-130 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are a NERC Act Section 41 species and are sensitive to habitat modification from the management of waterbodies. Data obtained from the Environment Agency and YWSL, as well as a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. White-clawed crayfish were recorded as present in the Rivelin, upstream of the reservoir, in 2014 and 2019; however, signal crayfish are know to be extensively present throughout the impacted reach downstream of the reservoir. Based on the available information this receptor is considered to be present within the impacted reach and has been excluded from further assessment.

Data obtained from the Environment Agency and a review of available data from NBN gateway was used inform the assessment of otter in the impacted reach. Review of Environment Agency and YWSL records indicates otters were recorded as present in 2022 within the impacted reach. However, no information from survey findings was available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought option. Based on the available information these species are considered not to be susceptible to drought option impacts and have a **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 otter 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.**

Four NERC act section 41 and notable fish species have been identified as present in the impacted reach, including one NERC Act Section 41 fish species (Brown trout and European eel) and two notable fish species (bullhead and Brook lamprey).

Three nationally scarce species including *Sisyra terminalis, Gyraulus laevis*, and *Wormaldia subnigra* have been identified as being present in Rivelin 1 between 2015 and 2023. Based on the available information these receptors are considered to be susceptible to drought permit impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Table B2-130 NERC Act Section 41 and other protected species

Site/Receptor 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 – Crustacea White-clawed crayfish (*Austropotamobius pallipes)*	Major	Given the presence of signal crayfish in this reach the Environment Agency considers it unlikely that white-clawed crayfish are present and they are not considered further for this reach.		No
Notable Species – Invertebrates Spongefly (*Sisyra terminalis*) Freshwater snail (*Gyraulus laevis*) Black-winged sedge (*Wormaldia subnigra*)	Major	Present species are considered relatively tolerant of short-term fluctuations in water levels or flow, as their preferred habitats are naturally dynamic. Low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only) and may therefore not markedly detract from the quality of the supporting environment.	Low	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Major	Limited data is available for the impacted reach. Otters could potentially to use the impacted reach. 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 Water vole (*Arvicola amphibious)*	Major	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 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.	Uncertain	Yes
NERC Species – Fish Brown trout *(Salmo trutta)* European Eel *(Anguilla Anguilla)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
Notable Species – Fish Bullhead (*Cottus gobio)*	Major	Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be	Medium	Yes

Site/Receptor 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)*
Brook lamprey *(Lampetra planeri)*		damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.		

B2.15.4 WFD receptors

B2.15.4.1 Macroinvertebrates

The WFD waterbody GB104027057340 Rivelin from Source to River Loxley classifies as 'high' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by four Environment Agency monitoring sites, Hollins Bridge (ID 245), Rivelin Mill (ID 1580), U/S WTW (ID 90061) and U/S Malin Bridge (ID 89955).

Hollins Bridge had baseline survey data for samples from 2013, with an additional six surveys commissioned by YWSL in 2021-2023. Rivelin Mill had baseline survey data for 2012 to 2021 and 2023, with an additional four YWSL monitoring samples in 2020 to 2022. U/S WTW only had baseline survey data for two seasonal samples in 2010. Lastly, U/S Malin Bridge only had baseline survey data from YWSL commissioned surveys in 2015, 2016, 2021 and 2022.

Generally, these sites provide strong temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors. However, the **EA Site 90061** surveyed exclusively in 2010 does not support long-term trend analysis but still provided a valuable snapshot of community composition at the time of sampling.

The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A.**

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Moderate' on three occurrences to 'High' on 17 occurrences. See **Table B2-4** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was successfully calculated for all sites.

$WHPT_{ASPT}$ scores ranged between 6.02 and 7.52 with the lowest $WHPT_{ASPT}$ score of 6.02 at Site 89955 in Summer 2021, and the highest score of 7.52 at Site 1580 in Spring 2019. The $WHPT_{ASPT}$ expected scores for ranged from 6.72 to 7.37 across the sites, with all samples above the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.9 and 1.05 with the lowest WHPT ASPT EQR of 0.9 at Site 89955 in Summer 2021, and the highest EQR of 1.05 at Site 245 in Spring 2021.

In Rivelin 1 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ ranging between 15 and 36 with the lowest $WHPT_{NTAXA}$ score of 15 at Site 245 in Autumn 2021, and the highest score of 36 at Site 1580 in Spring 2012. The $WHPT_{NTAXA}$ expected scores ranged from 25.01 to 27.67 across the sites, with 3 of the 44 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.56 and 1.38 with the lowest $WHPT_{NTAXA}$ EQR of 0.56 at Site 245 in Autumn 2021, and the highest EQR of 1.38 at Site 1580 in Autumn 2019.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites $LIFE_{FAMILY}$ scores ranged between 7.35 and 8.25 with the lowest $LIFE_{FAMILY}$ score of 7.35 at Site 89955 in Spring 2015, and the highest score of 8.25 at Site 1580 in Spring 2013. The $LIFE_{FAMILY}$ expected scores ranged from 7.66 to 7.85 across the sites, with 1 of the 44 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged

between 0.94 and 1.08 with the lowest $LIFE_{FAMILY}$ EQR of 0.94 at Site 89955 in Spring 2015, and the highest EQR of 1.08 at Site 245 in Autumn 2021.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 60.7 and 100 with the lowest PSI_{FAMILY} score of 60.7 at Site 89955 in Summer 2021, and the highest score of 100 at Site 245 in Autumn 2021. The PSI_{FAMILY} expected scores ranged from 66.53 to 74.14 across the sites, with 16 of the 44 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.86 and 1.5 with the lowest PSI_{FAMILY} EQR of 0.86 at Site 89955 in Summer 2021, and the highest EQR of 1.5 at Site 245 in Autumn 2021.

A total of five INNS species, Potamopyrgus antipodarum, Crangonyx pseudogracilis/floridanus, Crangonyx pseudogracilis, Chelicorophium curvispinum and Physella acuta were recorded as present at 3 sites between 2015 to 2023.

A total of three designated species, Wormaldia subnigra, Sisyra terminalis and Gyraulus laevis were recorded as present at one site (1580) between the years 2015 to 2023.

Summary

The WFD status of the macroinvertebrate community in Rivelin 1 may be impacted by the implementation of this drought permit. 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 permit must be considered in the context of environmental drought.

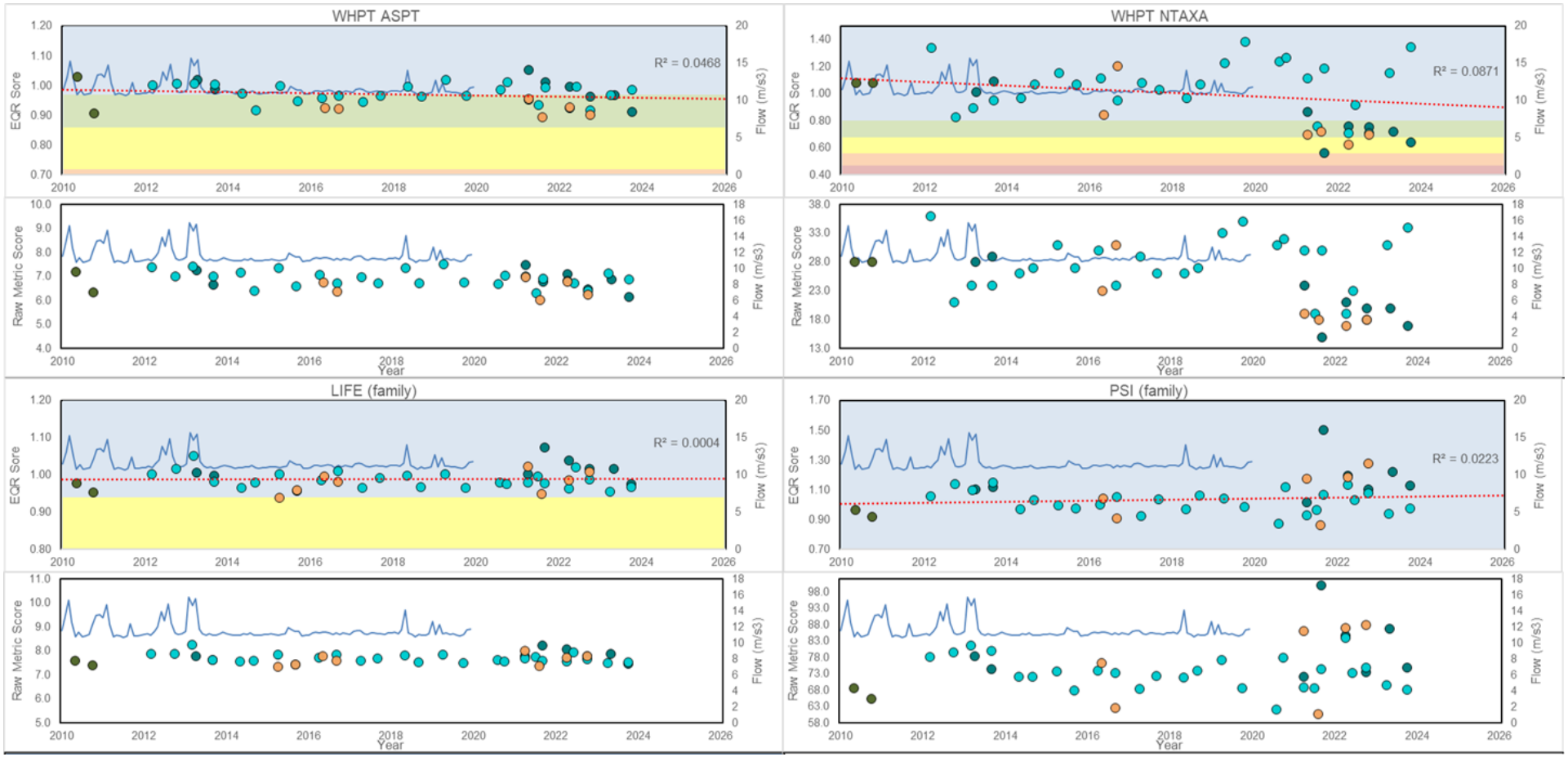
A summary of the above data is presented within **Table B2-131**. Baseline data indicates that under present conditions, the macroinvertebrate community in Rivelin 1 is highly sensitive to reduced flows (**Figure B2-15**). See **Table B2-5** for guidance in interpreting raw LIFE scores.

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

Table B2-131 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *R/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *R/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
245	SK3226888595	8	2013 to 2023	0.98 - 1.08 (1.02)	7.47 - 8.23 (7.83)	1.01 - 1.5 (1.17)	72.1 - 100 (80.63)	0.91 - 1.05 (0.99)	G - H (H)	6.14 - 7.48 (6.85)	0.56 - 1.09 (0.8)	M - H (H)	15 - 29 (22)
1580	SK2897987126	26	2012 to 2022	0.96 - 1.05 (0.99)	7.44 - 8.25 (7.7)	0.87 - 1.15 (1.02)	62.1 - 84 (73.37)	0.92 - 1.02 (0.97)	G - H (H)	6.32 - 7.52 (6.93)	0.71 - 1.38 (1.06)	G - H (H)	18 - 36 (27)
90061	SK2803286726	2	2010	0.95 - 0.98 (0.97)	7.42 - 7.6 (7.51)	0.92 - 0.97 (0.94)	65.31 - 68.63 (66.97)	0.91 - 1.03 (0.97)	G - H (G)	6.33 - 7.19 (6.76)	1.08	H	28
89955	SK3256689329	8	2015 to 2022	0.94 - 1.02 (0.98)	7.35 - 8 (7.63)	0.86 - 1.28 (1.08)	60.7 - 88 (76.82)	0.9 - 0.96 (0.92)	G - G (G)	6.02 - 6.97 (6.52)	0.63 - 1.2 (0.8)	M - H (G)	17 - 31 (21)

Figure B2-15 LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



B2.15.4.2 Fish

Waterbody GB104027057340 Rivelin from Source to River Loxley is classified under Cycle 3 (2022 as 'good'. The classification is informed by two sites, Allotments Bridge (ID 14078) and Rivelin Mill (ID 14199), which were classified as 'high' and 'good' respectively in 2022.

Baseline fisheries data is available for two Environment Agency sites, Allotments Bridge and Rivelin Mill. Allotments Bridge was surveyed in 2010, 2011, 2012, 2015, 2017, 2018, 2019, 2021 and 2023. Rivelin Mill was surveyed in 2011 and 2017.

YWSL commissioned additional surveys at four sites, Rivelin Mill, D/S Mill Dam (ID RR244075), Glen Bridge (ID RR344075) and Havelock Dam (ID RR44076). All sites were surveyed in 2020 and 2021.

Table B2-132 details site survey information within the Riveline 1 reach.

The WFD status of the fish community in Rivelin 1 may be impacted by drought permit 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 permit implementation must be considered in the context of environmental drought.

The site Allotments Bridge is individually classified as good with a site EQR of 0.6766, based on the FCS2 EQR scores from the 2023 survey. The site has a good diversity, with four species present from an expected five species. Trout had a higher observed density than expected, with a good EQR score of 0.7037. Bullhead and stone loach are observed at increased numbers, with an EQR score of 1. Perch are not observed in this reach, although they are expected to be present. Lamprey were observed at the site, though not expected due to the low prevalence, resulting in a high EQR score of 0.9833. Grayling are expected to be present at the site, at a low prevalence of 0.5163, though were not observed.

The site Rivelin Mill is individually classified as good with a site EQR of 0.4792, based on the FCS2 EQR scores from the 2023 survey. The site has a good diversity, with three species present from an expected three species. Trout had a lower observed density than expected, with an EQR score of 0.2543. Bullhead and stone loach are observed at increased numbers, with an EQR score of 1.

Brown trout and bullhead were counted at every site during every survey year. The highest count of brown trout was 73 at Havelock Dam in 2020, and for bullhead a log abundance of 100-999 in 2010 at Allotments Bridge. The lowest count for brown trout was 23 in 2017 at Rivelin Mill during a single-catch sample, the lowest count for bullhead was seven at Rivelin Mill in 2011 also during a single-catch sample.

Pike, perch and minnow were counted during a couple of surveys in low numbers, with a highest count of two. Stone loach were counted in low numbers at Allotments Bridge, Rivelin Mill, D/S Mill Dam and Glen Bridge with a highest count of 16 at Rivelin Mill in 2011 and multiple records of just one.

Lamprey sp. were counted at Glen Bridge in 2020 and at both Glen Bridge and Havelock Dam in 2021. Lamprey sp. were counted at Allotments Bridge in 2010, 2018, 2021 and 2023, as well as at Havelock Dam in 2020. All individuals have been classified as Lamprey sp. It is, however, highly likely that these individuals are brook lamprey, as the surveyed locations do not support suitable conditions for river lamprey migration.

Table B2-133 details fish survey data from sites within the Rivelin 1 reach, by year. All fish counts are available in **Annex 1** to this appendix.

Although European eel have not been identified, an absence from the impacted reach is not considered likely as previous historical data obtained from the EA suggested their presence. Therefore, a low abundance of this species has been assumed.

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

Table B2-132 Rivelin 1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
4346	Havelock Dam	SK3231288697	Electric Fishing (AC, PDC and DC)	3	2020	2021
14078	Allotments Bridge	SK3203588331	Electric Fishing (AC, PDC and DC)	9	2010	2023
14079	D/S Mill Dam	SK3091687605	Electric Fishing (AC, PDC and DC)	2	2020	2021
14126	Glen Bridge	SK3116287834	Electric Fishing (AC, PDC and DC)	2	2020	2021
14199	Rivelin Mill	SK2902587223	Electric Fishing (AC, PDC and DC)	5	2011	2021

Table B2-133 Rivelin 1 Fish Survey Results

Tolerance Category	Species Name	2010	2011	2012	2015	2017	2018	2019	2020	2021	2023
High tolerance	Perch								X	X	
Medium tolerance	Stone loach	X	X	X		X	X		X	X	X
Medium tolerance	Minnow								X		
Medium tolerance	Pike									X	
Low tolerance	Bullhead	X	X	X	X	X	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X	X	X	X	X	X
Low tolerance	Brook lamprey	X					X		X	X	X

B2.15.4.3WFD waterbody status

Table B2-134 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-134** also displays the objective status for 2022 (Cycle 3) or the predicted status in 2022 where objective to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-134 WFD classifications

Waterbody ID & Name		GB104027057340 Rivelin from Source to River Loxley	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Good	
	Fish	Good	Medium
	Macroinvertebrates	High	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Good	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.15.5 Invasive non-native species (INNS)

Table B2-135 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No INNS Receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-135**).

Table B2-135 INNS Receptors

Site/Receptor 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 - Freshwater Shrimp (*Crangonyx pseudogracilis*) - New Zealand mud snail (*Potamopyrgus antipodarum*) - Caspian mud snail (*Chelicorophium curvispinum*) -Acute bladder snail (*Physella acuta*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – macroinvertebrates - Signal crayfish (*Pacifastacus leniusculus*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Low	No
Invasive non-native species – Terrestrial plants - Himalayan balsam (*Impatiens glandulifera*) - Japanese knotweed (*Fallopia japonica*) - Giant hogweed (*Heracleum mantegazzianum)* - Japanese rose (*Rosa rugosa*) - Rhododendron (*Rhododendron ponticum*) - Montbretia (*Crocosmia pottsii x aurea = C. x crocosmiiflora*) - Few-flowered garlic (*Allium paradoxum*) - Floating pennywort (*Hydrocotyle ranunculoides*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Invasive non-native species – Mammals American mink (*Neovision vision*)	Major	The implementation of this drought option is not expected to increase the distribution of these INNS	Not sensitive	No

B2.15.6 Landscape, navigation, recreation and heritage

Table B2-136 summarises the wider receptors which should be taken into account in determining the potential impacts of drought option implementation.

No receptors that are sensitive or susceptible to drought permit impacts have been identified (see **Table B2-136**).

Table B2-136 Landscape, navigation, recreation and heritage receptors

Site/Receptor 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)*
Camp/Caravan Site, Rivelin Mill	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Mousehole Forge, Malin Bridge – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
River Rivelin - Angling	Major	Recreational angling takes place on the River Rivelin. Flows during a drought will be low such that further reduction in flows would not be likely to further reduce the angling quality of the reach.	Low	No
River Rivelin - Canoeing	Major	Drought conditions would not be conducive to canoeing.	Not sensitive	No

B3 ENVIRONMENTAL RECEPTORS SCREENING SUMMARY

Table B3-1 Environmental receptors summary of the South Area

Reach	Don 0	Windleden Clough 1	Don 1	Don 2	Don 3	Don 4	Don 5	Scout Dike 1	Little Don 0	Little Don 1	Ewden Beck 1	Dale Dike 1	Loxley 1	Loxley 2	Rivelin 1
Associated Drought Options	Winscar Reservoir	Windleden Lower Reservoir	Winscar Reservoir / Windleden Lower Reservoir	Winscar Reservoir / Windleden Lower Reservoir / Scout Dyke Reservoir	Winscar Reservoir / Windleden Lower Reservoir / Scout Dyke Reservoir / Underbank Reservoir	Winscar Reservoir / Windleden Lower Reservoir / Scout Dyke Reservoir / Underbank Reservoir / More Hall Reservoir	Winscar Reservoir / Windleden Lower Reservoir / Scout Dyke Reservoir / Underbank Reservoir / More Hall Reservoir / Damflask Reservoir / Rivelin Reservoir	Scout Dyke Reservoir	Langsett Reservoir	Underbank Reservoir	More Hall Reservoir	Dale Dike Reservoir	Damflask Reservoir	Damflask Reservoir / Rivelin Reservoir	Rivelin Reservoir
WFD Waterbody	GB104027057500 Don from Source to Scout Dyke	GB104027057500 Don from Source to Scout Dyke	GB104027057500 Don from Source to Scout Dyke	GB104027057490 Don from Scout Dyke to the Little Don	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057412 Don from River Loxley conf to River Don Works; GB104027057413 Don from River Don Works to River Rother	GB104027057530 Scout Dyke from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057400 Ewden Beck from Source to River Don	GB104027057380 Strines Dyke from Source to River Loxley	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057340 Rivelin from Source to River Loxley
Statutory Designated Sites															
SSSI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SAC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SPA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
NERC habitat and Local Wildlife Sites															
NERC Habitat	X	X	X	X	X	X	✓	X	X	X	X	X	X	X	X
Local Wildlife Sites	X	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NERC and Other Protected/ Notable Species Receptors															
White-clawed crayfish	X	X	X	X	X	✓	✓	X	✓	✓	✓	✓	✓	✓	X
Notable Macroinvertebrate Species	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Otter	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Water vole	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Atlantic Salmon	X	X	X	X	X	X	✓	X	X	X	X	X	X	X	X
Barbel	X	X	X	X	✓	X	✓	X	✓	✓	X	X	X	X	X
Brook lamprey	X	X	X	X	X	X	✓	X	X	X	X	X	✓	✓	✓
Brown trout	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bullhead	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
European eel	✓	✓	✓	✓	✓	✓	✓	X	X	X	X	X	X	✓	✓
Grayling	X	✓	✓	✓	✓	✓	✓	X	X	✓	X	X	✓	✓	X
WFD Waterbody WFD Status Receptors															
Fish	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Invertebrates	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Invasive non-native species (INNS)															
INNS – macroinvertebrates	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
INNS – plants	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
INNS – Fish	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Landscape, navigation, recreation and heritage															
Angling	X	X	X	X	X	X	✓	X	X	X	X	X	X	X	X
Nether Mill Fishery	X	X	X	X	X	X	X	✓	X	X	X	X	X	X	X

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

B4 RECEPTORS 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 DON 0

B4.1.1 Receptors assessment

B4.1.1.1 NERC and other protected species

Notable Macroinvertebrates

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in Table B4-1**.**These impacts are evaluated using species' LIFE score categories, which classify invertebrates based on their reliance on specific flow conditions and their ability to tolerate changes in flow regimes.

Table B4-1 Impacts on notable macroinvertebrates in Don 0

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Rhyacophila septentrionis	Reductions in wetted width and depth will reduce habitat availability for the species	Regional	Low	Minor
Potamophylax rotundipennis	Species associated with fast-moderate flows, any reduction is flow with the exception of flow depleted reaches is unlikely to impact upon habitat availability.	County	Low	Minor

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in Table B4-2**.**

Table B4-2 Impacts on otter in Don 0

Receptor	Impact	Ecological Value of Receptor	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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Don 0 as a result of the implementation of the drought option is not feasible. However, as suitable

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

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 B4-3**.** 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 B4-3 Impacts on water vole in Don 0

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as minor and will not impact on this receptor • Species has a preference for waterbodies that do not have extreme fluctuations in water level6. • 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. • 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	Medium	Moderate

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,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout has been classed as medium due to the number of surveys and the age of the most recent surveys completed. The confidence in the data and assessment for European eel has been classed as low due absence from survey data and reliance on historical records.

Table B4-4 Impacts on NERC and notable fish species in Don 0

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered minor. • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools).	National	Medium	Moderate

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.

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
European eel	• Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is unlikely as the risk to longitudinal connectivity is moderate. • Increased mortality (density dependant) as a result of increased predation • Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel	International	Low	Moderate

B4.1.1.2 WFD receptors

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 good 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 medium to high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by good $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a minor risk. Furthermore, there are no significant flow pressures, either abstractions or discharges, influencing flow in Don 0, 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 GB104027057500 Don from Source to Scout Dyke (associated with Don 0). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[8,9]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-18**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-5 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	High

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

[9] 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.

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 **moderate** risk to the fish component of the WFD GB104027057500 Don from Source to Scout Dyke (associated with Don 0). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

A major reduction in the energy of the system associated with up to 67% reduction in flow for the duration of the drought option poses a major risk of reduction to available aquatic habitat and a moderate risk to longitudinal connectivity. A minor risk to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout and grayling spawning sites.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-19**. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-6 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in brown trout spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation.	Medium	Moderate	Medium

B4.1.2 Summary of impacts

Table B4-20 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-7 Summary of impacts identified in Don 0's environmental receptors assessment

Reach	Don 0	
	Significance of Impact	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Rhyacophila septentrionis	Minor	No
Potamophylax rotundipennis	Minor	No
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
European eel	Moderate	Yes
WFD Status Receptors- GB104027057500 Don from Source to Scout Dyke		
Invertebrates	Moderate	Yes
Fish	Moderate	Yes

B4.2 WINDLEDEN CLOUGH 1

B4.2.1 Receptors assessment

B4.2.1.1 NERC and other protected species

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-15.**

Table B4-8 Impacts on otter in Windleden Clough 1

Receptor	Impact	Ecological Value of Receptor	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

Water vole

Due to limited quantitative data on populations of water vole within the impacted reach, a detailed assessment of the impact in Windleden Clough 1 as a result of the implementation of the drought option is not feasible. However, as positive records of water voles and 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 B4-16.** 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 B4-9 Impacts on water vole in Windleden Clough 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as minor and will not impact on this receptor • Species has a preference for waterbodies that do not have extreme fluctuations in water level10. • 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. • 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	National	Medium	Moderate

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

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	times[11] 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.			

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-17,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout has been classed as medium due to the number of surveys and the age of the most recent surveys completed. The confidence in the data and assessment for European eel has been classed as low due absence from survey data and reliance on historical records.

Table B4-10 Impacts on NERC and notable fish species in Windleden Clough 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered minor • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is unlikely as the risk to longitudinal connectivity is moderate. • Increased mortality (density dependant) as a result of increased predation • Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel	National	Medium	Moderate
European eel		International	Low	Moderate

B4.2.1.2 WFD receptors

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 good 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 medium to high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. Given the absence of taxa data, potential impact on the invertebrate community of Windleden Clough 1 will be reassessed following the receipt of 2024 survey data.

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

There are no significant flow pressures, either abstractions or discharges, influencing flow in Windleden Clough 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 GB104027057500 Don from Source to Scout Dyke (associated with Windleden Clough 1). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Subject to a review of the macroinvertebrate community, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-18**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as low due to the number of surveys and availability of community taxa data.

Table B4-11 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	Low

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 **moderate** risk to the fish component of the WFD GB104027057500 Don from Source to Scout Dyke (associated with Windleden Clough 1). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

A major reduction in the energy of the system for the duration of the drought option poses a moderate risk of reduction to available aquatic habitat and a moderate risk to longitudinal connectivity. A minor risk to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-19**. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-12 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in brown trout spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation.	Medium	Moderate	Medium

B4.2.2 Summary of impacts

Table B4-20 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-13 Summary of impacts identified in Windleden Clough 1's environmental receptors assessment

Reach	Windleden Clough 1	
	Significance of Impact	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
European eel	Moderate	Yes
WFD Status Receptors- GB104027057500 Don from Source to Scout Dyke		
Invertebrates	Moderate	Yes
Fish	Moderate	Yes

B4.3 DON 1

B4.3.1 Receptors assessment

B4.3.1.1 NERC and other protected species

Notable Macroinvertebrates

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-14**. These impacts are evaluated using species' LIFE score categories, which classify invertebrates based on their reliance on specific flow conditions and their ability to tolerate changes in flow regimes.

The overall confidence in the notable macroinvertebrate data and subsequent assessment has been classed as low due to the small number of surveys completed where the species were observed.

Table B4-14 Impacts on notable macroinvertebrates in Don 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Oreodytes davisii	Reductions in wetted width and depth will reduce habitat availability for the species	Regional	Low	Minor
Potamophylax rotundipennis	Species associated with fast-moderate flows, any reduction is flow with the exception of flow depleted reaches is unlikely to impact upon habitat availability.	County	Low	Minor
Sialis nigripes		National	Low	Minor

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-15.**

Table B4-15 Impacts on otter in Don 1

Receptor	Impact	Ecological Value of Receptor	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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Don 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 B4-16.** 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 B4-16 Impacts on water vole in Don 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as minor and will not impact on this receptor • Species has a preference for waterbodies that do not have extreme fluctuations in water level12. • 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. • 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	Medium	Moderate

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-17,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, bullhead and grayling has been classed as medium due to the number of surveys and the age of the most recent surveys completed. The confidence in the data and assessment for European eel has been classed as low due absence from survey data and reliance on historical records.

Table B4-17 Impacts on NERC and notable fish species in Don 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered minor • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Potential reduction in effectiveness of Bullhouse Mill Weir fish pass to brown trout movement (noting there a significant barrier at Millhouse Weir downstream in this reach). • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration	National	Medium	Moderate
Bullhead		Regional	Low	Minor
Grayling		Regional	Medium	Moderate
European eel		International	Low	Moderate

[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.

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• Stranding of individuals is unlikely as the risk to longitudinal connectivity is moderate. • Increased mortality (density dependant) as a result of increased predation • It is noted that depth of water is not critical to bullhead[14] • Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel			

B4.3.1.2 WFD receptors

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 good 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 medium to high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by good $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a minor risk. Furthermore, there are no significant flow pressures, either abstractions or discharges, influencing flow in Don 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 GB104027057500 Don from Source to Scout Dyke (associated with Don 1). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[15'16]. There is uncertainty associated with the dilution of iron in the discharge from the Bullhouse Minewater Project in Don 1 and how this may change with drought options as to date no data are available. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-18**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-18 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats.	Medium	Moderate	High

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

[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.

• Reduction in species diversity and abundance resulting from decreased recruitment opportunities.			

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 **moderate** risk to the fish component of the WFD GB104027057500 Don from Source to Scout Dyke (associated with Don 1). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

A major reduction in the energy of the system associated with up to 67% reduction in flow for the duration of the drought option poses a moderate risk of reduction to available aquatic habitat and a moderate risk to longitudinal connectivity. A minor risk to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout and grayling spawning sites.

There is uncertainty associated with the dilution of iron in the discharge from the Bullhouse Minewater Project in Don 1 and how this may change with drought options as to date no data are available.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-19**. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-19 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in brown trout spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of uncertain risk of water quality deterioration (iron toxicity).	Medium	Moderate	Medium

B4.3.2 Summary of impacts

Table B4-20 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-20 Summary of impacts identified in Don 1's environmental receptors assessment

Reach	Don 1	
	Significance of Impact	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Oreodytes davisii	Minor	No
Potamophylax rotundipennis	Minor	No
Sialis nigripes	Minor	No
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
Bullhead	Minor	No
European eel	Moderate	Yes
Grayling	Moderate	Yes
WFD Status Receptors- GB104027057500 Don from Source to Scout Dyke		
Invertebrates	Moderate	Yes
Fish	Moderate	Yes

B4.4 DON 2

B4.4.1 Receptors assessment

B4.4.1.1 Statutory designated sites/Local wildlife sites

Romticle Viaduct & Thurgoland Tunnels LWS

The site includes the Thurgoland Tunnel, which is a double-bore abandoned railway tunnel between Penistone and Wortley and the Romticle viaduct which now carries the Upper Don trail over the River Don near Thurgoland. These receptors of the Romticle Viaduct & Thurgoland Tunnels LWS will not be impacted by the implementation of the drought option and is not considered further. The site also includes the section of the River Don below the viaduct. The River Don flow through Romticle Viaduct & Thurgoland Tunnels 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 the Romticle Viaduct & Thurgoland Tunnels LWS is deemed to be **minor**.

Forge Rocher and Tin Mill Rocher LWS

The River Don runs along the east side of the site and is partially encompasses by the site boundary. Most of the site is ancient or lowland mixed deciduous woodland including wet woodland. Wet woodland occurs on poorly drained or seasonally wet soils, usually with alder, birch and willows as the predominant tree species, but sometimes including ash, oak, pine and beech on the drier riparian areas. Wet woodland are known to be effected by the lowering of water-tables through drainage or water abstraction, resulting in change to drier woodland types, however groundwater during a drought will be low such that any further reduction in groundwater levels or slight delays in recharge rates would not be likely to further reduce the quality of wet woodland outside of normal drought conditions. Two large former ponds are present. Disused millponds are often standing water with limited inflow from adjacent waterbodies. These ponds may now be offline but some connectivity of these ponds to the river cannot be ruled out, and a precautionary approach has been adopted. Based on the available information these ponds may potentially be hydrologically connected via a man-made stream/leat. A reduction in flows within the River Don may result in a disconnection of the ponds with the impacted reach, but given the assumed hydrological regime the risk from the implementation of the drought option to Forge Rocher and Tin Mill Rocher LWS is deemed to be **minor**.

B4.4.1.2 NERC and other protected species

Notable Macroinvertebrates

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-21**. These impacts are evaluated using species' LIFE score categories, which classify invertebrates based on their reliance on specific flow conditions and their ability to tolerate changes in flow regimes.

The overall confidence in the notable macroinvertebrate data and subsequent assessment has been classed as low due to the small number of surveys completed where the species were observed.

Table B4-21 Impacts on notable macroinvertebrates in Don 2

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Paraleptophlebia cincta	Reductions in flow, wetted width, and depth will decrease habitat availability for the species during the implementation of the option.	National	Medium	Moderate
Atherix ibis				

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-22.** The overall confidence in the data and subsequent assessment has been classed as low due to the lack of observations in the impacted reach**-**.

Table B4-22 Impacts on otter in Don 2

Receptor	Impact	Ecological Value of Receptor	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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Don 2 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 potential reduction in flow may impact water vole, as burrow located along the banks on the potentially depleted reach without mitigation within Don 2. The overall confidence in the water vole data and subsequent assessment has been classed as low due to the small number of surveys and the age of the most recent surveys completed where the species was observed.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-23.** 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 B4-23 Impacts on water vole in Don 2

Feature	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as moderate and may impact on this receptor • Species has a preference for waterbodies that do not have extreme fluctuations in water level[17]. • 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. • 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[18] and the potentially increased density of this	National	Medium	Moderate

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

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

Feature	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	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.			

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-24. Appendix A** also details the potential impact of the implementation of the associated drought option on the depleted reach with potential for zero flow without mitigation within Don 2. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed. The confidence in the data and assessment for European eel has been classed as low due absence from survey data and reliance on historical records.

Table B4-24 Impacts on NERC and notable fish species in Don 2

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• It is noted that, fish are known to show a behavioural response to drought conditions and will potentially relocate downstream were suitable habitat is present. • However, the risk of a depleted reach and the major risk to flow reduction and loss of longitudinal connectivity could result in impacts/delay in migration of salmonids. • This would impact on the downstream migration of smolt, the upstream migration of adults and the movement of juveniles from spawning grounds to nursery habitats and feeding areas. • Exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals as a result of a reduction in velocity, depth and/or wetted width • Increased mortality (density dependant) as a result of increased predation • Mortality as a result of water quality deterioration (oxygen stress, gill clogging) – *Salmonids only* • Fragmentation of habitats and increased significance of obstacles/barriers • It is noted that depth of water is not critical to bullhead[19] • Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel	National	High	Major
Bullhead		Regional	Medium	Moderate
Grayling		Regional	High	Major
European eel		International	High	Major

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

B4.4.1.3 WFD receptors

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 good 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 medium to high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by moderate to good $WHPT_{ASPT}$ 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 one listed CSO during rainfall events. Additionally, water quality modelling identifies one continuous discharge, YWSL Cheesebottom WwTW, presenting a significant risk to total ammonia in Don 2. Also continued risk to ammonia associated with Scout Dyke WwTW in the upstream reach (Scout Dike 1).

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 major risk to the macroinvertebrate component of the WFD GB104027057490 Don from Scout Dyke to the Little Don (associated with Don 2). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[20'21]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-25.** The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as **high** due to the number of surveys and the age of the most recent surveys completed.

Table B4-25 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	High

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 **major** risk to the fish component of the WFD GB104027057490 Don from Scout Dyke to the Little Don (associated with Don 2). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

A major reduction in the energy of the system associated with up to 67% reduction in flow for the duration of the drought option poses a moderate risk of reduction to available aquatic habitat and a

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

[21] 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.

major risk to longitudinal connectivity. A minor risk to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

The risk of medium-term chronic, regular, temporary water quality pressures (acute toxicity of ammonia) downstream of Cheesebottom WwTW, as identified in **Appendix A**. Furthermore, there is the potential for one flow depleted reach (with potential for zero flow without mitigation) within Don 2, there is a risk of a reduction in the water quality needed to maintain the current WFD status for fisheries without mitigation.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-26**. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-26 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in brown trout spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of moderate risk of water quality deterioration (ammonia toxicity).	High	Major	Medium

B4.4.2 Summary of impacts

Table B4-27 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-27 Summary of impacts identified in Don 2's environmental receptors assessment

Reach	Don 2	
	Significance of Impact	**Mitigation Required** *(Y/N)*
Statutory designated sites/Local wildlife sites		
Romticle Viaduct & Thurgoland Tunnels LWS	Minor	No
Forge Rocher and Tin Mill Rocher LWS	Minor	No
NERC and Notable Species Receptors		
Paraleptophlebia cincta	Moderate	No
Atherix ibis	Moderate	No
Water vole	Moderate	Yes
Otter	Negligible	No
Brown trout	Major	Yes
Bullhead	Moderate	Yes
Grayling	Major	Yes
European eel	Major	Yes
WFD Status Receptors - GB104027057490 Don from Scout Dyke to the Little Don		

Reach	Don 2	
Invertebrates	Moderate	Yes
Fish	Major	Yes

B4.5 DON 3

B4.5.1 Receptors assessment

B4.5.1.1 Statutory designated sites/Local wildlife sites

Lower Ewden Beck LWS

Lower Ewden Beck LWS comprises woodland, grassland, pasture and heathland. Areas of ancient upland oak woodland are present around the river, with some wet woodland also present. Upland oak woods are characterised by a predominance of oak (most commonly sessile, but locally pedunculate) and birch in the canopy, with varying amounts of holly, rowan and hazel as the main understorey species. The implementation of the drought option will not significantly affect oak woodlands, against a baseline of reduced flows characteristic of drought, as oak woodlands are known to have a high tolerance to prolonged dry periods. Ewden Beck flows through the Lower Ewden Beck LWS, though the impacted reach is upstream of the confluence with Ewden Beck and therefore is unlikely to result in further reduction in flows. As such, the risk from the implementation of the drought option to Lower Ewden Beck is deemed to be **negligible**.

Upper River Don: Deepcar to Hillsborough LWS

The Upper River Don: Deepcar to Hillsborough LWS comprises wetland habitats that provide a wealth of habitats for a vast array of animals and plants. Wet woodlands within this area can be affected by the lowering of water tables through drainage or water abstraction, potentially leading to a transition to drier woodland types. However, during a drought, groundwater levels are typically low, and any further reduction or slight delays in recharge rates are unlikely to significantly reduce the quality of wet woodland outside the scope of normal drought conditions.

A reduction in water quality may result in changes to the composition of the ground flora and invertebrate communities within wet woodland and wetland habitats. However, the implementation of the drought option is not expected to significantly affect water quality beyond what would naturally occur during a drought, which is known to cause noticeable changes in water quality[22]. The River Don flows through the Upper River Don: Deepcar to Hillsborough LWS, and potential changes to the physical environment are presented in **Appendix A**. The appendix highlights a potential minor risk of reduction in the total wetted aquatic habitat within the reach and minor changes in available habitat for species with varying requirements. However, dominant flow types will be maintained. Therefore, the risk from implementing the drought option to the Upper River Don: Deepcar to Hillsborough LWS is deemed to be **minor**.

Upper River Don: Station Road, Deepcar LWS

The Upper River Don: Station Road, Deepcar LWS also comprises wetland habitats, hosting a variety of animal and plant species. Similar to the Deepcar to Hillsborough section, wet woodlands in this area may experience changes due to the lowering of water tables, typically resulting from drainage or water abstraction. However, during drought conditions, groundwater levels are naturally lower, and further reductions are unlikely to adversely affect the quality of wet woodland outside the typical drought impact range.

Potential water quality changes may influence the composition of ground flora and invertebrate communities within wetland habitats. Nonetheless, the drought option is not expected to significantly impact water quality beyond the natural variations observed during droughts. The River Don also flows through the Upper River Don: Station Road, Deepcar LWS. **Appendix A** outlines potential physical changes, including a minor risk of reducing the total wetted aquatic habitat and potential adjustments in species-specific habitat availability. However, the predominant flow types will be preserved. Consequently, the risk from implementing the drought option to the Upper River Don: Station Road, Deepcar LWS is considered **minor**.

[22] Mosley,L. M, Drought impacts on the water quality of freshwater systems; review and integration. Earth-Science Reviews Volume 140, January 2015, Pages 203-214.

B4.5.1.2 NERC and other protected species

Notable Macroinvertebrates

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-28**. These impacts are evaluated using species' LIFE score categories, which classify invertebrates based on their reliance on specific flow conditions and their ability to tolerate changes in flow regimes. The overall confidence in the notable macroinvertebrate data and subsequent assessment has been classed as low due to the small number of surveys completed where the species were observed.

Table B4-28 Impacts on notable macroinvertebrates in Don 3

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Atherix ibis	Reductions in flow, wetted width, and depth will decrease habitat availability for the species during the implementation of the option.	National	Medium	Low

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-29**. The overall confidence in the data and subsequent assessment has been classed as low due to the lack of observations in the impacted reach**.**

Table B4-29 Impacts on otter in Don 3

Receptor	Impact	Ecological Value of Receptor	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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Don 3 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 B4-30.** The overall confidence in the water vole data and subsequent assessment has been classed as low due to the small number of surveys and the age of the most recent surveys completed where the species was observed.

Table B4-30 Impacts on water vole in Don 3

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as moderate and may impact on this receptor	National	Medium	Moderate

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• Species has a preference for waterbodies that do not have extreme fluctuations in water level[23]. • 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. • 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[24] 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.			

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-31,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, bullhead, grayling and barbel has been classed as medium due to the number of surveys and the age of the most recent surveys completed. The confidence in the data and assessment for European eel has been classed as low due absence from survey data and reliance on historical records.

Table B4-31 Impacts on NERC and notable fish species in Don 3

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered minor • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Reduced flow during downstream and upstream migration of brown trout and movement from spawning to nursery areas could be impeded due to lower flows. As flows could be reduced at any time of the year, all life stage are considered to be at risk. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is unlikely as longitudinal connectivity will not be impacted.	National	Medium	Moderate
Bullhead		Regional	Low	Minor
Grayling		Regional	Medium	Moderate
Barbel		County	Low	Minor

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

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

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
European eel	• Increased mortality (density dependant) as a result of increased predation • It is noted that depth of water is not critical to bullhead[25] • Exposure/loss of important habitats (wetland habitats for juveniles and adults)	International	Low	Moderate

B4.5.1.3 WFD receptors

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 good 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 medium to high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by good $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a moderate risk.

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 major risk to the macroinvertebrate component of the WFD GB104027057411 Don from the Little Don to River Loxley confluence (associated with Don 3). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[26,27]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-32**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed, although only at a single site.

Table B4-32 Impacts on macroinvertebrate communities.

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities. • Mortality as a result of water quality deterioration (oxygen/ammonia stress).	Medium	Moderate	Medium

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

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

[27] 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.

Fish

The fish component of the WFD GB104027057411 Don from the Little Don to River Loxley confluence is classified under Cycle 3 (2022) as 'moderate', a deterioration from 'good' in 2019 and 'high' in 2016. This is a negative development, highlighting the waterbody is at greater risk of deteriorating under unfavourable conditions as any disruptions could further impact the fish component. The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons including migratory and spawning periods. Drought option impacts on the physical environment are summarised in **Appendix A**. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

A major reduction in the energy of the system associated with up to 67% reduction in flow for the duration of the drought option poses a minor risk of reduction to available aquatic habitat and a negligible risk to longitudinal connectivity. A minor risk to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-33.** The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-33 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation.	Medium	Minor	Medium

B4.5.2 Summary of impacts

Table B4-34 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-34 Summary of impacts identified in Don 3's environmental receptors assessment

Reach	Don 3	
	Significance of Impact	**Mitigation Required** *(Y/N)*
Statutory designated sites/Local wildlife sites		
Lower Ewden Beck LWS	Negligible	No
Upper River Don: Deepcar to Hillsborough LWS	Minor	No
Upper River Don: Station Road, Deepcar LWS	Minor	No
NERC and Notable Species Receptors		
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
Bullhead	Minor	No
European eel	Moderate	Yes
Grayling	Moderate	Yes

Reach	Don 3	
Barbel	Minor	No
WFD Status Receptors- GB104027057411 Don from the Little Don to River Loxley confluence		
Invertebrates	Moderate	Yes
Fish	Moderate	Yes

B4.6 DON 4

B4.6.1 Receptors assessment

B4.6.1.1 Statutory designated sites/Local wildlife sites

Lower Ewden Beck LWS

Lower Ewden Beck LWS comprises woodland, grassland, pasture and heathland. Areas of ancient upland oak woodland are present around the river, with some wet woodland also present. Wet woodland are known to be effected by the lowering of water-tables through drainage or water abstraction, resulting in change to drier woodland types, however groundwater during a drought will be low such that any further reduction in groundwater levels or slight delays in recharge rates would not be likely to further reduce the quality of wet woodland outside of normal drought conditions. Upland oak woods are characterised by a predominance of oak (most commonly sessile, but locally pedunculate) and birch in the canopy, with varying amounts of holly, rowan and hazel as the main understorey species. The implementation of the drought option will not significantly affect oak woodlands, against a baseline of reduced flows characteristic of drought, as oak woodlands are know to have a high tolerance to prolonged dry periods. Ewden Beck flow through the Lower Ewden Beck LWS, though the impacted reach is upstream of the confluence with Ewden Beck and therefore is unlikely to result in further reduction in flows. As such, the risk from the implementation of the drought option to Lower Ewden Beck is deemed to be **negligible**.

Middle River Don: Hillsborough to City Centre LWS

The banks of the river corridor were previously industrial but are now becoming residential. The woodland on the banks are ancient, containing indicator species such as pendulous sedge, wood anemone and dog's mercury. Island within the river are very species rich with vegetation and wildlife including birds and invertebrates. The islands also host ancient woodland indicator species. Bankside habitats include broad-leaved woodland, scrub, tall and short herbs, built (walls and disused buildings). The river has strong marginal aquatic vegetation and a rich aquatic fauna. The River Don flows through the Middle River Don: Hillsborough to City Centre LWS, with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a Potential moderate risk of reduction in total wetted aquatic habitat in the reach, and moderate 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 Middle River Don: Hillsborough to City Centre LWS is deemed to be **moderate**.

Upper River Don: Deepcar to Hillsborough LWS

Upper River Don: Deepcar to Hillsborough LWS comprises wetland habitats, with the wetlands providing a wealth of habitats for a vast array of animals and plants. Wet woodland are known to be effected by the lowering of water-tables through drainage or water abstraction, resulting in change to drier woodland types, however groundwater during a drought will be low such that any further reduction in groundwater levels or slight delays in recharge rates would not be likely to further reduce the quality of wet woodland outside of normal drought conditions. A reduction in water quality may lead to changes in the composition of the ground flora and invertebrate communities in wetland habitats. The implementation of the drought option will not significantly affect the water quality outside that of a natural drought, which have been shown to result in significant changes in water quality[28]. The River Don flows through the Upper River Don: Deepcar to Hillsborough LWS, with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a potential moderate risk of reduction in total wetted aquatic habitat in the reach, and moderate 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 Upper River Don: Deepcar to Hillsborough LWS is deemed to be **moderate**.

[28] Mosley,L. M, Drought impacts on the water quality of freshwater systems; review and integration. Earth-Science Reviews Volume 140, January 2015, Pages 203-214.

B4.6.1.2 NERC and other protected species

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Don 4 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 overall confidence in the water vole data and subsequent assessment has been classed as low due to the small number of surveys and the age of the most recent surveys completed where the species was observed.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-35.** 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 B4-35 Impacts on water vole in Don 4

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as moderate and may impact on this receptor • Species has a preference for waterbodies that do not have extreme fluctuations in water level[29]. • 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. • 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[30] 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	Medium	Moderate

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-36**. The overall confidence in the data and subsequent assessment has been classed as low due to the lack of observations in the impacted reach**.**

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

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

Table B4-36 Impacts on otter in Don 4

Receptor	Impact	Ecological Value of Receptor	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 B4-37,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, bullhead and grayling has been classed as medium due to the number of surveys and the age of the most recent surveys completed. The confidence in the data and assessment for European eel has been classed as low due absence from survey data and reliance on historical records.

Table B4-37 Impacts on NERC and notable fish species in Don 4

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered moderate • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Reduced flow during downstream and upstream migration of brown trout and movement from spawning to nursery areas could be impeded due to lower flows. As flows could be reduced at any time of the year, all life stage are considered to be at risk. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is likely as risk to longitudinal connectivity is moderate. • Increased mortality (density dependant) as a result of increased predation • It is noted that depth of water is not critical to bullhead[31] • Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel	National	Medium	Moderate
Bullhead		Regional	Low	Minor
Grayling		Regional	Medium	Moderate
European eel		International	Low	Moderate

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

B4.6.1.3 WFD receptors

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 medium to high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by poor to moderate $WHPT_{ASPT}$ 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 one listed CSO during rainfall events.

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 major risk to the macroinvertebrate component of the WFD GB104027057411 Don from the Little Don to River Loxley confluence (associated with Don 4). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[32'33]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-38**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-38 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities. • Mortality as a result of water quality deterioration (oxygen stress).	Medium	Moderate	High

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 **moderate** risk to the fish component of the WFD GB104027057411 Don from the Little Don to River Loxley confluence (associated with Don 4). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

A major reduction in the energy of the system associated with up to 67% reduction in flow for the duration of the drought option poses a moderate risk of reduction to available aquatic habitat and a

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

[33] 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.

moderate risk to longitudinal connectivity. A moderate risk to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

A moderate risk of short term acute water quality pressures consisting of acute toxicity of ammonia and oxygen sags locally downstream of one listed CSO during rainfall events.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-39**. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-39 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of moderate risk of water quality deterioration (oxygen stress and ammonia toxicity).	Medium	Minor	Medium

B4.6.2 Summary of impacts

Table B4-40 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-40 Summary of impacts identified in Don 4's environmental receptors assessment

Reach	Don 4	
	Significance of Impact	**Mitigation Required** *(Y/N)*
Statutory designated sites/Local wildlife sites		
Lower Ewden Beck LWS	Negligible	No
Middle River Don: Deepcar to Hillsborough LWS	Moderate	Yes
Upper River Don: Deepcar to Hillsborough LWS	Moderate	Yes
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
Bullhead	Minor	No
Grayling	Moderate	Yes
European eel	Moderate	Yes
WFD Waterbody - GB104027057411 Don from the Little Don to River Loxley confluence		
Fish	Moderate	Yes
Invertebrates	Moderate	Yes

B4.7 DON 5

B4.7.1 Receptors assessment

B4.7.1.1 Statutory designated sites

Salmon Pastures LNR

Salmon Pastures LNR hosts a unique mix of habitats that support myriad of birds and invertebrates, this reserve plays a vital role in Sheffield's green corridor. 22 species of hoverfly that have been recorded at the reserve. There are also dragonflies, moths and butterflies, including gatekeeper and orange tip. Birds such as mistle thrush, bullfinch, goldfinch and long tailed tit nest and feed in the local area, while kingfishers, little grebe, moorhens and mallards all live nearby on the banks of the River Don. Salmon Pastures has limited aquatic habitat present with woodland and grassland the predominant receptors. The site is not thought to be within connectivity with the impact impacted reach in a way which will impact the habitat during implementation of the drought option. Therefore, the implementation of the drought option will not significantly affect the hydrological regime of the grassland habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Salmon Pastures LNR is deemed to be **negligible,** with a medium confidence level assigned.

Centenary Riverside LNR

Centenary Riverside LNR is a 4.5 hectare wetland reserve alongside the River Don. The site consists of a wildflower meadow bank with a high density of butterflies and insects, and a series of ponds and wetlands that attract a large variety of birds, mammals and insects. The site is excellent for butterflies with 23 different species having been recorded, and is also home to a variety of damsel and dragonflies. A reduction in water quality may lead to changes in the composition of the ground flora and invertebrate communities in wetland habitats. The implementation of the drought option will not significantly affect the water quality outside that of a natural drought, which have been shown to result in significant changes in water quality[34]. The site serves as a natural floodplain for the River Don as the site periodically floods with increased flows in the river. The variation in 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 Centenary Riverside LNR is deemed to be **negligible,** with a medium confidence level assigned.

B4.7.1.2 NERC and local wildlife sites

Salmon Pastures LWS

Impacts to the Salmon Pastures LWS are covered in the above LNR section, with the LWS site sharing the same **negligible** risk from the implementation of the drought option.

Centenary Riverside LWS

Impacts to the Centenary Riverside LWS are covered in the above LNR section, with the LWS site sharing the same **negligible** risk from the implementation of the drought option.

Kelham Island LWS

Kelham Island is one of Sheffield's oldest manufacturing sites, with the manmade island forming in the 1100s, when a stream was diverted to power a nearby mill. The wetland/floodplain habitat is found surround the edge of the ex-industry hub. The River don flow past the island ,which is located in a low-

[34] Mosley,L. M, Drought impacts on the water quality of freshwater systems; review and integration. Earth-Science Reviews Volume 140, January 2015, Pages 203-214.

lying flood plain of the River Don. The site forms part of the natural floodplain and wetland habitat for the River Don. 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. However, the River Don flows through the Kelham Island 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 Kelham Island LWS is deemed to be **minor,** with a medium confidence level assigned.

Sandersons Mill Race LWS

Sandersons Goit (mill race) branches off from the River Don opposite Sandersons Weir, running east between the railway and Stevenson Road; where the water is culverted under Sanderson Kayser Steelworks and back into the river. The mill race contains diverse aquatic vegetation and supports breeding wildfowl and dragonflies. The grassland is rich in wildflowers, including orchids. The River Don flows through the Sandersons Mill Race 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 Sandersons Mill Race LWS is deemed to be **minor.,** with a medium confidence level assigned.

Lower River Don: River Don (City Centre to Blackburn Meadows) 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 Don flows through the Lower River Don: River Don (City Centre to Blackburn Meadows) 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 Lower River Don LWS is deemed to be **minor,** with a high confidence level assigned.

Lower Don Valley: Sheffield and Tinsley Canal LWS

The site encompasses the canal and banks from the River Don Navigation near Tinsley to Park Hill. The canal banks have a range of habitat from woodland, grassland, scrub, tall herbs and urban common. There is much aquatic vegetation on the canal including submerged, floating-leaved, emergent and marginal aquatic plants. Fresh water jellyfish have been recorded on site. The site includes the confluence of Sheffield and Tinsley Canal and River Don, however the implementation of the drought option will not significantly affect the connectivity of the canal with the impacted reach, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Lower Don Valley LWS is deemed to be **minor,** with a low confidence level assigned..

Blackburn Meadows LWS

Sheffield City Council and Yorkshire Water leased an unused part of the former sewage works, to turn into a nature reserve which provides habitat for migrating birds. A water meadow created on vacant land promotes ecological biodiversity and flood water attenuation. The site boundary encompasses a section of the River Don and its banks, an old disused sewage treatment works, areas of woodland, wet woodland, scrub, grassland, heathland, marsh, urban common, standing water, marginal aquatic vegetation and wet woodland. Blackburn Meadows offers a mix of open water, grassland and scrub

attractive to a range of species, including water birds, warblers and finches. There is a lake and wader flash although, as water levels are not controlled on the reserve itself, there may only be sufficient water for wildfowl and other water birds after recent wet weather. The River Don flows through the Blackburn Meadows 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 Blackburn Meadows LWS is deemed to be **minor,** with a low confidence level assigned..

Middle River Don: Hillsborough to City Centre LWS

The banks of the river corridor were previously industrial but are now becoming residential. The woodland on the banks are ancient, containing indicator species such as pendulous sedge, wood anemone and dog's mercury. Island within the river are very species rich with vegetation and wildlife including birds and invertebrates. The islands also host ancient woodland indicator species. Bankside habitats include broad-leaved woodland, scrub, tall and short herbs, built (walls and disused buildings). The river has strong marginal aquatic vegetation and a rich aquatic fauna. The implementation of the drought option will not significantly affect the connectivity of the marginal aquatic vegetation with the main river channel within the impacted reach, against a baseline of reduced flows characteristic of drought. However, the River Don flows through the Middle River Don: Hillsborough to City Centre 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 Middle River Don: Hillsborough to City Centre LWS is deemed to be **moderate,** with a low confidence level assigned..

NERC Habitat

The likely impacts on NERC habitats, and their magnitude are identified in **Table B4-41**.

Table B4-41 Impacts on NERC habitats in Don 5

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
NERC Habitats Reedbeds -452749 -447335	Habitat degradation as a result of decreased river flows in the impacted reach • Habitat degradation potentially linked to effects on connectivity. • Detailed information on connectivity within the reach is lacking. However, loss of connectivity with the impacted reach, are not expected to be significantly increased by implementation of the drought option against a baseline of reduced flows characteristic of drought	County	Negligible	Negligible

B4.7.1.3 NERC and other protected species

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Don 5 as a result of the implementation of the drought option is not feasible. However, as white-clawed crayfish have been recorded as present within the reach, it is possible that individuals will become stranded as river levels reduce, and habitats become exposed.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-42.** 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 B4-42 Impacts on White-clawed crayfish in Don 5

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
White–clawed crayfish	Stranding and mortality as a result of a reduction in velocity, depth and/or wetted width. Increased mortality (density dependant) as a result of increased predation. • Increased competition for resources as habitat availability reduces. Risk of deterioration in water quality has been identified as moderate and may impact on this receptor.	National	Medium	Moderate

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-43.** The overall confidence in the data and subsequent assessment has been classed as low due to the lack of observations in the impacted reach**.**

Table B4-43 Impacts on otter in Don 5

Receptor	Impact	Ecological Value of Receptor	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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Don 5 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 potential reduction in flow may impact water vole, as burrow located along the banks on the two potentially depleted reaches without mitigation within Don 5.The overall confidence in the water vole data and subsequent assessment has been classed as low due to the small number of surveys and the age of the most recent surveys completed where the species was observed.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-44.** 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 B4-44 Impacts on water vole in Don 5

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	Risk of deterioration in water quality has been identified as moderate and may impact on this receptor	National	Medium	Moderate

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	Species has a preference for waterbodies that do not have extreme fluctuations in water level[35]. 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. • 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[36] 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.			

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-45,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, bullhead, barbel, European eel and grayling has been classed as medium due to the number of surveys and the age of the most recent surveys completed. The confidence in data and subsequent assessment for Atlantic salmon has been classed as low due to absence from survey data.

Table B4-45 Impacts on NERC and notable fish species in Don 5

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered minor • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Reduced flow during downstream and upstream migration of brown trout and movement from spawning to nursery areas could be impeded due to lower flows. As flows could be reduced at any time of the year, all life stage are considered to be at risk. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is unlikely as longitudinal connectivity will not be impacted. • Increased mortality (density dependant) as a result of increased predation	National	High	Major
Atlantic Salmon		National	High	Major
Bullhead		Regional	Medium	Moderate
Brook lamprey		Regional	Medium	Moderate
Grayling		Regional	Medium	Moderate
Barbel		County	Medium	Moderate
European eel		International	High	Major

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

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

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• It is noted that depth of water is not critical to bullhead[37] • Exposure/loss of important habitats for juveniles and adults eel			

B4.7.1.4 WFD receptors

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 good 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 medium to high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by poor to good $WHPT_{ASPT}$ 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 seven listed CSO during rainfall events. **Appendix A** also details the potential impact of the implementation of the associated drought option on the two potentially flow depleted reaches with potential for zero flow without mitigation within Don 5.

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 major risk to the macroinvertebrate component of the WFD GB104027057412 Don from River Loxley conf to River Don Works and GB104027057413 Don from River Don Works to River Rother (associated with Don 5). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[38,39]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-46**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-46 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	High

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

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

[39] 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.

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Mortality as a result of water quality deterioration (ammonia stress).			

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 **major** risk to the fish component of the WFD GB104027057412 Don from River Loxley conf to River Don Works and GB104027057413 Don from River Don Works to River Rother (associated with Don 5). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

The risk of medium-term chronic, regular, temporary water quality pressures (acute toxicity of ammonia) downstream of each of Wharncliffe Side WwTW and Ewden WwTW, as identified in **Appendix A**. Furthermore, there is the potential for two flow depleted reaches with potential for periods of time with flow reduced by 13.9% and 40.3% respectively without mitigation within Don 5. The major risk of flow depleted reaches may lead to significant reduction of available aquatic habitat and major reduction of habitat connectivity, leading to impacts on fish movement, and spawning.

A moderate risk of short term acute water quality pressures consisting of acute toxicity of ammonia and oxygen sags locally downstream of seven listed CSO during rainfall events.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-47**. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-47 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows and reduction in longitudinal connectivity. • Reduction in salmonid spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of moderate risk of water quality deterioration (oxygen stress and ammonia toxicity).	High	Major	Medium

B4.7.1.5 Landscape, navigation, recreation and heritage receptors

Angling

The assessment of impacts on angling is based on changes to water flow/levels, water quality summarised in **Appendix A** and fish communities summarised above.

As a result of the implementation of the drought option, the impacts to anglers will involve a required geographical shift in location to target specific areas as fish may avoid impacted areas during the implementation of the drought permit. Despite the potential reduction in abundance and species diversity in the impacted reach, angling would be able to continue during drought permit implementation. Similar impacts on angling will be presented during a natural drought and therefore impacts on angling resulting from the implementation of the drought permit are considered to be **negligible** in Don 5.

B4.7.2 Summary of impacts

Table B4-48 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-48 Summary of impacts identified in Don 5's environmental receptors assessment

Reach	Don 5	
	Significance of Impact	**Mitigation Required** *(Y/N)*
Statutory designated sites		
Centenary Riverside LNR	Negligible	No
Salmon Pastures LNR	Negligible	No
NERC and local wildlife sites		
Kelham Island LWS	Minor	No
Centenary Riverside LWS	Negligible	No
Sandersons Mill Race LWS	Minor	No
Salmon Pastures LWS	Negligible	No
Lower River Don: River Don (City Centre to Blackburn Meadows) LWS	Minor	No
Lower Don Valley: Sheffield and Tinsley Canal LWS	Minor	No
Middle River Don: Hillsborough to City Centre LWS	Moderate	Yes
Blackburn Meadows LWS	Minor	No
NERC Habitats (Reedbeds) -452749 -447335	Negligible	No
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Atlantic Salmon	Major	Yes
Barbel	Moderate	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes
European eel	Major	Yes
Grayling	Moderate	Yes
Brook lamprey	Moderate	Yes
Invertebrates	Moderate	Yes
Fish	Major	Yes
WFD Status Receptors - GB104027057413 Don from River Don Works to River Rother		
Invertebrates	Moderate	Yes
Fish	Major	Yes
Landscape, navigation, recreation and heritage receptors		
Angling	Negligible	No

B4.8 SCOUT DIKE 1

B4.8.1 Receptors assessment

B4.8.1.1 NERC and other protected species

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-49.** The overall confidence in the data and subsequent assessment has been classed as low due to the lack of quantitative data.

Table B4-49 Impacts on otter in Scout Dike 1

Receptor	Impact	Ecological Value of Receptor	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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Scout Dike 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 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.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-50**. The overall confidence in the data and subsequent assessment has been classed as low due to the lack of quantitative data.

Table B4-50 Impacts on water vole in Scout Dike 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as moderate and may impact on this receptor • Species has a preference for waterbodies that do not have extreme fluctuations in water level[40]. • 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. • 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	National	Medium	Moderate

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

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	times[41] 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.			

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-51,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, bullhead and grayling has been classed as medium due to the number of surveys and the age of the most recent surveys completed. The confidence in the data and assessment for European eel has been classed as low due absence from survey data and reliance on historical records.

Table B4-51 Impacts on NERC and notable fish species in Scout Dike 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered minor • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Reduced flow during downstream and upstream migration of brown trout and movement from spawning to nursery areas could be impeded due to lower flows. As flows could be reduced at any time of the year, all life stage are considered to be at risk. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is unlikely as longitudinal connectivity will not be impacted. • Increased mortality (density dependant) as a result of increased predation • It is noted that depth of water is not critical to bullhead[42] • Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel	National	Medium	Moderate
Bullhead		Regional	Low	Minor
European eel		International	Low	Moderate
Grayling		Regional	Medium	Moderate

B4.8.1.2 WFD receptors

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

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

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

good 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 medium to high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by good $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a moderate risk. Additionally, water quality modelling identifies one frequently spilling CSO potential presenting an environmental risk in the reach, as well as one continuous discharge, YWSL Scout Dike WwTW, presenting a significant risk to total ammonia in Scout Dike 1.

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 major risk to the macroinvertebrate component of the WFD GB104027057530 Scout Dyke from Source to River Don (associated with Scout Dike 1). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[43'44]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-52**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-52 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities. • Mortality as a result of water quality deterioration (ammonia stress).	Medium	Moderate	High

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 **moderate** risk to the fish component of the WFD GB104027057530 Scout Dyke from Source to River Don (associated with Scout Dike 1). The risk of medium-term chronic, regular, temporary water quality pressures (acute toxicity of ammonia) downstream of Scout Dike WwTW, as identified in **Appendix A**. The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-53**. The overall confidence in the fisheries data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

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

[44] 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.

Table B4-53 Impacts on fish communities.

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows and reduction in longitudinal connectivity. • Reduction in salmonid spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of moderate risk of water quality deterioration (oxygen stress and ammonia toxicity).	High	Major	Medium

B4.8.1.3 Landscape, navigation, recreation and heritage receptors

Nether Mill Fishery

Nether Mill Fishery is a purpose-built fishing lake which covers nearly 2 acres and provides 32 pegs for anglers of all ages, interests and abilities. The lake contains 3 purpose-built islands and lake depth varies slightly between 130 and 150cm. The margins and the islands are planted with a wide variety of plants to provide cover and spawning grounds for the fish. The lake is fed by Scout Dyke Beck, which ensures a constant flow through the fishery. Based on the available information the pond may be hydrologically connected via a man-made stream /leat. A reduction in flows within the River Scout Dike 1 may result in a disconnection of the ponds with the impacted reach, however given the large size of the pond the risk from the implementation of the drought option to Nether Mill Fishery is deemed to be **negligible.**

B4.8.2 Summary of impacts

Table B4-54 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-54 Summary of impacts identified in Scout Dike 1's environmental receptors assessment

Reach	Scout Dike 1	
	Significance of Impact	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
Bullhead	Minor	No
European eel	Moderate	Yes
Grayling	Moderate	Yes
WFD Status Receptors - GB104027057530 Scout Dyke from Source to River Don		
Invertebrates	Moderate	Yes
Fish	Moderate	Yes
Landscape, navigation, recreation and heritage receptors		
Nether Mill Fishery	Negligible	No

B4.9 LITTLE DON 0

B4.9.1 Receptors assessment

B4.9.1.1 NERC and other protected species

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Little Don 0 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, it is possible that individuals will become stranded as river levels reduce, and habitats become exposed.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-55.** 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 B4-55 Impacts on White-clawed crayfish in Little Don 0

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
White–clawed crayfish	• Stranding and mortality as a result of a reduction in velocity, depth and/or wetted width. • Increased mortality (density dependant) as a result of increased predation. • Increased competition for resources as habitat availability reduces. • Risk of deterioration in water quality has been identified as moderate and may impact on this receptor.	National	Low	Moderate

Notable Macroinvertebrates

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-56**. These impacts are evaluated using species' LIFE score categories, which classify invertebrates based on their reliance on specific flow conditions and their ability to tolerate changes in flow regimes.

The overall confidence in the notable macroinvertebrate data and subsequent assessment has been classed as low due to the small number of surveys completed where the species were observed.

Table B4-56 Impacts on notable macroinvertebrates in Little Don 0

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Paraleptophlebia cincta	Reductions in flow, wetted width, and depth will decrease habitat availability for the species during the implementation of the option.	National	Low	Minor
Potamophylax rotundipennis	Species associated with fast-moderate flows, any reduction is flow with the exception of flow depleted reaches is unlikely to impact upon habitat availability.	County	Low	Minor

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Tinodes assimilis	Reductions in flow, wetted width, and depth will decrease habitat availability for the species during the implementation of the option.	National	Low	Minor
Sialis nigripes	Reductions in flow, wetted width, and depth will decrease habitat availability for the species during the implementation of the option.	National	Low	Minor

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-57**.

Table B4-57 Impacts on otter in Little Don 0

Receptor	Impact	Ecological Value of Receptor	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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Little Don 0 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 potential reduction in flow may impact water vole, as burrow located along the banks on the potentially depleted reach without mitigation within Little Don 0.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-58**. 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 B4-58 Impacts on water vole in Little Don 0

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as moderate and may impact on this receptor • Species has a preference for waterbodies that do not have extreme fluctuations in water level[45]. • 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.	National	Medium	Moderate

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

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• 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[46] 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.			

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-59. Appendix A** also details the potential impact of the implementation of the associated drought option on the depleted reach with potential for zero flow without mitigation within Little Don 0. The overall confidence in the data and subsequent assessment for brown trout and bullhead has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-59 Impacts on NERC and notable fish species in Little Don 0

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered minor • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Reduced flow during downstream and upstream migration of brown trout and movement from spawning to nursery areas could be impeded due to lower flows. As flows could be reduced at any time of the year, all life stage are considered to be at risk. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is likely as longitudinal connectivity may be impacted. • Increased mortality (density dependant) as a result of increased predation • It is noted that depth of water is not critical to bullhead[47]	National	Medium	Moderate
Bullhead		Regional	Low	Minor

B4.9.1.2 WFD receptors

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 good to high level of diversity, and consequently, loss of habitat may reduce the diversity of the

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

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

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 high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by poor to moderate $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a moderate risk.

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 major risk to the macroinvertebrate component of the GB104027057460 Little Don from Source to River Don (associated with Little Don 0). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[48,49]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-60.** The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-60 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	Low

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 **moderate** risk to the fish component of the GB104027057460 Little Don from Source to River Don The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

A major reduction in the energy of the system associated with up to 67% reduction in flow for the duration of the drought option poses a major risk of reduction to available aquatic habitat and a major risk to longitudinal connectivity associated with three weirs. A moderate risk to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-61.** The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and age of the most recent surveys completed.

Table B4-61 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in spawning and juvenile survival due to habitat loss.	Medium	Minor	Medium

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

[49] 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.

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Increased risk of stress and predation.			

B4.9.2 Summary of impacts

Table B4-62 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-62 Summary of impacts identified in Little Don 0's environmental receptors assessment

Reach	Little Don 0	
	Significance of Impact	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Notable macroinvertebrates	Minor	No
Paraleptophlebia cincta	Minor	No
Potamophylax rotundipennis	Minor	No
Tinodes assimilis	Minor	No
Sialis nigripes	Minor	No
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
Bullhead	Minor	No
WFD Status Receptors - GB104027057460 Little Don from Source to River Don		
Invertebrates	Moderate	Yes
Fish	Moderate	Yes

B4.10 LITTLE DON 1

B4.10.1 Receptors assessment

B4.10.1.1 Statutory designated sites/Local wildlife sites

Upper River Don: Deepcar to Hillsborough LWS

Upper River Don: Deepcar to Hillsborough LWS comprises wetland habitats, with the wetlands providing a wealth of habitats for a vast array of animals and plants. Wet woodland are known to be effected by the lowering of water-tables through drainage or water abstraction, resulting in change to drier woodland types, however groundwater during a drought will be low such that any further reduction in groundwater levels or slight delays in recharge rates would not be likely to further reduce the quality of wet woodland outside of normal drought conditions. A reduction in water quality may lead to changes in the composition of the ground flora and invertebrate communities in wetland habitats. The implementation of the drought option will not significantly affect the water quality outside that of a natural drought, which have been shown to result in significant changes in water quality[50]. The Little Don flows through a small northern section of the Upper River Don: Deepcar to Hillsborough LWS, with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a potential moderate risk of reduction in total wetted aquatic habitat in the reach, and moderate 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 Upper River Don: Deepcar to Hillsborough LWS is deemed to be **minor**.

Lower Little Don, Stocksbridge LWS

Lower Little Don, Stocksbridge contains the Lower Little Don River and fringing surrounding areas. As well as the river habitats) the site includes areas of semi-natural woodland, ancient woodland, unimproved grassland neutral grassland, lowland heath and improved grassland on regenerating brownfield sites. The river corridor has been altered by industry and has been culverted in other sections. A reduction in water quality may lead to changes in the composition of the ground flora and invertebrate communities in wetland habitats. The implementation of the drought option will not significantly affect the water quality outside that of a natural drought, which have been shown to result in significant changes in water quality[51]. Riparian wetlands are resilient ecosystems that can adapt to extreme periodic drought–flood episodes[52]. The Little Don flow through Lower Little Don, Stocksbridge LWS with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a Potential moderate risk of reduction in total wetted aquatic habitat in the reach, and moderate risk of changes in available habitat for different species requirements – noting that dominant flow types will be retained. At the numerous sections the channel and banks of the little Don have been resectioned and reinforced and some areas have been the channel had been realigned and overdeepened. As such, the risk from the implementation of the drought option to Upper River Don: Lower Little Don, Stocksbridge LWS is deemed to be **minor**.

B4.10.1.2 NERC and other protected species

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Little Don 1as 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, it is possible that individuals will become stranded as river levels reduce and habitats become exposed.

[50] Mosley,L. M, Drought impacts on the water quality of freshwater systems; review and integration. Earth-Science Reviews Volume 140, January 2015, Pages 203-214.

[51] Mosley,L. M, Drought impacts on the water quality of freshwater systems; review and integration. Earth-Science Reviews Volume 140, January 2015, Pages 203-214.

[52] Sandi, S.G., Rodriguez, J.F., Saintilan, N. *et al*. Resilience to drought of dryland wetlands threatened by climate change. Sci Rep 10, 13232 (2020).

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-63.** 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 B4-63 Impacts on White-clawed crayfish in Little Don 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
White–clawed crayfish	• Stranding and mortality as a result of a reduction in velocity, depth and/or wetted width. • Increased mortality (density dependant) as a result of increased predation. • Increased competition for resources as habitat availability reduces. • Risk of deterioration in water quality has been identified as moderate and may impact on this receptor.	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 B4-64**.

Table B4-64 Impacts on otter in Little Don 1

Receptor	Impact	Ecological Value of Receptor	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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Little Don 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 potential reduction in flow may impact water vole, as burrow located along the banks on the potentially depleted reach without mitigation within Little Don 1.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-65.** 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 B4-65 Impacts on water vole in Little Don 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as moderate and may impact on this receptor	National	Medium	Moderate

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• Species has a preference for waterbodies that do not have extreme fluctuations in water level[53]. • 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. • 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[54] 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.			

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-66**. **Appendix A** also details the potential impact of the implementation of the associated drought option on the depleted reach with potential for zero flow without mitigation within Little Don 1. The overall confidence in the data and subsequent assessment for brown trout, bullhead and grayling has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-66 Impacts on NERC and notable fish species in Little Don 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered minor • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Reduced flow during downstream and upstream migration of brown trout and movement from spawning to nursery areas could be impeded due to lower flows. As flows could be reduced at any time of the year, all life stage are considered to be at risk. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is likely as longitudinal connectivity may be impacted. • Increased mortality (density dependant) as a result of increased predation	National	Medium	Moderate
Bullhead		Regional	Low	Minor
Grayling		Regional	Medium	Moderate

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

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

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• It is noted that depth of water is not critical to bullhead[55]			

B4.10.1.3WFD receptors

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 good 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 high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by poor to moderate $WHPT_{ASPT}$ 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 an short-term acute impact on invertebrate community, associated with additional temporary water quality pressures locally downstream of one listed CSO during rainfall events.

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 major risk to the macroinvertebrate component of the WFD GB104027057460 Little Don from Source to River Don (associated with Little Don 1). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[56'57]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-67**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-67 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	High

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

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

[57] 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.

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 **moderate** risk to the fish component of the WFD GB104027057460 Little Don from Source to River Don (associated with Little Don 1). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **Moderate**. Furthermore, there is the potential for one flow depleted reaches (with potential for zero flow without mitigation) within little Don 1, there is a risk of a reduction in the water quality needed to maintain the current WFD status for fisheries.

in **Table B4-68**. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and age of the most recent surveys completed.

Table B4-68 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of moderate risk of water quality deterioration (oxygen stress and ammonia toxicity).	Medium	Minor	Medium

B4.10.2 Summary of impacts

Table B4-69 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-69 Summary of impacts identified in Little Don 1's environmental receptors assessment

Reach	Little Don 1	
	Significance of Impact	**Mitigation Required** *(Y/N)*
Statutory designated sites/Local wildlife sites		
Upper River Don: Deepcar to Hillsborough LWS	Minor	No
Lower Little Don, Stocksbridge LWS	Minor	No
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
Bullhead	Minor	No
Grayling	Moderate	Yes
WFD Status Receptors - GB104027057460 Little Don from Source to River Don		
Invertebrates	Moderate	Yes
Fish	Moderate	Yes

B4.11 EWDEN BECK 1

B4.11.1 Receptors assessment

B4.11.1.1 Statutory designated sites/Local wildlife sites

Lower Ewden Beck LWS

Lower Ewden Beck LWS comprises woodland, grassland, pasture and heathland. Areas of ancient upland oak woodland are present around the river, with some wet woodland also present. Wet woodland are known to be effected by the lowering of water-tables through drainage or water abstraction, resulting in change to drier woodland types, however groundwater during a drought will be low such that any further reduction in groundwater levels or slight delays in recharge rates would not be likely to further reduce the quality of wet woodland outside of normal drought conditions. Upland oak woods are characterised by a predominance of oak (most commonly sessile, but locally pedunculate) and birch in the canopy, with varying amounts of holly, rowan and hazel as the main understorey species. The implementation of the drought option will not significantly affect oak woodlands, against a baseline of reduced flows characteristic of drought, as oak woodlands are known to have a high tolerance to prolonged dry periods. Ewden Beck flows through the Lower Ewden Beck LWS, with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a major risk of reduction in total wetted aquatic habitat in the reach, and major 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 Lower Ewden Beck is deemed to be **moderate**.

Upper River Don: Deepcar to Hillsborough LWS

Upper River Don: Deepcar to Hillsborough LWS comprises wetland habitats, with the wetlands providing a wealth of habitats for a vast array of animals and plants. Wet woodland are known to be effected by the lowering of water-tables through drainage or water abstraction, resulting in change to drier woodland types, however groundwater during a drought will be low such that any further reduction in groundwater levels or slight delays in recharge rates would not be likely to further reduce the quality of wet woodland outside of normal drought conditions. A reduction in water quality may lead to changes in the composition of the ground flora and invertebrate communities in wetland habitats. The implementation of the drought option will not significantly affect the water quality outside that of a natural drought, which have been shown to result in significant changes in water quality[58]. Ewden beck is upstream of the Upper River Don: Deepcar to Hillsborough LWS, with potential changes to the physical environment presented in **Appendix A.** As such, the risk from the implementation of the drought option to Upper River Don: Deepcar to Hillsborough LWS is deemed to be **minor**.

B4.11.1.2 NERC and other protected species

Notable Macroinvertebrates

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-70**. These impacts are evaluated using species' LIFE score categories, which classify invertebrates based on their reliance on specific flow conditions and their ability to tolerate changes in flow regimes. The overall confidence in the notable macroinvertebrate data and subsequent assessment has been classed as low due to the small number of surveys completed where the species were observed.

[58] Mosley,L. M, Drought impacts on the water quality of freshwater systems; review and integration. Earth-Science Reviews Volume 140, January 2015, Pages 203-214.

Table B4-70 Impacts on notable macroinvertebrates in Ewden Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Potamophylax rotundipennis	• Species associated with fast-moderate flows, any reduction is flow with the exception of flow depleted reaches is unlikely to impact upon habitat availability.	County	Low	Minor
Riolus subviolaceus	• Species has a moderate sensitivity to organic pollution, but water quality impacts are minor. There will be no likely impacts on the species as a result of water quality pressures. • Although dominant flow types could remain, the species is less mobile compared to fish and the reductions in wetted width and depth could reduce habitat availability for the species.	County	Low	Minor

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Ewden Beck 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, it is possible that individuals will become stranded as river levels reduce and habitats become exposed.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-71** 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 B4-71 Impacts on White-clawed crayfish in Ewden Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
White–clawed crayfish	• Stranding and mortality as a result of a reduction in velocity, depth and/or wetted width. • Increased mortality (density dependant) as a result of increased predation. • Increased competition for resources as habitat availability reduces. • Water quality risks are considered minor and water quality related impacts are considered unlikely.	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 B4-72**

Table B4-72 Impacts on otter in Ewden Beck 1

Receptor	Impact	Ecological Value of Receptor	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.	International	Negligible	Negligible

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• Species could remain within the reach for longer. • Otter likely to move to unaffected reaches.			

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Ewden Beck 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 B4-73**. 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 B4-73 Impacts on water vole in Ewden Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as minor and will not impact on this receptor • Species has a preference for waterbodies that do not have extreme fluctuations in water level[59]. • 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. • 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 times60 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	Medium	Moderate

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-74,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, bullhead and grayling has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

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

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

Table B4-74 Impacts on NERC and notable fish species in Ewden Beck 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered moderate • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Reduced flow during downstream and upstream migration of brown trout and movement from spawning to nursery areas could be impeded due to lower flows. As flows could be reduced at any time of the year, all life stage are considered to be at risk. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is likely as longitudinal connectivity could be impacted. • Increased mortality (density dependant) as a result of increased predation • It is noted that depth of water is not critical to bullhead[61]	National	High	Major
Bullhead		Regional	Medium	Moderate
Grayling		Regional	Medium	Moderate

B4.11.1.3WFD receptors

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 good 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 high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by high $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a moderate risk.

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 major risk to the macroinvertebrate component of the WFD GB104027057400 Ewden Beck from Source to River Don (associated with Ewden Beck 1). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[62,63]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-75**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

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

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

63 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.

Table B4-75 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	High

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 **moderate** risk to the fish component of the WFD GB104027057400 Ewden Beck from Source to River Don (associated with Ewden Beck 1). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

A major reduction in the energy of the system associated with up to 67% reduction in flow for the duration of the drought option poses a major risk of reduction in available aquatic habitat but only a minor risk to longitudinal connectivity owing to the small number of barriers and lack of flow depleted reaches. The reduction in flow poses a moderate risk of changes in sediment dynamics, leading to potential fine sediment deposition on spawning gravels, negatively impacting brown trout spawning.

The likely impacts arising from the hydrological changes as a result o the drought permit are identified in **Table B4-76**. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and age of the most recent surveys completed.

Table B4-76 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of moderate risk of water quality deterioration (ammonia toxicity).	Medium	Minor	Medium

B4.11.2 Summary of impacts

Table B4-77 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-77 Summary of impacts identified in Ewden Beck 1's environmental receptors assessment

Reach	Ewden Beck 1	
	Significance of Impact	**Mitigation Required** *(Y/N)*
Statutory designated sites/Local wildlife sites		
Lower Ewden Beck LWS	Moderate	Yes
Upper River Don: Deepcar to Hillsborough LWS	Minor	No
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Riolus subviolaceus	Minor	No
Potamophylax rotundipennis	Minor	No
Brown trout	Major	Yes
Bullhead	Moderate	Yes
Grayling	Moderate	Yes
WFD Status Receptors - GB104027057400 Ewden Beck from Source to River Don		
Invertebrates	Moderate	Yes
Fish	Moderate	Yes

B4.12 DALE DIKE 1

B4.12.1 Receptors assessment

B4.12.1.1 NERC and other protected species

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Dale Dike 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, it is possible that individuals will become stranded as river levels reduce, and habitats become exposed.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-78**. 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 B4-78 Impacts on White-clawed crayfish in Dale Dike 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
White–clawed crayfish	• Stranding and mortality as a result of a reduction in velocity, depth and/or wetted width. • Increased mortality (density dependant) as a result of increased predation. • Increased competition for resources as habitat availability reduces. • Risk of deterioration in water quality has been identified as moderate and may impact on this receptor.	National	Low	Moderate

Notable Macroinvertebrates

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-79.** These impacts are evaluated using species' LIFE score categories, which classify invertebrates based on their reliance on specific flow conditions and their ability to tolerate changes in flow regimes.

The overall confidence in the notable macroinvertebrate data and subsequent assessment has been classed as low due to the small number of surveys completed where the species were observed.

Table B4-79 Impacts on notable macroinvertebrates in Don 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Stictonectes Lepidus	Reductions in wetted width and depth will reduce habitat availability for the species	Regional	Low	Minor

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-80**.

Table B4-80 Impacts on otter in Dale Dike 1

Receptor	Impact	Ecological Value of Receptor	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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Dale Dike 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 potential reduction in flow may impact water vole, as burrow located along the banks on the potentially depleted reach without mitigation within Dale Dike 1.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B 4-81**. 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 B 4-81 Impacts on water vole in Dale Dike 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as moderate and may impact on this receptor • Species has a preference for waterbodies that do not have extreme fluctuations in water level[64]. • 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. • 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[65] 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	Medium	Moderate

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

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

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-82**. **Appendix A** also details the potential impact of the implementation of the associated drought option on the depleted reach with potential for zero flow without mitigation within Dale Dike 1. The overall confidence in the data and subsequent assessment for brown trout and bullhead has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-82 Impacts on NERC and notable fish species in Dale Dike 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered minor • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Reduced flow during downstream and upstream migration of brown trout and movement from spawning to nursery areas could be impeded due to lower flows. As flows could be reduced at any time of the year, all life stage are considered to be at risk. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is likely as longitudinal connectivity may be impacted. • Increased mortality (density dependant) as a result of increased predation • It is noted that depth of water is not critical to bullhead[66]	National	Medium	Moderate
Bullhead		Regional	Low	Minor

B4.12.1.2WFD receptors

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 good 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 high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by poor to moderate $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a moderate risk.

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 major risk to the macroinvertebrate component of the GB104027057460 Little Don from Source to River Don (associated with Little Don 0). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due

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

to effective re-colonisation strategies in macroinvertebrates[67'68]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-83**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-83 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	High

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 **moderate** risk to the fish component of GB104027057380 Strines Dyke from Source to River Loxley. The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

A major risk of change in the energy of the system associated with up to 67% reduction in flow for the duration of the drought option poses a potentially major risk of reduction in available aquatic habitat and major risk to longitudinal connectivity owing to four weirs within the reach. A moderate risk of change in sediment dynamics could potentially increase deposition of fine sediment, adversely affecting brown trout spawning habitat.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-84**. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-84 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation.	Medium	Moderate	Medium

B4.12.2 Summary of impacts

Table B4-85 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

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

[68] 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.

Table B4-85 Summary of impacts identified in Dale Dike 1's environmental receptors assessment

Reach	Dale Dike 1	
	Significance of Impact	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Stictonectes Lepidus	Minor	No
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
Bullhead	Minor	No
WFD Status Receptors- GB104027057380 Strines Dyke from Source to River Loxley		
Invertebrates	Moderate	Yes
Fish	Moderate	Yes

B4.13 LOXLEY 1

B4.13.1 Receptors assessment

B4.13.1.1 Statutory designated sites/Local wildlife sites

Dam Flask to Rowel Bridge LWS

Dam Flask to Rowel Bridge LWS comprises the slipway of the Damflask reservoir, the River Loxley immediately downstream, areas of fields, broadleaved woodland (mature, wet, semi-natural) and agricultural grassland (unimproved, semi-improved, improved, acid, neutral) around the River Loxley and Storrs Brook. Grassland habitats are expected to be relatively robust to the direct threats posed by natural drought conditions, with drier conditions favouring stress-tolerant (eg deep rooted) and ruderal species due to the increased gaps/bare ground in swards. However, species which are intermediate between stress tolerant and competitive will be retarded by drier summers. Summer drought may favour annual species over perennials, potentially leading to community change[69]. Broadleaved woodland is characterised by trees which do not have needles. Broadleaved woodlands response to drought conditions will differ because the landscapes and type of woodland. However, even within a single landscape, the critical factors may vary: changes in winter rainfall might be important for valley bottoms, whereas summer drought could be critical on adjacent south-facing slopes. Mixed deciduous woodland are thought to have a low sensitivity to climate change related stress, such as droughts. The implementation of the drought option will not significantly affect the hydrological regime of the woodland and grassland habitats against a baseline of reduced flows characteristic of drought. A large pond is known to be present and given the proximity to the river, connectivity to the river is assumed on a precautionary basis. Based on the available information the pond may be hydrologically connected and a reduction in flows within the River Loxley may result in a disconnection of the ponds with the impacted reach, however given the large size of the pond the risk from the implementation of the drought option to Dam Flask to Rowel Bridge LWS is deemed to be **minor**.

Acorn Hill and Little Matlock Wood LWS

Acorn Hill and Little Matlock Wood LWS comprises Contains the Loxley River, areas of standing water (mill ponds) and ancient woodland and associated woodland species, lowland dry acid grassland (UKBAP habitat), unimproved grassland, semi-improved grassland and neutral grassland. has limited aquatic habitat present with woodland and grassland the predominant receptors. The implementation of the drought option will not significantly affect the hydrological regime of the grassland habitat, against a baseline of reduced flows characteristic of drought. Loxley 1 flows through the Acorn Hill and Little Matlock Wood LWS, with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a major risk of reduction in total wetted aquatic habitat in the reach, and major 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 Acorn Hill and Little Matlock Wood LWS is deemed to be **moderate**.

Broadhead Dam to Malin Bridge LWS

The site covers a former mill pond on the River Loxley and Broadhead Dam. The dam hosts sensitive wetland habitats. Wet woodlands are present. The riparian zone hosts large alders. Areas of scrub, springs and tall herbs are also present as well as areas of marginal aquatic vegetation. Wet woodland are known to be effected by the lowering of water-tables through drainage or water abstraction, resulting in change to drier woodland types, however groundwater during a drought will be low such that any further reduction in groundwater levels or slight delays in recharge rates would not be likely to further reduce the quality of wet woodland outside of normal drought conditions. A large pond is known to be present and given the proximity to the river connectivity to the river is assumed on a precautionary basis. Based on the available information the pond may be hydrologically connected via a man-made stream / leat. A reduction in flows within the River Loxley may result in a disconnection of the ponds

[69] Crofts, A. & Jefferson, R.G. 1999 The Lowland Grassland Management Handbook. English Nature & The Wildlife Trusts, Peterborough.

with the impacted reach, however given the large size of the pond the risk from the implementation of the drought option to Broadhead Dam to Malin Bridge LWS is deemed to be **minor.**

Lower Rivelin Valley LWS

The site encompasses the River Rivelin and immediate areas until its confluence with the River Loxley. The area is used for recreation, flood control and nature conservation. Areas wet woodland/alder carr are present, typically at the sites of silted mill ponds. Along with the carr areas, the bankside vegetation among the trees supports ancient woodland indicator species. Wet woodland are known to be effected by the lowering of water-tables through drainage or water abstraction, resulting in change to drier woodland types, however groundwater during a drought will be low such that any further reduction in groundwater levels or slight delays in recharge rates would not be likely to further reduce the quality of wet woodland outside of normal drought conditions. River Rivelin flow through the Lower Rivelin Valley LWS, though the impacted reach (Loxley 1) is upstream of the confluence with River Rivelin and therefore is unlikely to result in further reduction in flows. As such, the risk from the implementation of the drought option to Lower Rivelin Valley LWS is deemed to be **negligible**.

B4.13.1.2NERC and other protected species

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Loxley 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, it is possible that individuals will become stranded as river levels reduce and habitats become exposed.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-86.** 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 B4-86 Impacts on White-clawed crayfish in Loxley 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
White–clawed crayfish	• Stranding and mortality as a result of a reduction in velocity, depth and/or wetted width. • Increased mortality (density dependant) as a result of increased predation. • Increased competition for resources as habitat availability reduces. • Water quality risks are considered minor and water quality related impacts are considered unlikely.	National	Medium	Moderate

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-87**

Table B4-87 Impacts on otter in Loxley 1

Receptor	Impact	Ecological Value of Receptor	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.	International	Negligible	Negligible

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• Otter likely to move to unaffected reaches.			

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Loxley 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 potential reduction in flow may impact water vole, as burrow located along the banks on the potentially depleted reach without mitigation within Loxley 1.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-88**. 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 B4-88 Impacts on water vole in Loxley 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as minor and will not impact on this receptor • Species has a preference for waterbodies that do not have extreme fluctuations in water level[70]. • 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. • 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[71] 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	Medium	Moderate

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-89**. **Appendix A** also details the potential impact of the implementation of the associated drought option on depleted reach with potential for zero flow without mitigation within The overall confidence in the data and subsequent assessment for brown trout, bullhead, brook lamprey

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

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

and grayling has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-89 Impacts on NERC and notable fish species in Loxley 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• It is noted that, fish are known to show a behavioural response to drought conditions and will potentially relocate downstream were suitable habitat is present. • However, the risk of a depleted reach and the major risk to flow reduction and loss of longitudinal connectivity could result in impacts/delay in migration of salmonids. • This would impact on the downstream migration of smolt, the upstream migration of adults and the movement of juveniles from spawning grounds to nursery habitats and feeding areas. • Exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals as a result of a reduction in velocity, depth and/or wetted width • Increased mortality (density dependant) as a result of increased predation • Mortality as a result of water quality deterioration (oxygen stress, gill clogging) – Salmonids only • Fragmentation of habitats and increased significance of obstacles/barriers • It is noted that depth of water is not critical to bullhead[72]	National	High	Major
Grayling		Regional	High	Major
Brook lamprey		National	Medium	Moderate
Bullhead		Regional	Medium	Moderate

B4.13.1.3WFD receptors

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 good 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 medium to high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by bad to moderate $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a minor risk. Furthermore, there are no significant flow pressures, either abstractions or discharges, influencing flow in Loxley 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 major risk to the macroinvertebrate

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

component of the WFD GB104027057370 Loxley from Strines Dyke to River Don (associated with Loxley 1). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[73][74]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-90**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-90 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	High

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 **major** risk to the fish component of the WFD GB104027057370 Loxley from Strines Dyke to River Don (associated with Loxley 1).

The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Furthermore, there is the potential for one flow depleted reach (with potential for zero flow without mitigation) within Loxley 1. Drought option impacts on the physical environment are summarised in **Appendix A**.

Reductions in flow of up to 67% pose a moderate risk of reduction in available aquatic habitat as well as to longitudinal connectivity. A minor risk of changes to sediment dynamics during the drought options could lead to increased deposition of fine sediment, negatively impacting brown trout and grayling spawning. There is uncertainty associated with the dilution of iron in the discharge from abandoned mines at Loxley Bottom and Myers Grove and how this may change with drought options as to date no data are available.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-91**. The overall confidence in the fisheries data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-91 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation.	Medium	Moderate	Medium

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

[74] 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.

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Mortality as a result of uncertain impacts of water quality deterioration from abandoned minewater discharge			

B4.13.2 Summary of impacts

Table B4-92 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-92 Summary of impacts identified in Loxley 1's environmental receptors assessment

Reach	Loxley 1	
	Significance of Impact	**Mitigation Required** *(Y/N)*
Statutory designated sites/Local wildlife sites		
Dam Flask to Rowel Bridge LWS	Minor	No
Acorn Hill and Little Matlock Wood LWS	Moderate	Yes
Lower Rivelin Valley LWS	Negligible	No
Broadhead Dam to Malin Bridge LWS	Minor	No
NERC and Notable Species Receptors		
Gyraulus laevis	Minor	
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes
Grayling	Major	Yes
WFD Status Receptors - GB104027057370 Loxley from Strines Dyke to River Don		
Invertebrates	Moderate	Yes
Fish	Major	Yes

B4.14 LOXLEY 2

B4.14.1 Receptors assessment

B4.14.1.1Statutory designated sites/Local wildlife sites

Malin Bridge to River Don LWS

Malin Bridge to River Don LWS comprises the River Loxley to its confluence with the Don, and the surround margins and woodland habitat. The woodlands are semi-natural. Tall herb habitats also exist, as well as marginal aquatic vegetation. Broadleaved woodland is characterised by trees which do not have needles. Broadleaved woodlands response to drought conditions will differ because the landscapes and type of woodland. However, even within a single landscape, the critical factors may vary: changes in winter rainfall might be important for valley bottoms, whereas summer drought could be critical on adjacent south-facing slopes. Mixed deciduous woodlands are thought to have a low sensitivity to climate change related stress, such as droughts. Therefore, the implementation of the drought option will not significantly affect the hydrological regime of the woodland habitat, against a baseline of reduced flows characteristic of drought. Riparian plant communities and marginal aquatic vegetation along lowland streams are characterised by high species richness due to their system-specific environmental gradients. As these streams and their hydrological gradients are mainly rain-fed, they are sensitive to precipitation changes[75]. Loxley 2 flows through the Malin Bridge to River Don LWS, with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a major risk of reduction in total wetted aquatic habitat in the reach, and major 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 Malin Bridge to River Don LWS is deemed to be **moderate**.

B4.14.1.2NERC and other protected species

Notable Macroinvertebrates

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-93**. These impacts are evaluated using species' LIFE score categories, which classify invertebrates based on their reliance on specific flow conditions and their ability to tolerate changes in flow regimes.

The overall confidence in the notable macroinvertebrate data and subsequent assessment has been classed as low due to the small number of surveys completed where the species were observed.

Table B4-93 Impacts on notable macroinvertebrates in Loxley 2

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Potamophylax rotundipennis	• Species associated with fast-moderate flows, any reduction is flow with the exception of flow depleted reaches is unlikely to impact upon habitat availability.	County	Low	Minor
Atherix ibis	• Reductions in flow, wetted width, and depth will decrease habitat availability for the species during the implementation of the option.	National		
Baetis digitatus				

[75] Garssen, Annemarie G et al. "Effects of climate-induced increases in summer drought on riparian plant species: a meta-analysis." *Freshwater biology* vol. 59,5 (2014): 1052-1063.

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Loxley 2 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, it is possible that individuals will become stranded as river levels reduce and habitats become exposed.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-94.** 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 B4-94 Impacts on White-clawed crayfish in Loxley 2

Feature	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
White–clawed crayfish	• Stranding and mortality as a result of a reduction in velocity, depth and/or wetted width. • Increased mortality (density dependant) as a result of increased predation. • Increased competition for resources as habitat availability reduces. • Water quality risks are considered minor and water quality related impacts are considered unlikely.	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 B4-95

Table B4-95 Impacts on otter in Loxley 2

Feature	Impact	Ecological Value of Receptor	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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Loxley 2 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 B 4-96**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 B 4-96 Impacts on water vole in Loxley 2

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as minor and will not impact on this receptor • Species has a preference for waterbodies that do not have extreme fluctuations in water level76. • 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. • 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[77] 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	Medium	Moderate

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-97,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, bullhead, brook lamprey and grayling has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-97 Impacts on NERC and notable fish species in Loxley 2

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered minor • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Reduced flow during downstream and upstream migration of brown trout and movement from spawning to nursery areas could be impeded due to lower flows. As flows could be reduced at any time of the year, all life stage are considered to be at risk. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is unlikely as longitudinal connectivity will not be impacted.	National	High	Major
Bullhead		Regional	Medium	Moderate
Brook lamprey		National	Medium	Moderate
Grayling		Regional	Medium	Moderate

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

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

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• Increased mortality (density dependant) as a result of increased predation • It is noted that depth of water is not critical to bullhead[78] • Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel			

B4.14.1.3WFD receptors

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 moderate 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 high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by good $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a minor risk. Furthermore, there are no significant flow pressures, either abstractions or discharges, influencing flow in Loxley 2, 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 major risk to the macroinvertebrate component of the WFD GB104027057370 Loxley from Strines Dyke to River Don (associated with Loxley 2). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[79'80]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B 4-98**. The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as medium as the number of surveys could be increased however the age of the most recent surveys completed is strong.

Table B 4-98 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	Medium

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

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

[80] 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.

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 **moderate** risk to the fish component of the WFD GB104027057370 Loxley from Strines Dyke to River Don (associated with Loxley 2).The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

A potential reduction in flow of up to 48% poses a moderate risk to available aquatic habitat and longitudinal connectivity. A minor risk of change in sediment dynamics may increase fine sediment deposition, negatively impacting brown trout and grayling spawning.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-99.** The overall confidence in the fisheries data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-99 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation.	Medium	Moderate	Medium

B4.14.2 Summary of impacts

Table B4-100 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-100 Summary of impacts identified in Loxley 2's environmental receptors assessment

Reach	Loxley 2	
	Significance of Impact	**Mitigation Required** *(Y/N)*
Statutory designated sites/Local wildlife sites		
Malin Bridge to River Don LWS	Moderate	Yes
NERC and Notable Species Receptors		
Potamophylax rotundipennis	Minor	No
Atherix ibis	Minor	No
Baetis digitatus	Minor	No
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes
Brook lamprey	Moderate	Yes
Grayling	Moderate	Yes
WFD Status Receptors - GB104027057370 Loxley from Strines Dyke to River Don		

Reach	Loxley 2	
Invertebrates	Moderate	Yes
Fish	Moderate	Yes

B4.15 RIVELIN 1

B4.15.1 Receptors assessment

B4.15.1.1 Statutory designated sites/Local wildlife sites

Fox Hagg LWS

Fox Hagg nature reserve comprises 33.25 hectares of woodland, grassland and heathland lying within the Rivelin Valley. A stream – Allen Sike - runs south-north through Fox Hagg nature reserve, meeting the River Rivelin which then runs east-west through Fox Hagg extension. Large parts of the reserve are free-draining, but seasonal springs and flushes wet flushes occur where impermeable shales impede drainage. The River Rivelin flows through the Fox Hagg LWS, with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a major risk of reduction in total wetted aquatic habitat in the reach, and major 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 Fox Hagg LWS is deemed to be **moderate**.

Lower/Middle Rivelin Valley LWS

The main habitats of the Lower/Middle Rivelin Valley LWS comprise woodland, with trees such as Alder, Ash, Beech, Holly and Oak. Spring flowers include Bluebell, Cow Parsley, Dog's Mercury, Stitchwort and Wood Sorrel. Birds such as Blackbird, Great tit, Long-tailed tit, Robin and Wren are regularly seen amongst the trees. Others such as Dipper, Grey Heron, Grey Wagtail, Kingfisher and Mallard can be found along the river or at the water-filled mill dams. Areas of wet woodland/alder carr are present, typically at the sites of silted mill ponds. Along with the carr areas, the bankside vegetation among the trees supports ancient woodland indicator species. Wet woodlands are known to be effected by the lowering of water-tables through drainage or water abstraction, resulting in change to drier woodland types, however groundwater during a drought will be low such that any further reduction in groundwater levels or slight delays in recharge rates would not be likely to further reduce the quality of wet woodland outside of normal drought conditions. The River Rivelin flows through the Lower/Middle Rivelin Valley LWS, with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a major risk of reduction in total wetted aquatic habitat in the reach, and major 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 Lower/Middle Rivelin Valley LWS is deemed to be **moderate**.

Roscoe Plantation LWS

The main habitats of the site is patches of acid grassland (on the dry slopes with bilberry and heath bedstraw), a silted mill pond (with developing willow & alder carr), old plantation woodland (possibly formed part of the larger ancient Stannington Wood), and overgrown allotments form the diversity of this site. The River Rivelin flows along the southern boundary. The River Rivelin flows through the Roscoe Plantation LWS, with potential changes to the physical environment presented in **Appendix A. Appendix A** highlights the potential for a major risk of reduction in total wetted aquatic habitat in the reach, and major 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 Roscoe Plantation LWS is deemed to be **moderate**.

B4.15.1.2 NERC and other protected species

Notable Macroinvertebrates

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-101**. These impacts are evaluated using species' LIFE score categories, which classify invertebrates based on their reliance on specific flow conditions and their ability to tolerate changes in flow regimes. The overall confidence in the notable macroinvertebrate data and subsequent assessment has been classed as low due to the small number of surveys completed where the species were observed.

Table B4-101 Impacts on notable macroinvertebrates in Rivelin 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Gyraulus laevis	• Species associated low-to-moderate salinity waters with low-energy hydrodynamic conditions, any reduction is flow is unlikely to impact upon habitat availability.	National	Low	Minor
Sisyra terminalis	• Reductions in wetted width and depth will reduce habitat availability for the species • Reduced water quality in the reach	National	Low	Minor
Wormaldia subnigra	• Species associated with rapid flows, The combined major physical environment (River flows, river habitat and water quality) impacts on the reach are likely to lead to mortality. • There is a major risk of impacts on the species as a result of water quality pressures	County	High	Moderate

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-102**.

Table B4-102 Impacts on otter in Rivelin 1

Feature	Impact	Ecological Value of Receptor	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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Rivelin 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 B4.85** 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 B4.85 Impacts on water vole in Rivelin 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as moderate and may impact on this receptor	National	Medium	Moderate

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• Species has a preference for waterbodies that do not have extreme fluctuations in water level81. • 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. • 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[82] 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.			

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-103,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, bullhead and brook lamprey has been classed as medium due to the number of surveys and the age of the most recent surveys completed. The confidence in the data and assessment for European eel has been classed as low due absence from survey data and reliance on historical records.

Table B4-103 Impacts on NERC and notable fish species in Rivelin 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• The risk to siltation of spawning gravels is considered Moderate • Reduced flow and wetted width could result in exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) • Reduced flow during downstream and upstream migration of brown trout and movement from spawning to nursery areas could be impeded due to lower flows. As flows could be reduced at any time of the year, all life stage are considered to be at risk. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration • Stranding of individuals is likely as longitudinal connectivity will be impacted. • Increased mortality (density dependant) as a result of increased predation • It is noted that depth of water is not critical to bullhead83	National	High	Major
Bullhead		Regional	Medium	Moderate
Brook lamprey		Regional	High	Major
European eel		International	Medium	Moderate

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

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

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

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel			

B4.15.1.3WFD receptors

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 good 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 high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by high $WHPT_{ASPT}$ 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 one listed CSO during rainfall events.

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 major risk to the macroinvertebrate component of the WFD GB104027057340 Rivelin from Source to River Loxley (associated with Holme T2). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[84'85]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B 4-104** The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B 4-104 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	High

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 **Major** risk to the fish component of

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

[85] 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.

the WFD GB104027057340 Rivelin from Source to River Loxley (associated with Rivelin 1). The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

A potential reduction in flow of up to 67% poses a major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. With additional risk to sediment dynamics assessed as moderate. A moderate risk to water quality from short term acute ammonia toxicity or oxygen sags is posed downstream of one listed CSO.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-105.** The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-105 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of moderate risk of water quality deterioration (oxygen stress and ammonia toxicity).	High	Major	Medium

B4.15.2 Summary of impacts

Table B4-106 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate receptors within WFD waterbodies and significance of impacts to statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-106 Summary of impacts identified in Rivelin 1's environmental receptors assessment

Reach	Rivelin 1	
	Significance of Impact	**Mitigation Required** *(Y/N)*
Statutory designated sites/Local wildlife sites		
Middle Rivelin Valley LWS	Moderate	Yes
Lower Rivelin Valley LWS	Moderate	Yes
Fox Hagg LWS	Moderate	Yes
Roscoe Plantation LWS	Moderate	Yes
NERC and Notable Species Receptors		
Gyraulus laevis	Minor	No
Sisyra terminalis	Minor	No
Wormaldia subnigra	Minor	No
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
Brook Lamprey	Major	Yes
Bullhead	Moderate	Yes

Reach	Rivelin 1	
European eel	Moderate	Yes
WFD Status Receptors - GB104027057340 Rivelin from Source to River Loxley		
Invertebrates	Moderate	Yes
Fish	Major	Yes

B5 ENVIRONMENTAL RECEPTORS ASSESSMENT SUMMARY

Table B5-1 Environmental receptors summary of the South Area

Reach	Don 0	Windleden Clough 1	Don 1	Don 2	Don 3	Don 4	Don 5	Scout Dike 1	Little Don 0	Little Don 1	Ewden Beck 1	Dale Dike 1	Loxley 1	Loxley 2	Rivelin 1
Hydrological Impact	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major
Associated Drought Options	**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir / More Hall Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir / More Hall Reservoir / Damflask Reservoir / Rivelin Reservoir**	**Scout Dike Reservoir**	**Langsett Reservoir**	**Underbank Reservoir**	**More Hall Reservoir**	**Dale Dike Reservoir**	**Damflask Reservoir**	**Damflask Reservoir / Rivelin Reservoir**	**Rivelin Reservoir**
WFD Waterbody	GB104027057500 Don from Source to Scout Dyke	GB104027057500 Don from Source to Scout Dyke	GB104027057500 Don from Source to Scout Dyke	GB104027057490 Don from Scout Dyke to the Little Don	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057412 Don from River Loxley conf to River Don Works; GB104027057413 Don from River Don Works to River Rother	GB104027057530 Scout Dyke from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057400 Ewden Beck from Source to River Don	GB104027057380 Strines Dyke from Source to River Loxley	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057340 Rivelin from Source to River Loxley
Statutory designated sites															
Centenary Riverside LNR	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Salmon Pastures LNR	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NERC habitat and Local Wildlife Sites															
Romticle Viaduct & Thurgoland Tunnels LWS	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Forge Rocher and Tin Mill Rocher LWS	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower Ewden Beck LWS	N/A	N/A	N/A	N/A	Negligible	Negligible	N/A	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	N/A
Upper River Don: Station Road, Deepcar LWS	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Upper River Don: Deepcar to Hillsborough LWS	N/A	N/A	N/A	N/A	Minor	Moderate	N/A	N/A	N/A	Minor	Minor	N/A	N/A	N/A	N/A
NERC Habitats, Reedbeds, -452749, -447335	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kelham Island LWS	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Centenary Riverside LWS	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sandersons Mill Race LWS	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Salmon Pastures LWS	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower River Don: River Don (City Centre to Blackburn Meadows) LWS	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower Don Valley: Sheffield and Tinsley Canal LWS	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Middle River Don: Hillsborough to City Centre LWS	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blackburn Meadows LWS	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lower Little Don, Stocksbridge LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A
Dam Flask to Rowel Bridge LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A
Acorn Hill and Little Matlock Wood LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A	N/A
Lower Rivelin Valley LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	Moderate
Broadhead Dam to Malin Bridge LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A
Malin Bridge to River Don LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A
Middle Rivelin Valley LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
Fox Hagg LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate

Reach	Don 0	Windleden Clough 1	Don 1	Don 2	Don 3	Don 4	Don 5	Scout Dike 1	Little Don 0	Little Don 1	Ewden Beck 1	Dale Dike 1	Loxley 1	Loxley 2	Rivelin 1
Hydrological Impact	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major
Associated Drought Options	**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir / More Hall Reservoir**	**Winscar Reservoir /Windleden Lower Reservoir / Scout Dike Reservoir / Underbank Reservoir / More Hall Reservoir / Damflask Reservoir / Rivelin Reservoir**	**Scout Dike Reservoir**	**Langsett Reservoir**	**Underbank Reservoir**	**More Hall Reservoir**	**Dale Dike Reservoir**	**Damflask Reservoir**	**Damflask Reservoir / Rivelin Reservoir**	**Rivelin Reservoir**
WFD Waterbody	GB104027057500 Don from Source to Scout Dyke	GB104027057500 Don from Source to Scout Dyke	GB104027057500 Don from Source to Scout Dyke	GB104027057490 Don from Scout Dyke to the Little Don	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057411 Don from the Little Don to River Loxley confluence	GB104027057412 Don from River Loxley conf to River Don Works; GB104027057413 Don from River Don Works to River Rother	GB104027057530 Scout Dyke from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057460 Little Don from Source to River Don	GB104027057400 Ewden Beck from Source to River Don	GB104027057380 Strines Dyke from Source to River Loxley	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057370 Loxley from Strines Dyke to River Don	GB104027057340 Rivelin from Source to River Loxley
Roscoe Plantation LWS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
NERC and Other Protected/ Notable Species Receptors															
White-clawed crayfish *Austropotamobius pallipe*	N/A	N/A	N/A	N/A	N/A	Moderate	Moderate	N/A	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	N/A
Otter *Lutra lutra*	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Water vole *Arvicola amphibious*	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Snipefly *Atherix ibis*	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A
Mayfly *Baetis digitatus*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A
Freshwater snail *Gyraulus laevis*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	Minor
Water beetle *Oreodytes davisii*	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A	N/A
Mayfly *Paraleptophlebia cincta*	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A
Caddisfly *Potamophylax rotundipennis*	Minor	N/A	Minor	N/A	N/A	N/A	N/A	N/A	Minor	N/A	Minor	N/A	N/A	Minor	N/A
Riffle beetle *Riolus subviolaceus*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A
Rhyacophila septentrionis	Minor	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Alderfly *Sialis nigripes*	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A
Spongefly *Sisyra terminalis*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor
Water beetle *Stictonectes lepidus*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A
Caddisfly *Tinodes assimilis*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor	N/A	N/A	N/A	N/A	N/A	N/A
Caddisfly *Wormaldia subnigra*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minor
Atlantic salmon *Salmo salar*	N/A	N/A	N/A	N/A	N/A	N/A	Major	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Barbel *Barbus barbus*	N/A	N/A	N/A	N/A	Minor	N/A	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Brook lamprey *Lampetra planeri*	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	N/A	N/A	Moderate	Moderate	Major
Brown trout *Salmo trutta*	Moderate	Moderate	Moderate	Major	Moderate	Moderate	Major	Moderate	Moderate	Moderate	Major	Moderate	Major	Major	Major
Bullhead *Cottus gobio*	N/A	N/A	Minor	Moderate	Minor	Minor	Moderate	Minor	Minor	Minor	Moderate	Minor	Moderate	Moderate	Moderate
European eel *Anguilla anguilla*	Moderate	Moderate	Moderate	Major	Moderate	Moderate	Major	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
Grayling *Thymallus thymallus*	N/A	N/A	Moderate	Major	Moderate	Moderate	Moderate	N/A	N/A	Moderate	Moderate	N/A	N/A	Moderate	N/A
	WFD Waterbody WFD Status Receptors														
Macroinvertebrates	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Fish	Moderate	Moderate	Moderate	Major	Moderate	Moderate	Major	Moderate	Moderate	Moderate	Moderate	Moderate	Major	Moderate	Major
	Landscape, navigation, recreation and heritage receptors														
Angling	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nether Mill Fishery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Negligible	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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 receptors within in the reaches susceptible to the drought option(s) implementation. The baseline monitoring programme to inform the susceptibility, sensitivity and assessment of environmental receptors has also been reviewed; On the assumption that otter and water vole can be potentially 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 permits 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 would 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 would 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.1 of YWSL's Drought Plan EMP and a summary is provided in the main EAR Section 6.2.

Further reach specific actions needed are listed below:

- **Don 2:** the assessment has identified a significant water quality pressure in the reach associated with Cheesebottom WwTW and continued risk from Scout Dyke WwTW. (which discharges in Scout Dike 1).
- **Scout Dike 1:** the assessment has identified a significant water quality pressure in the reach associated with Scout Dyke WwTW.

WwTW optimisation plan[86] provides details on enhancement for WwTW that discharge into rivers where compensation flows may be reduced under drought permit implementation. During any future on-set of drought periods (14 weeks before drought control lines are crossed) YWSL will consult with the EA 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, which identifies all significant intermittent water quality pressures identified in this EAR. During any future drought onset period YWSL will also consult with the EA and additional sites could be identified as required.

[86] YWSL (2025) Wastewater Treatment Works Optimisation & Maintenance,for Drought Plan 2027.

ANNEX 1 FULL FISH SURVEY COUNTS

							Low tolerance						Medium tolerance									High tolerance						
Reach	Site ID	Site Name	Survey NGR	Year	Survey Method	Survey Strategy	Bullhead	Brown trout	Grayling	Rainbow trout	Lamprey sp.	Brook lamprey	Chub	Dace	Ruffe	Gudgeon	Pike	Minnow	Stone loach	Common bream	Barbel	Roach	Perch	3-spined stickleback	European eel	Rudd	Orfe / Ide	Roach x bream hybrid
Don 1	RD1	u/s Windleden Clough	SE1587002426	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		36																				
Don 1	RD1	u/s Windleden Clough	SE1587002426	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		24																				
Don 1	4035	Soughley Farm DON/BT/Q/001	SE1884602802	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		108																				
Don 1	4035	Soughley Farm DON/BT/Q/001	SE1884602802	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		66																				
Don 1	4035	Soughley Farm DON/BT/Q/001	SE1884602802	2012	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		63																				
Don 1	4035	Soughley Farm DON/BT/Q/001	SE1884602802	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		93																				
Don 1	4035	Soughley Farm DON/BT/Q/001	SE1884602802	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		60																				
Don 1	4035	Soughley Farm DON/BT/Q/001	SE1884602802	2019	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		69																				
Don 1	4079	Dunford Bridge (lower site)	SE1633202402	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9 †	62																				
Don 1	4079	Dunford Bridge (lower site)	SE1633202402	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		75																				
Don 1	4079	Dunford Bridge (lower site)	SE1633202402	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		108														1						
Don 1	4079	Dunford Bridge (lower site)	SE1633202402	2013	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		120																				
Don 1	4079	Dunford Bridge (lower site)	SE1633202402	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		101																				
Don 1	4079	Dunford Bridge (lower site)	SE1633202402	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		106																				
Don 1	4079	Dunford Bridge (lower site)	SE1633202402	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		113																				
Don 1	4079	Dunford Bridge (lower site)	SE1633202402	2019	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		102																				
Don 1	4133	Thurlstone	SE2367803542	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	4	15																				
Don 1	4133	Thurlstone	SE2367803542	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	17	4	1																			
Don 1	13683	Bull House Bridge	SE2152902936	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		36	1																			
Don 1	13683	Bull House Bridge	SE2152902936	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		89	1															1				
Don 1	RD2	d/s Windleden Clough	SE1620702412	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		148																				
Don 1	RD2	d/s Windleden Clough	SE1620702412	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		110																				
Don 1	RD3	d/s confluence	SE1666902491	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		78																				
Don 1	RD3	d/s confluence	SE1666902491	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		182																				
Don 1	RD4	Pylons (right hand bank)	SE1721402687	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		76																				
Don 1	RD5	Holme farm	SE1808702678	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		62																				
Don 1	RD5	Holme farm	SE1808702678	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		58																				
Don 1	RD6	u/s Soughley farm	SE1850202816	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		87																				
Don 1	RD6	u/s Soughley farm	SE1850202816	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		180																				
Don 1	RD7	Soughley Farm	SE1874902876	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		105																				
Don 1	RD7	Soughley Farm	SE1874902876	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		258																				
Don 1	32088	Dunford Bridge Car Park	SE1588202433	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		95																				

							Low tolerance						Medium tolerance									High tolerance						
Reach	Site ID	Site Name	Survey NGR	Year	Survey Method	Survey Strategy	Bullhead	Brown trout	Grayling	Rainbow trout	Lamprey sp.	Brook lamprey	Chub	Dace	Ruffe	Gudgeon	Pike	Minnow	Stone loach	Common bream	Barbel	Roach	Perch	3-spined stickleback	European eel	Rudd	Orfe / Ide	Roach x bream hybrid
Don 2	4045	Wortley	SK2975499085	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	10	37	4										1									
Don 2	4045	Wortley	SK2975499085	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	1																					
Don 2	4045	Wortley	SK2975499085	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	12	39	5										3				2					
Don 2	4045	Wortley	SK2975499085	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	6	8										3				1	1	1				
Don 2	4045	Wortley	SK2975499085	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	1	6										6				1						
Don 2	4045	Wortley	SK2975499085	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9	8										7	1				1					
Don 2	4045	Wortley	SK2975499085	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	53	23	1									33	62				2	43				
Don 2	4045	Wortley	SK2975499085	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	53	1									999 †	99 †				2					
Don 2	4134	Penistone Cricket Club	SE2540003400	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	2	25											2									
Don 2	4134	Penistone Cricket Club	SE2540003400	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	52	64											3									
Don 2	4135	Cheesebottom STW	SE2790001500	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	35	37																				
Don 2	4135	Cheesebottom STW	SE2790001500	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	14	48	6										1									
Don 2	4135	Cheesebottom STW	SE2790001500	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	15	18	1																			
Don 2	4135	Cheesebottom STW	SE2790001500	2017	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	42	48	8									4	2					2				
Don 2	4135	Cheesebottom STW	SE2790001500	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	39	12	3									1	12									
Don 2	4135	Cheesebottom STW	SE2790001500	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	72	16											11									
Don 2	4135	Cheesebottom STW	SE2790001500	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	24	29										3	19									
Don 2	11961	Oxspring Bridge (WR)	SE2731902047	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	8	64	3									6	3				1					
Don 2	11961	Oxspring Bridge (WR)	SE2731902047	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	39	53	1									1	8				1					
Don 2	11961	Oxspring Bridge (WR)	SE2731902047	2016	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		23																				
Don 2	11961	Oxspring Bridge (WR)	SE2731902047	2017	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	70	28	1										9									
Don 2	11961	Oxspring Bridge (WR)	SE2731902047	2018	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	113	67	5									16	49				1	1				
Don 2	11961	Oxspring Bridge (WR)	SE2731902047	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	109	44										7	30									
Don 2	11961	Oxspring Bridge (WR)	SE2731902047	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	71	24										1	44									
Don 3	YW10010	Deepcar (formerly Stocksbridge STW US)	SK290979	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	81	50	32									3	3					1				
Don 3	YW10010	Deepcar (formerly Stocksbridge STW US)	SK290979	2016	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	47	10	1										1									
Don 3	YW10010	Deepcar (formerly Stocksbridge STW US)	SK290979	2017	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	80	17	1									3	1		1							
Don 3	YW10010	Deepcar (formerly Stocksbridge STW US)	SK290979	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	42	10	3									1	1									
Don 3	YW10010	Deepcar (formerly Stocksbridge STW US)	SK290979	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	85	23	7									14	1									
Don 3	YW10010	Deepcar (formerly Stocksbridge STW US)	SK290979	2024	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	158	192	24									90	22									
Don 3	YW10011	u/s More Hall Bridge	SK2990795549	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	7	13																				
Don 3	YW10011	u/s More Hall Bridge	SK2990795549	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	21	10	5	2								1										
Don 3	YW10011	u/s More Hall Bridge	SK2990795549	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	13	21	7															1				
Don 3	YW10011	u/s More Hall Bridge	SK2990795549	2018	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	22	23																				

							Low tolerance						Medium tolerance									High tolerance							
Reach	Site ID	Site Name	Survey NGR	Year	Survey Method	Survey Strategy	Bullhead	Brown trout	Grayling	Rainbow trout	Lamprey sp.	Brook lamprey	Chub	Dace	Ruffe	Gudgeon	Pike	Minnow	Stone loach	Common bream	Barbel	Roach	Perch	3-spined stickleback	European eel	Rudd	Orfe / Ide	Roach x bream hybrid
Don 3	YW10012	Bitholmes	SK298957	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9	29	1									1											
Don 3	YW10012	Bitholmes	SK298957	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	12	27	1																				
Don 3	YW10012	Bitholmes	SK298957	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	2	15																					
Don 3	YW10012	Bitholmes	SK298957	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	13	14											1										
Don 4	4046	Beeley Wood, d/s weir	SK3187191992	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	38	82	16									80	52					2		3			
Don 4	4046	Beeley Wood, d/s weir	SK3187191992	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	47	49	9										4										
Don 4	4046	Beeley Wood, d/s weir	SK3187191992	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	29	2	1										1										
Don 4	4046	Beeley Wood, d/s weir	SK3187191992	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	14	16	12																				
Don 4	4046	Beeley Wood, d/s weir	SK3187191992	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	30	20	12									22	1										
Don 4	4046	Beeley Wood, d/s weir	SK3187191992	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	197	17	12									80	9 †										
Don 4	4046	Beeley Wood, d/s weir	SK3187191992	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	3	5									999 †	99										
Don 4	4253	Oughtibridge	SK3077993391	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	32	84	8										4										
Don 4	4253	Oughtibridge	SK3077993391	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	40	20																					
Don 4	4253	Oughtibridge	SK3077993391	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	40	37											2										
Don 4	4253	Oughtibridge	SK3077993391	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	81	20											1					1					
Don 4	4253	Oughtibridge	SK3077993391	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	84	41	28										1										
Don 4	16196	Livesey Street - Owlerton, Sheffield	SK3406690207	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	5	53	8					1		3		125	29				1	4		1			
Don 4	16196	Livesey Street - Owlerton, Sheffield	SK3406690207	2017	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	31	46	10									3	6					2					
Don 4	16196	Livesey Street - Owlerton, Sheffield	SK3406690207	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	150	33	16									74	14					2					
Don 5	644	Blackburn Meadows d/s weir DON/CO/TEMP/001	SK4026992088	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	12	10	1			19	14	2	36	3	999 †	999 †		12	17	4	999 †					
Don 5	644	Blackburn Meadows d/s weir DON/CO/TEMP/001	SK4026992088	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	5	4					5	1	18		9999 †	9999 †		7	8	3	999 †					
Don 5	644	Blackburn Meadows d/s weir DON/CO/TEMP/001	SK4026992088	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	16					9	11	6	9	1	999 †	99 †		12	13	10	99 †	1				
Don 5	644	Blackburn Meadows d/s weir DON/CO/TEMP/001	SK4026992088	2013	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	14	22				4	1	3	15		999 †	999 †		21	4	3	9 †	9 †				
Don 5	644	Blackburn Meadows d/s weir DON/CO/TEMP/001	SK4026992088	2014	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		10	12				3	14	6	10					3	18	13						
Don 5	644	Blackburn Meadows d/s weir DON/CO/TEMP/001	SK4026992088	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	7	17	8				2	15		7		40	9		3	64		27					
Don 5	644	Blackburn Meadows d/s weir DON/CO/TEMP/001	SK4026992088	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	14	18	2						4	9	3	51	19		5	6		5					
Don 5	644	Blackburn Meadows d/s weir DON/CO/TEMP/001	SK4026992088	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	196	9	5					6		17		60	41		1	27	3	4					
Don 5	644	Blackburn Meadows d/s weir DON/CO/TEMP/001	SK4026992088	2020	Electric Fishing (AC, PDC and DC)	CPUE	14		5					1	1	3	2	40	2			1	4	5					
Don 5	644	Blackburn Meadows d/s weir DON/CO/TEMP/001	SK4026992088	2024	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	37	75				3	2		3	1	9999 †	9 †		2	15	1	9 †					
Don 5	17371	Kelham Island Museum	SK3509388264	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	36	33									999 †	99 †										
Don 5	17371	Kelham Island Museum	SK3509388264	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	30	45								1	999 †	99 †										
Don 5	17371	Kelham Island Museum	SK3509388264	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	163	71							9 †		999 †	9 †										
Don 5	36760	Effingham Street, sheffield	SK3640088100	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	20	74	125				12	12		10		31	999				3	99 †					
Don 5	36760	Effingham Street, sheffield	SK3640088100	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	10	72	119				7	26	1	1	1	28	10		2		1						

							Low tolerance						Medium tolerance										High tolerance						
Reach	Site ID	Site Name	Survey NGR	Year	Survey Method	Survey Strategy	Bullhead	Brown trout	Grayling	Rainbow trout	Lamprey sp.	Brook lamprey	Chub	Dace	Ruffe	Gudgeon	Pike	Minnow	Stone loach	Common bream	Barbel	Roach	Perch	3-spined stickleback	European eel	Rudd	Orfe / Ide	Roach x bream hybrid
Don 5	36760	Effingham Street, sheffield	SK3640088100	2013	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	38	63	66				11	15	1	1		99 †	99 †			1	3						
Don 5	36760	Effingham Street, sheffield	SK3640088100	2014	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9 †	79	369				2	37		99		99 †	99 †				1						
Don 5	36760	Effingham Street, sheffield	SK3640088100	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	999 †	41	118				1	1				9999 †	999 †					9					
Don 5	38246	Kelham Island (Channel 2)	SK3501288310	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	22	12							8		999 †	999 †				2						
Don 5	38246	Kelham Island (Channel 2)	SK3501288310	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	999 †	36	13									9999 †	999 †				1						
Don 5	41166	Nursery Street, Sheffield	SK3560087900	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	3	21	32					4	2	22		14	99 †			16	5	99 †					
Don 5	41166	Nursery Street, Sheffield	SK3560087900	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	5	30	41		1		1	1	1	25		42	5		2	4	7				1	
Don 5	41167	Blonk Street, sheffield	SK3590087800	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	22	57	108					53	1			16	99 †	6		17	2					1
Don 5	41167	Blonk Street, sheffield	SK3590087800	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	40	70	86				3	22	2	6		81	3	1	1	2	3						
Don 5	41167	Blonk Street, sheffield	SK3590087800	2013	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	42	95	193					8	2	13	1	3	1		2	16	14		1				
Don 5	41167	Blonk Street, sheffield	SK3590087800	2014	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	18	24	78						1		1	9	3				5						
Don 5	41167	Blonk Street, sheffield	SK3590087800	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	200	23	18					1				146	60										
Don 5	41167	Blonk Street, sheffield	SK3590087800	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	153	2	1							1		99	43					3					
Don 5	41167	Blonk Street, sheffield	SK3590087800	2023	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	53	19	29								1	50	9										
Don 5	52747	Firth Rixon	SK4184391906	2013	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	1	10	2				2			14	1	99 †	9		2	25	4						
Scout Dike 1	4340	D/S B6462	SE2396004470	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	2						3										16	4			1	
Scout Dike 1	4340	D/S B6462	SE2396004470	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE							2									3	28				2	
Scout Dike 1	4340	D/S B6462	SE2396004470	2020	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	29	5																				
Scout Dike 1	4340	D/S B6462	SE2396004470	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	99	11		1																		
Scout Dike 1	4340	D/S B6462	SE2396004470	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	110	8															1					
Scout Dike 1	4340	D/S B6462	SE2396004470	2023	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	80	3															1					
Scout Dike 1	29872	Nether Mill Fishery	SE2457603946	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	24	27										20	2				2	5					
Scout Dike 1	29872	Nether Mill Fishery	SE2457603946	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	4	12										47	5										
Scout Dike 1	29872	Nether Mill Fishery	SE2457603946	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	4	34								14		41	6			5							
Scout Dike 1	29872	Nether Mill Fishery	SE2457603946	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	1	26								59		124	6			62							
Scout Dike 1	29872	Nether Mill Fishery	SE2457603946	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9 †	6	1							16		999 †	99 †	1		23	3						
Little Don 0	11957	Downstream Langsett Reservoir	SE2187500411	2011	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		24																11					
Little Don 0	11957	Downstream Langsett Reservoir	SE2190000400	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		24																32					
Little Don 0	11957	Downstream Langsett Reservoir	SE2190000400	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		9																3					
Little Don 0	LD1	d/s Water works	SE2189900421	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		10																7					
Little Don 0	LD1	d/s Water works	SE2189900421	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	2	5																1					
Little Don 0	LD2	Gas main – gorge	SE2232800295	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		30																2					
Little Don 0	LD2	Gas main – gorge	SE2232800295	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		31																3					
Little Don 0	LD3	Bend u/s Uskers Barn	SE2253900190	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		47																4					

							Low tolerance						Medium tolerance									High tolerance							
Reach	Site ID	Site Name	Survey NGR	Year	Survey Method	Survey Strategy	Bullhead	Brown trout	Grayling	Rainbow trout	Lamprey sp.	Brook lamprey	Chub	Dace	Ruffe	Gudgeon	Pike	Minnow	Stone loach	Common bream	Barbel	Roach	Perch	3-spined stickleback	European eel	Rudd	Orfe / Ide	Roach x bream hybrid
Little Don 0	LD3	Bend u/s Uskers Barn	SE2253900190	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		78																2				
Little Don 0	LD4	d/s ford – new gateway	SE2276300177	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	2	30																5				
Little Don 0	LD4	d/s ford – new gateway	SE2276300177	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	2	14																1				
Little Don 0	LD5	u/s Hand Bank, west bend	SK2294999974	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	8	68																				
Little Don 0	LD5	u/s Hand Bank, west bend	SK2294999974	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	43	42																3				
Little Don 0	LD6	u/s Hand Bank, east bend	SK2304999888	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	41	10																1				
Little Don 0	LD6	u/s Hand Bank, east bend	SK2304999888	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	152	7																16				
Little Don 1	4342	Deepcar (formerly Stocksbridge STW US)	SK2900698026	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	28	56	2									33						11				
Little Don 1	4342	Deepcar (formerly Stocksbridge STW US)	SK2900698026	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	33	2									99 †	9 †					99 †				
Little Don 1	31624	Downstream Underbank Reservoir	SK2550599142	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	41	17																				
Little Don 1	31624	Downstream Underbank Reservoir	SK2550599142	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	108	4														4						
Little Don 1	31624	Downstream Underbank Reservoir	SK2550599142	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	19	112														5						
Little Don 1	31624	Downstream Underbank Reservoir	SK2550599142	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	6	42														9						
Little Don 1	31624	Downstream Underbank Reservoir	SK2550599142	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9	16																				
Ewden Beck 1	11987	D/S Morehall Res (WR)	SK2899895624	2010	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		91														2	3					
Ewden Beck 1	11987	D/S Morehall Res (WR)	SK2899895624	2011	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		142														4	3					
Ewden Beck 1	11987	D/S Morehall Res (WR)	SK2899895624	2012	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		105		2												7	6					
Ewden Beck 1	11987	D/S Morehall Res (WR)	SK2899895624	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		53														8	34				1	
Ewden Beck 1	11997	d/s Dupont Abstraction	SK2985595514	2010	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	19	60																				
Ewden Beck 1	11997	d/s Dupont Abstraction	SK2985595514	2011	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	43	54															1					
Ewden Beck 1	11997	d/s Dupont Abstraction	SK2985595514	2012	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	81	53															5					
Ewden Beck 1	11997	d/s Dupont Abstraction	SK2985595514	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	19	28															4					
Ewden Beck 1	11997	d/s Dupont Abstraction	SK2985595514	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	28	41		5								1										
Ewden Beck 1	11997	d/s Dupont Abstraction	SK2985595514	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	57	64																				
Ewden Beck 1	16238	U/S Ewden Beck	SK2990095500	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	17	34	10																			
Ewden Beck 1	16238	U/S Ewden Beck	SK2990095500	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	13	21	7															1				
Ewden Beck 1	16238	U/S Ewden Beck	SK2990095500	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	999 †	14	5									999 †	9 †					99 †				
Dale Dyke 1	4347	D/S Dale Dike Reservoir	SK2553091819	2011	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	50	90																				
Dale Dyke 1	DD1	Walker House Farm	SK2498591796	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		95																				
Dale Dyke 1	DD1	Walker House Farm	SK2498591796	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		74																				
Dale Dyke 1	DD2	d/s weir 300m d/s DD2	SK2521191736	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	48	35																				
Dale Dyke 1	DD2	d/s weir 300m d/s DD2	SK2521191736	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	79	62																				
Dale Dyke 1	DD3	u/s Blindside lane bridge	SK2545791829	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	70	53																				
Dale Dyke 1	DD3	u/s Blindside lane bridge	SK2545791829	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	138	58																				

							Low tolerance						Medium tolerance									High tolerance						
Reach	Site ID	Site Name	Survey NGR	Year	Survey Method	Survey Strategy	Bullhead	Brown trout	Grayling	Rainbow trout	Lamprey sp.	Brook lamprey	Chub	Dace	Ruffe	Gudgeon	Pike	Minnow	Stone loach	Common bream	Barbel	Roach	Perch	3-spined stickleback	European eel	Rudd	Orfe / Ide	Roach x bream hybrid
Dale Dyke 1	DD4	d/s Blindside lane bridge	SK2556391795	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	60	67																				
Dale Dyke 1	DD4	d/s Blindside lane bridge	SK2556391795	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	54	66																				
Dale Dyke 1	DD5	u/s sewage works	SK2594591753	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	34	21																				
Dale Dyke 1	DD5	u/s sewage works	SK2594591753	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	36	27																				
Dale Dyke 1	DD6	u/s Mill Lee road bridge	SK2617091760	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	36	47																				
Dale Dyke 1	DD6	u/s Mill Lee road bridge	SK2617091760	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	17	54																				
Loxley 1	14182	Old Wheel Farm	SK2954989835	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	8	16																				
Loxley 1	14182	Old Wheel Farm	SK2954989835	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9	34																				
Loxley 1	14182	Old Wheel Farm	SK2954989835	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	27	41																				
Loxley 1	14182	Old Wheel Farm	SK2954989835	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	77	55																				
Loxley 1	14184	Proroll	SK3090089400	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	31	74									1						1					
Loxley 1	14184	Proroll	SK3090089400	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	10	27																				
Loxley 1	14184	Proroll	SK3090089400	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	22	61																				
Loxley 1	14184	Proroll	SK3090089400	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	78	82																				
Loxley 1	YW10016	D/S Malin Bridge	SK32578932	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	50	42											1				1					
Loxley 1	YW10016	D/S Malin Bridge	SK32578932	2016	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	40	42										5					1					
Loxley 1	YW10016	D/S Malin Bridge	SK32578932	2017	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	58	45										1	2				1					
Loxley 1	YW10016	D/S Malin Bridge	SK32578932	2018	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	61	46											2				3	1				
Loxley 1	YW10016	D/S Malin Bridge	SK32578932	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	39	35				1																
Loxley 1	YW10016	D/S Malin Bridge	SK32578932	2024	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	100	38				2												2				
Loxley 1	14191	Stacey Lane	SK2869090491	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	31	60																				
Loxley 1	14191	Stacey Lane	SK2869090491	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	38	84	1										2									
Loxley 1	14130	Storrs Bridge Works	SK2930090100	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	22	35																				
Loxley 1	14130	Storrs Bridge Works	SK2930090100	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	38	39																1				
Loxley 2	YW10017	Livesey Street	SK338899	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	20	97	16									8	9				1					
Loxley 2	YW10017	Livesey Street	SK338899	2016	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	36	25	3							1		6	6									
Loxley 2	YW10017	Livesey Street	SK338899	2017	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	31	46	10									3	6					2				
Loxley 2	YW10017	Livesey Street	SK338899	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	8	14	2																			
Loxley 2	YW10017	Livesey Street	SK338899	2018	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	44	16	5									29	11					7				
Loxley 2	YW10017	Livesey Street	SK338899	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	21	12	3																			
Loxley 2	YW10017	Livesey Street	SK338899	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	31	34	2																			
Loxley 2	YW10017	Livesey Street	SK338899	2024	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	100	82				2												2				
Loxley 2	YW10018	Owlerton	SK338896	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	36	6	2																			
Loxley 2	YW10018	Owlerton	SK338896	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	15	4																				

							Low tolerance						Medium tolerance									High tolerance						
Reach	Site ID	Site Name	Survey NGR	Year	Survey Method	Survey Strategy	Bullhead	Brown trout	Grayling	Rainbow trout	Lamprey sp.	Brook lamprey	Chub	Dace	Ruffe	Gudgeon	Pike	Minnow	Stone loach	Common bream	Barbel	Roach	Perch	3-spined stickleback	European eel	Rudd	Orfe / Ide	Roach x bream hybrid
Loxley 2	YW10018	Owlerton	SK338896	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	3	3	2																			
Loxley 2	YW10018	Owlerton	SK338896	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	11	8	2																			
Loxley 2	YW10018	Owlerton	SK338896	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	25	29	39								2						9					
Rivelin 1	14078	Allotments Bridge	SK3203588331	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	999 †	59			9 †								9 †									
Rivelin 1	14078	Allotments Bridge	SK3203588331	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	81	62											2									
Rivelin 1	14078	Allotments Bridge	SK3203588331	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	92	40											1									
Rivelin 1	14078	Allotments Bridge	SK3203588331	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	53	33																				
Rivelin 1	14078	Allotments Bridge	SK3203588331	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	60	44																				
Rivelin 1	14078	Allotments Bridge	SK3203588331	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	31	47			3								1									
Rivelin 1	14078	Allotments Bridge	SK3203588331	2019	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	89	45																				
Rivelin 1	14078	Allotments Bridge	SK3203588331	2021	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	68	32			9 †								1									
Rivelin 1	14078	Allotments Bridge	SK3203588331	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99 †	43			2								9									
Rivelin 1	14199	Rivelin Mill	SK2902587223	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	7	68											16									
Rivelin 1	14199	Rivelin Mill	SK2902587223	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	29	23											3									
Rivelin 1	14199	Rivelin Mill	SK2902587223	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	54	59											2									
Rivelin 1	14199	Rivelin Mill	SK2902587223	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	56	55									2						1					
Rivelin 1	14079	D/S Mill Dam	SK3091687605	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	12	58																				
Rivelin 1	14079	D/S Mill Dam	SK3091687605	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	52	63											2									
Rivelin 1	14126	Glen Bridge	SK3116287834	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	13	51				1																
Rivelin 1	14126	Glen Bridge	SK3116287834	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	46	50				4							1									
Rivelin 1	4346	Havelock Dam	SK3231288697	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	47	73			1							2					1					
Rivelin 1	4346	Havelock Dam	SK3231288697	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	74	57				3																

† Values represents the estimated observed abundance for the completed survey, ranging from 0-9,10-99,100-999, 1000+

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