DROUGHT PLAN 2027: ENVIRONMENTAL ASSESSMENT REPORT

South West Area Reservoirs: Middle Calder Area

Report for: Yorkshire Water Services Ltd

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Glossary

Abstraction Licence

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

Biochemical Oxygen Demand (referred to as BOD)

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

Compensation Releases

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

Discharge Consent

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

Drought Order

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

Drought Permit

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

Environmental Drought

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

Environmental Quality Ratio (EQR)

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

Local Wildlife Sites (LWS)

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

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

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

Macroinvertebrate

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

Natural Environment and Rural Communities (NERC) Act Section 41

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

pH

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

Ramsar site

Internationally important wetland site.

Special Area of Conservation (SAC)

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

Special Protection Area (SPA)

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

Site of Special Scientific Interest (SSSI)

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

Supply Drought

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

Walley Hawkes Paisley Trigg (referred to as WHPT)

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

Abbreviations

AOD	–	Above Ordnance Datum
BOD	–	Biochemical Oxygen Demand
CIEEM	–	Chartered Institute of Ecology and Environmental Management
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 West Area Reservoirs: Middle Calder 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 2025 Drought Plan Guideline (DPG)[1] and the Environment Agency's '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 Middle Calder 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 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.

Key stakeholders will be further consulted throughout the 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 West Area Reservoirs: Middle Calder Area 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 6**). The methodologies and details for monitoring and mitigation requirements are documented in the standalone document 'YWSL's Draft 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 are yet to be published but it is anticipated that water companies will submit these to the Secretary of State in October 2025.

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 Middle Calder Area reservoir drought permit/orders 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: Middle Calder Area reservoirs** - overview of drought permit conditions.

Section 5: **Physical environment effects: Middle Calder Area reservoirs** - 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 5**.

Section 6: **Receptors assessment, monitoring and mitigation: Middle Calder 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 Draft Drought Plan EMP and summarised in **Section 6**. **Appendix C** summarises the full suite of monitoring and mitigation measures as detailed in the EMP.

Appendices

Appendix A Physical Environment

Appendix B Environmental 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 permit/orders may not be used by YWSL at the same time. This EAR considers the impacts of implementation of all nine of the Middle Calder Area reservoir drought permit/orders.

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 Error! Reference source not found.**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.

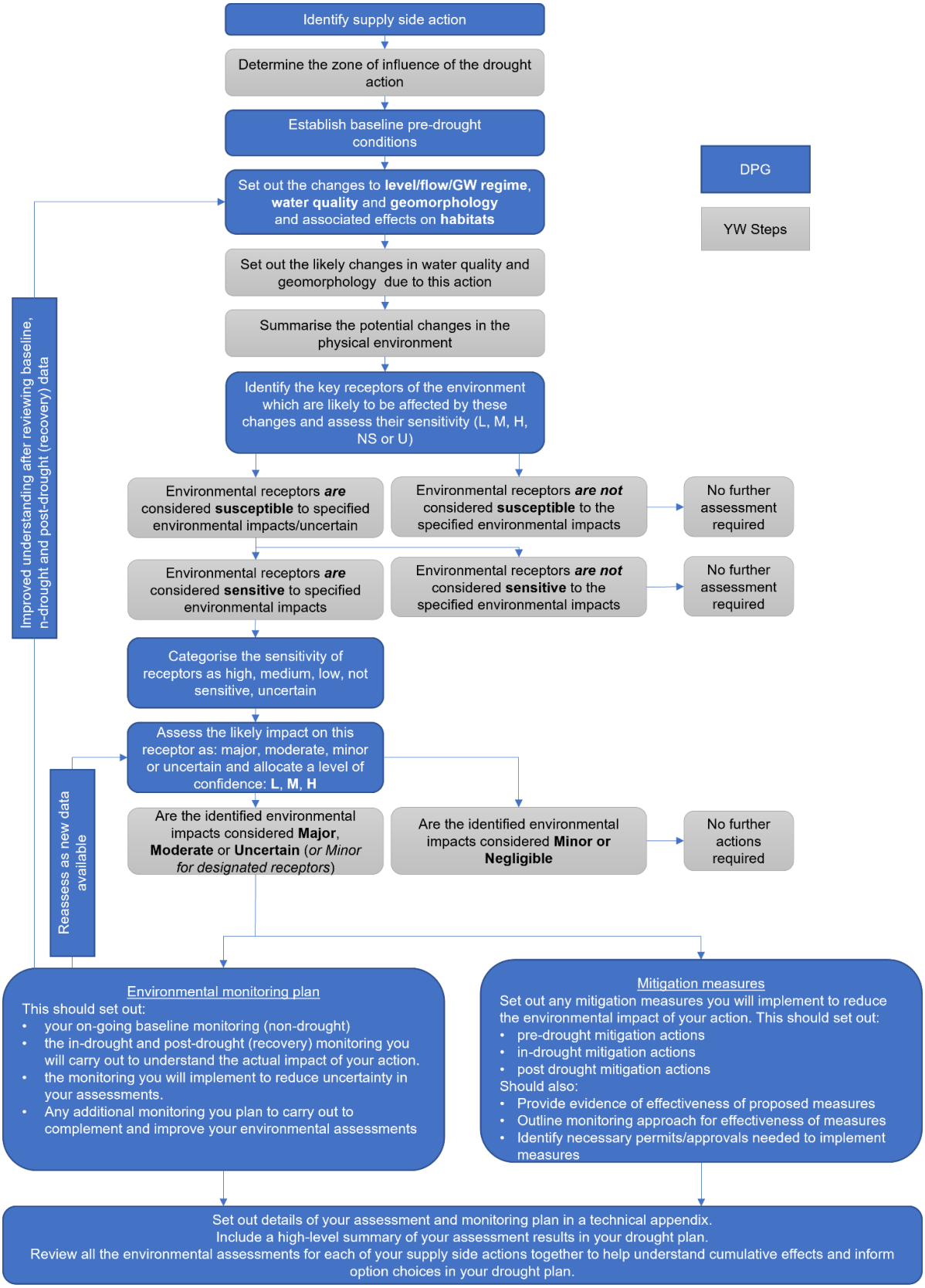

Figure 3-1: Approach to undertaking environmental assessments as identified in the 2024 DPG. Steps in blue are 2024 DPG tasks. Tasks indicated in grey are YWSL tasks

4. DROUGHT OPTIONS OVERVIEW

4.1 DROUGHT PERMIT/ORDER DESCRIPTIONS

This EAR was originally drafted, as per the Yorkshire Water Drought Plan 2022, to include the Deerhill drought permit. The assessments presented in this EAR were based on its implementation. However, following further discussions with the Environment Agency, YWSL has decided to exclude the Deerhill Drought permit from this application and all references to it have been removed from the EAR. Nonetheless, given the time constraints around the application, the assessments below continue to assume a flow reduction associated with the implementation of the Deerhill drought permit and therefore overrepresent the hydrological impact on reaches Colne 2, Colne 3, Colne 4 and Calder 4.

This EAR assesses the potential impacts on the environmental receptors of the South West Area during the period of implementation of associated drought options, specifically the Middle Calder Area. This EAR should be read in conjunction with the Upper Calder EAR. Two EARs have been produced to aid clarity due to the large number of reservoirs in the South West, however the study area should be considered as continuous.

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

1. Scammonden Water – Black Brook drought permit
2. Colne Maintained Flow at Marsden Reservoir drought permit
3. Butterley Reservoir drought permit
4. Blackmoorfoot Reservoir - Hoyle House Clough drought permit
5. Scammonden Water - Bradshaw Clough drought permit
6. Brownhill Reservoir drought permit
7. Digley Reservoir drought permit
8. Blackmoorfoot Reservoir - Brow Grains 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** and **Figure 4-2**.

Table 4-1: Middle Calder Area reservoirs drought permit descriptions

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
Colne Maintained Flow at Marsden Reservoir drought permit							
River Colne Maintained Flow at Marsden	R Colne	SE 042118	7.27	3.64	3.63	2.40	4.87
Butterley Reservoir drought permit							
Butterley Reservoir	Wessenden Brook, R Colne	SE 048107	8.07	4.04	4.03	2.66	5.41
Scammonden Reservoir – Bradshaw Clough drought permit							
Scammonden Water	Bradshaw Clough	SE 058143	1.36	0.68	0.68	0.45	0.91
Scammonden Reservoir – Black Brook drought permit							

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
Scammonden Water	Black Brook	SE 053169	3.49	1.75	1.74	1.15	2.34
Blackmoorfoot Reservoir – Hoyle House Clough drought permit							
Blackmoorfoot Reservoir -Hoyle House Clough	Hoyle House Clough	SE 099131	0.61	0.31	0.30	0.20	0.41
Blackmoorfoot Reservoir – Brow Grains drought permit							
Blackmoorfoot Reservoir - Brow Grains Dyke	Brow Grains Dyke, R Holme	SE 085106	2.67	1.33	1.33	0.88	1.78
Digley Reservoir drought permit							
Digley Reservoir	Digley Brook	SE 112069	10.60 Nov to Jan; 5.80 Feb to May; 4.50 June; 3.20 July; 5.80 August to Oct	5.30 Nov to Jan; 2.90 Feb to May; 2.25 June; 1.6 July; 2.90 August to Oct	1.60 – 5.30	3.50 Nov to Jan; 1.91 Feb to May; 1.49 June; 1.06 July; 1.91 August to Oct	2.14 – 7.10
Brownhill Reservoir drought permit							
Brownhill Reservoir	River Holme	SE 118064	6.90 between Nov to March; 5.40 April to May; 4.80 June to July and; 5.40 August to October	3.45 between Nov to March; 2.70 April to May; 2.40 June to July and; 2.70 August to October	2.70 - 3.45	2.28 between Nov to March; 1.78 April to May; 1.58 June to July and; 1.78 August to October	3.22 - 4.62

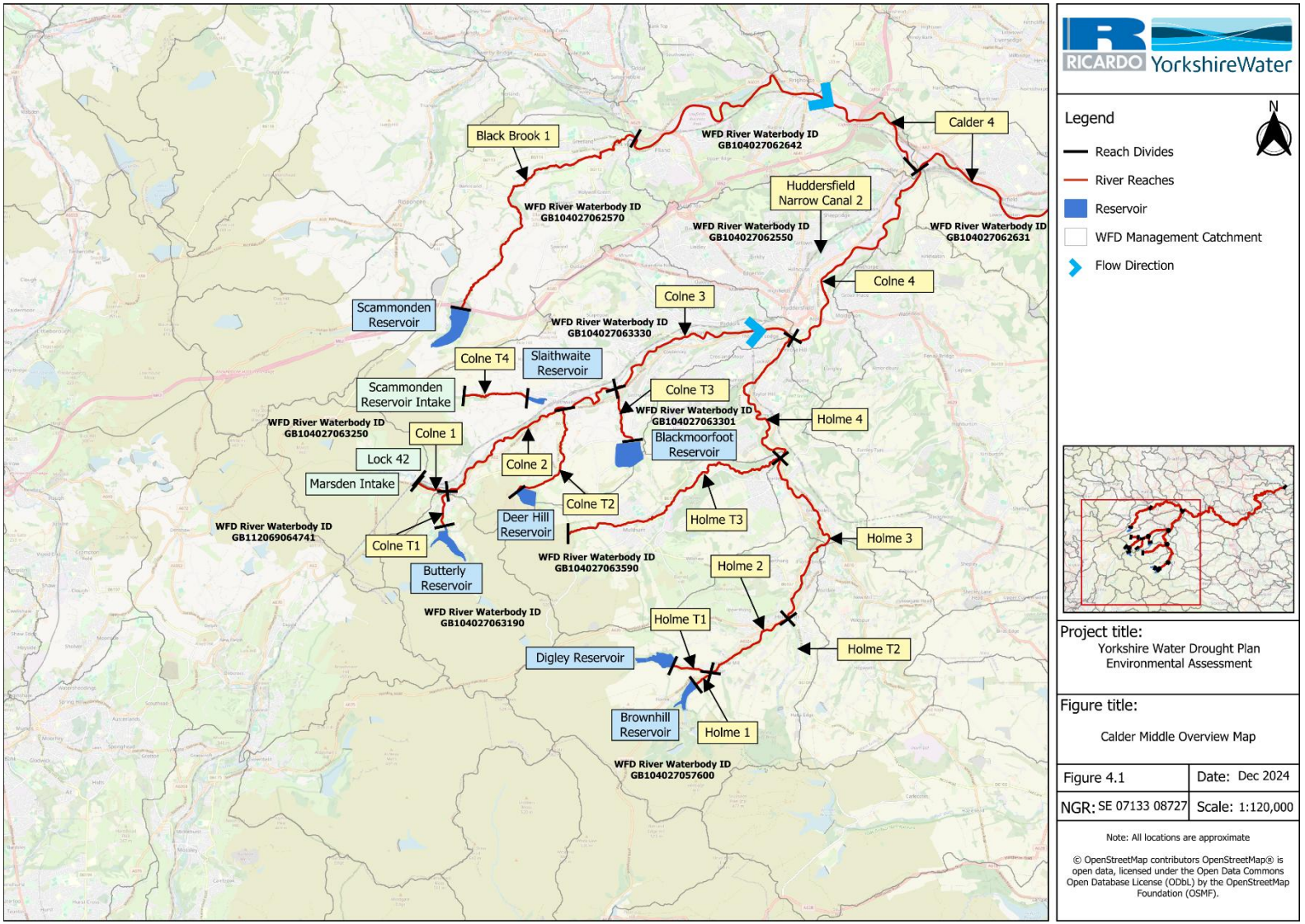

Figure 4-1: Overview Map; Scammonden, Blackmoorfoot, Slaithwaite, Butterley, Digley, and Brownhill Reservoirs

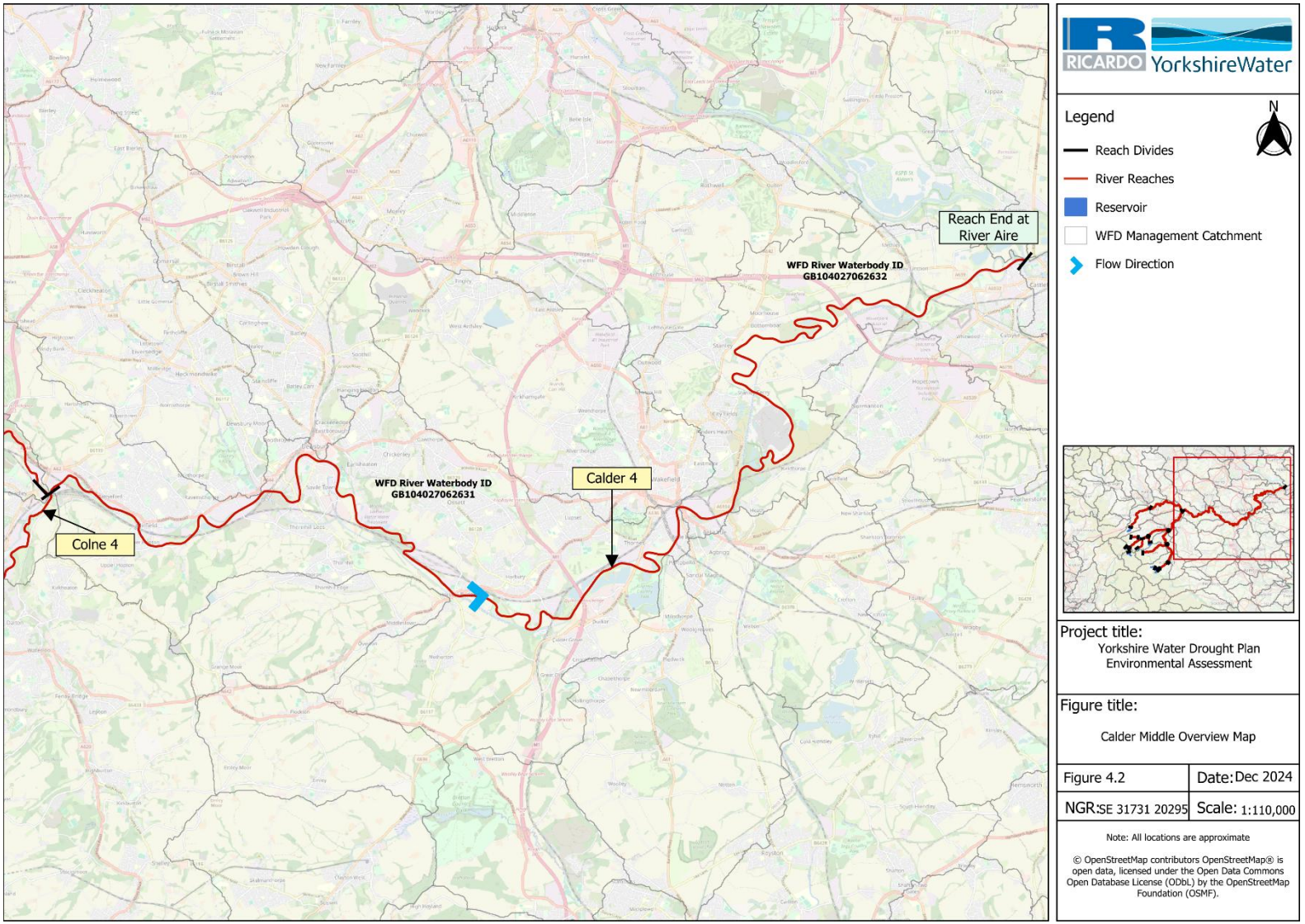

Figure 4-2: Overview Map; Calder 4

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 Middle Calder Area reservoir drought permit/orders 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 **Figure 4-2**, and in a schematic below in **Figure 4-3.**

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

Table 4-2: Middle Calder Area reach details

Reach name	Watercourse name	Reach start	Reach end	Down-stream reach	Drought measure								
					Scammonder Water – Black Brook	Colne Maintained Flow at Marsden Reservoir	Butterley Reservoir	Scammonden Water - Bradshaw Clough	Blackmoorfoot Reservoir - Hoyle House Clough	Blackmoorfoot Reservoir - Brow Grains	Digley Reservoir	Brownhill Reservoir	Upper Calder Drought Measures
Black Brook 1	Black Brook	Scammonden Reservoir	River Calder	Calder 4	✓								
Colne 1	River Colne	Marsden intake	Wessenden Brook	Colne 2		✓							
Colne 2	River Colne	Wessenden Brook	Hoyle House Clough	Colne 3		✓	✓						
Colne 3	River Colne	Hoyle House Clough	River Holme	Colne 4		✓	✓		✓				
Colne 4	River Colne	River Holme	River Calder	Calder 4		✓	✓		✓	✓	✓	✓	
Colne T1	Wessenden Brook	Butterley Reservoir	River Colne	Colne 2			✓						
Colne T3	Hoyle House Clough	Blackmoorfoot Reservoir	River Colne	Colne 3					✓				
Colne T4	Bradshaw Clough	Scammonden Reservoir intake	Slaithwaite Reservoir	N/A				✓					
Holme 1	River Holme	Brownhill Reservoir	Digley Brook	Holme 2								✓	
Holme 2	River Holme	Digley Brook	River Ribble	Holme 3							✓	✓	
Holme 3	River Holme	River Ribble	Mag Brook	Holme 4							✓	✓	
Holme 4	River Holme	Mag Brook	River Colne	Colne 4						✓	✓	✓	
Holme T1	Digley Brook	Digley Reservoir	River Holme	Holme 2							✓		
Holme T3	Mag Brook	Blackmoorfoot Reservoir	River Holme	Holme 4						✓			
Calder 4	River Calder	River Colne	River Aire	N/A	✓	✓	✓		✓	✓	✓	✓	✓

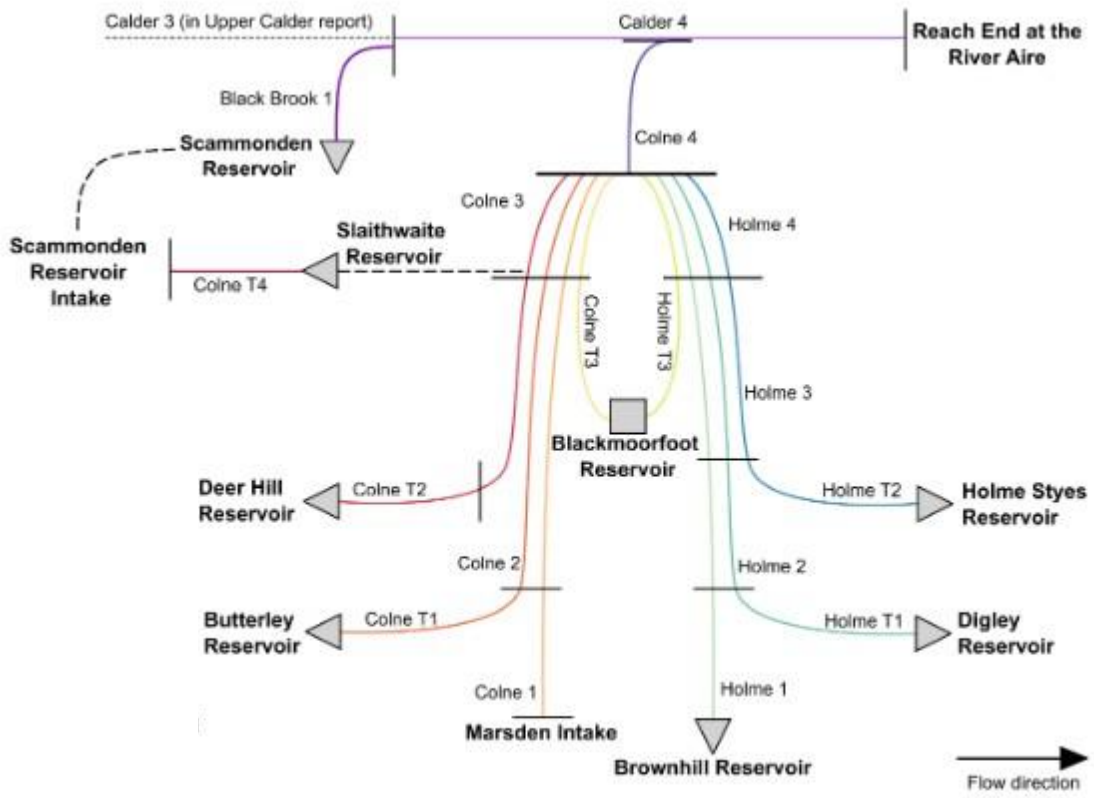

Figure 4-3: Middle Calder Area reservoirs drought permits reach schematic

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** and **Figure 4-2**.

Table 4-3: WFD waterbodies considered in the assessment

Drought Option	Reach	WFD Waterbody
Scammonden Reservoir – Black Brook	Black Brook 1	GB104027062570 Black Brook from Source to River Calder
Colne Maintained Flow at Marsden Reservoir	Colne 1	GB104027063250 Colne from Source to Wessenden Brook
Colne Maintained Flow at Marsden Reservoir; Butterley Reservoir	Colne 2	GB104027063330 Colne from Wessenden Brook to River Holme
Colne Maintained Flow at Marsden Reservoir; Butterley Reservoir; Blackmoorfoot Reservoir- Hoyle House Clough	Colne 3	GB104027063330 Colne from Wessenden Brook to River Holme
Colne Maintained Flow at Marsden Reservoir; Butterley Reservoir; Blackmoorfoot Reservoir- Hoyle House Clough; Blackmoorfoot Reservoir-Hoyle House Clough; Digley Reservoir; Brownhill Reservoir	Colne 4	GB104027062550 Colne from River Holme to River Calder
Butterley Reservoir	Colne T1	GB104027063190 Wessenden Brook from Butterly Reservoir to River Colne
Blackmoorfoot Reservoir-Hoyle House Clough	Colne T3	GB104027063330 Colne from Wessenden Brook to River Holme
Scammonden Reservoir-Bradshaw Clough	Colne T4	GB104027063330 Colne from Wessenden Brook to River Holme
Brownhill Reservoir	Holme 1	GB104027057600 River Holme from source to New Mill Dyke
Digley Reservoir; Brownhill Reservoir	Holme 2	GB104027057600 River Holme from source to New Mill Dyke
Digley Reservoir; Brownhill Reservoir; Upper Calder Drought Measures	Holme 3	GB104027057600 River Holme from source to New Mill Dyke
		GB104027063301 Holme from New Mill Dike to River Colne
Blackmoorfoot Reservoir-Brow Grains; Digley Reservoir; Brownhill Reservoir	Holme 4	GB104027063301 Holme from New Mill Dike to River Colne
Digley Reservoir	Holme T1	GB104027057600 River Holme from source to New Mill Dyke
Upper Calder Drought Measures	Holme T2	GB104027057600 River Holme from source to New Mill Dyke
Blackmoorfoot Reservoir-Brow Grains	Holme T3	GB104027063590 Mag Brook from Source to River Holme
Colne Maintained Flow at Marsden Reservoir; Butterley Reservoir; Digley Reservoir; Brownhill Reservoir; Upper Calder Drought Measures	Calder 4	GB104027062642 Calder from Ryburn Confluence to River Colne
		GB104027062631 Calder from River Colne to River Chald
		GB104027062632 Calder from River Chald to River Aire

5. PHYSICAL ENVIRONMENT EFFECTS: MIDDLE CALDER AREA RESERVOIRS

Potential impacts on the physical environment due to the Middle Calder Area reservoir drought permit/orders 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 Middle Calder Area reservoirs drought options

Reach	River flow impact	Flow depleted reaches and risks	Risk to river habitats	Risk to water quality
Black Brook 1	Major	Major	Major	Moderate
Colne 1	Major	Major	Major	Minor
Colne 2	Major	Major	Minor	Moderate
Colne 3	Major	Major	Major	Moderate
Colne 4	Major	Major	Major	Moderate
Colne T1	Major	Major	Major	Minor
Colne T2	Major	None	Moderate	Minor
Colne T3	Major	None	Major	Moderate
Colne T4	Major	None	Major	Minor
Holme 1	Major	None	Moderate	Minor
Holme 2	Major	None	Major	Minor
Holme 3	Major	Minor	Major	Moderate
Holme 4	Major	Major	Major	Moderate
Holme T1	Major	None	Major	Moderate
Holme T3	Major	Major	Major	Minor
Calder 4	Moderate (autumn) Minor (winter)	Major	Minor	Moderate

6. RECEPTOR ASSESSMENT, MONITORING AND MITIGATION: MIDDLE CALDER 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 West Area Reservoirs: Middle Calder 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: Middle Calder Area drought options

Reach	Blackbrook 1	Colne 1	Colne 2	Colne 3	Colne 4	Colne T1	Colne T3	Colne T4	Holme 1	Holme 2	Holme 3	Holme 4	Holme T1	Holme T3	Calder 4
Hydrological Impact	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Moderate (autumn) Minor (winter)
Associated Drought Options	**Scammonden Water – Black Brook**	**River Colne Maintained Flow at Marsden**	**River Colne Maintained Flow at Marsden, Butterley Reservoir**	**Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough**	**Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoor Reservoir – Brow Grains, Digley Reservoir, Brownhil Reservoir**	**Butterley Reservoir**	**Blackmoorfoot Reservoir - Hoyle House Clough**	**Scammonden Water - Bradshaw Clough**	**Brownhill Reservoir**	**Digley Reservoir, Brownhill Reservoir**	**Digley Reservoir, Brownhill Reservoir**	**Digley Reservoir, Brownhill Reservoir, Blackmoorfoot Reservoir - Brow Grains**	**Digley Reservoir**	**Blackmoorfoot Reservoir - Brow Grains**	**Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoot Reservoir – Brow Grains, Digley Reservoir, Brownhill Reservoir, Scammonden Water – Black Brook and the Upper Calder Drought Measures**
WFD Waterbody	GB104027062570 Black Brook from Source to River Calder	GB104027063250 River Colne from Source to Wessenden Brook	GB104027063330 Colne from Wessenden Brook to R Holme	GB104027063330 River Colne from Wessenden Brook to River Holme	GB104027062550 Colne from River Holme to River Calder	GB104027063190 Wessenden Bk from Butterly Resr to River Colne	GB104027063330 River Colne from Wessenden Brook to River Holme	GB104027063330 River Colne from Wessenden Brook to River Holme	GB104027057600 Holme from Source to New Mill Dike	GB104027057600 Holme from Source to New Mill Dike	GB104027057600 Holme from Source to New Mill Dike, GB104027063301 Holme from New Mill Dike to River Colne	GB104027057600 Holme from Source to New Mill Dike	GB104027057600 Holme from Source to New Mill Dike	GB104027063590 Mag Brook from Source to River Holme	GB104027062642 Calder from Ryburn Confluence to River Colne, GB104027062631 Calder from River Colne to River Chald, GB104027062632 Calder from River Chald to River Aire
Statutory designated sites															
None															
Non-statutory designated sites															
Cromwell Bottom – LNR/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
Southern Washlands - LNR/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	Minor
Stanley Marsh LNR/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	Negligible
Horbury Lagoons 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	Minor
Altoft Ings 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	Minor
Foxholes 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	Negligible
NERC and Notable Species															
White-clawed crayfish *Austropotamobius pallipe*	Moderate	Moderate	Moderate	Moderate	N/A	Moderate	Moderate	Moderate	Moderate	N/A	Moderate	Moderate	N/A	N/A	N/A
Otter *Lutra lutra*	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Water vole *Arvicola amphibious*	Major	Moderate	Moderate	Moderate	Moderate	N/A	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	N/A	Moderate	Moderate
Atherix ibis	Minor	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	Minor
Potamophylax rotundipennis	N/A	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	Minor	Minor	N/A	N/A	N/A	N/A	N/A
Ameletus inopinatus	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
Wormaldia subnigra	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
Tinodes unicolor	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
Barbel *Barbus barbus*	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

Reach	Blackbrook 1	Colne 1	Colne 2	Colne 3	Colne 4	Colne T1	Colne T3	Colne T4	Holme 1	Holme 2	Holme 3	Holme 4	Holme T1	Holme T3	Calder 4
Hydrological Impact	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Moderate (autumn) Minor (winter)
Brook lamprey *Lampetra planeri*	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
River Lamprey *Lampetra fluviatilis*	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
Brown trout *Salmo trutta*	Major	Major	Moderate	Major	Major	Major	Minor	N/A	Moderate	Major	Major	Major	Moderate	Major	Moderate
Bullhead *Cottus gobio*	Moderate	Moderate	Minor	Moderate	Moderate	N/A	N/A	N/A	Minor	Moderate	Moderate	Moderate	N/A	N/A	Minor
European eel *Anguilla anguilla*	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
Grayling *Thymallus thymallus*	N/A	N/A	N/A	Moderate	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A	N/A	Minor
WFD Status Receptors															
Fish	Major	Major	Moderate	Major	N/A	N/A	Minor	N/A	Moderate	Major	Major	Major	Moderate	Moderate	Moderate
Macroinvertebrates	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Minor
Landscape, navigation, recreation and heritage															
None															

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 1.3**). Consultation between YWSL and the Environment Agency is ongoing, and the EMP will be updated as required to reflect future agreements.

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

A summary of the monitoring and mitigations recommendations for the South West Area - Middle Calder 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 Middle Calder Area reservoirs drought options

Reach		Black Brook 1	Colne 1	Colne 2	Colne 3	Colne 4	Colne T1	Colne T3	Colne T4	Holme 1	Holme 2	Holme 3	Holme 4	Holme T1	Holme T3	Calder 4
Hydrological Impact		**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Moderate (autumn) Minor (winter)**
Associated Drought Options		Scammonden Water – Black Brook	River Colne Maintained Flow at Marsden	River Colne Maintained Flow at Marsden, Butterley Reservoir	Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough	Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoor Reservoir – Brow Grains, Digley Reservoir, Brownhil Reservoir	Butterley Reservoir	Blackmoorfoot Reservoir - Hoyle House Clough	Scammonden Water - Bradshaw Clough	Brownhill Reservoir	Digley Reservoir, Brownhill Reservoir	Digley Reservoir, Brownhill Reservoir	Digley Reservoir, Brownhill Reservoir, Blackmoorfoot Reservoir - Brow Grains	Digley Reservoir	Blackmoorfoot Reservoir - Brow Grains	Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoot Reservoir – Brow Grains, Digley Reservoir, Brownhill Reservoir, Scammonden Water – Black Brook and the Upper Calder Drought Measures
Code	**Description**	GB104027062570 Black Brook from Source to River Calder	GB104027063250 River Colne from Source to Wessenden Brook	GB104027063330 Colne from Wessenden Brook to R Holme	GB104027063330 River Colne from Wessenden Brook to River Holme	GB104027062550 Colne from River Holme to River Calder	GB104027063190 Wessenden Bk from Butterly Resr to River Colne	GB104027063330 River Colne from Wessenden Brook to River Holme	GB104027063330 River Colne from Wessenden Brook to River Holme	GB104027057600 Holme from Source to New Mill Dike	GB104027057600 Holme from Source to New Mill Dike	GB104027057600 Holme from Source to New Mill Dike, GB104027063301 Holme from New Mill Dike to River Colne	GB104027057600 Holme from Source to New Mill Dike	GB104027057600 Holme from Source to New Mill Dike	GB104027063590 Mag Brook from Source to River Holme	GB104027062642 Calder from Ryburn Confluence to River Colne, GB104027062631 Calder from River Colne to River Chald, GB104027062632 Calder from River Chald to River Aire
Baseline Monitoring																
BMON_H	Routine flow/levels	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BMON_WQ	Routine WQ	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BMON_E1	Macroinvertebrate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BMON_E2	Fisheries (including Lamprey)	✓	✓	✓	✓	x	x	✓	x	✓	✓	✓	✓	✓	✓	✓
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	x	x	x
IDMON_WSWQ2	CSO Monitoring	✓	x	✓	✓	✓		✓				✓	✓	x	x	✓
Post-Drought (Drought Options Removed)																
PDMON_E1	Macroinvertebrate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDMON_E2	Fisheries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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

Reach		Blackbrook 1	Colne 1	Colne 2	Colne 3	Colne 4	Colne T1	Colne T3	Colne T4	Holme 1	Holme 2	Holme 3	Holme 4	Holme T1	Holme T3	Calder 4
Hydrological Impact		**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Major**	**Moderate (autumn) Minor (winter)**
Associated Drought Options		Scammonden Water – Black Brook	River Colne Maintained Flow at Marsden	River Colne Maintained Flow at Marsden, Butterley Reservoir	Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough	Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoor Reservoir – Brow Grains, Digley Reservoir, Brownhill Reservoir	Butterley Reservoir	Blackmoorfoot Reservoir - Hoyle House Clough	Scammonden Water - Bradshaw Clough	Brownhill Reservoir	Digley Reservoir, Brownhill Reservoir	Digley Reservoir, Brownhill Reservoir	Digley Reservoir, Brownhill Reservoir, Blackmoorfoot Reservoir - Brow Grains	Digley Reservoir	Blackmoorfoot Reservoir - Brow Grains	Scammonden Water – Black Brook, Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoot Reservoir – Brow Grains, Digley Reservoir
Code	**Description**	GB104027062570 Black Brook from Source to River Calder	GB104027063250 River Colne from Source to Wessenden Brook	GB104027063330 Colne from Wessenden Brook to R Holme	GB104027063330 River Colne from Wessenden Brook to River Holme	GB104027062550 Colne from River Holme to River Calder	GB104027063190 Wessenden Bk from Butterly Resr to River Colne	GB104027063330 River Colne from Wessenden Brook to River Holme	GB104027063330 River Colne from Wessenden Brook to River Holme	GB104027057600 Holme from Source to New Mill Dike	GB104027057600 Holme from Source to New Mill Dike	GB104027057600 Holme from Source to New Mill Dike, GB104027063301 Holme from New Mill Dike to River Colne	GB104027057600 Holme from Source to New Mill Dike	GB104027057600 Holme from Source to New Mill Dike	GB104027063590 Mag Brook from Source to River Holme	GB104027062642 Calder from Ryburn Confluence to River Colne, GB104027062631 Calder from River Colne to River Chald, GB104027062632 Calder from River Chald to River Aire
In–Drought (During Drought Option Implementation)																
IDMIT_H1	Third party abstraction	✓	✓	✓	✓	✓	✓	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 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	✓	✓
IDMIT_E6	Fish/crayfish rescue and relocate	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓
Post–Drought (Drought Options Removed)																
PDMIT_E1	Habitat enhancement	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDMIT_E2	Freshets	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PDMIT_E3	Barrier modification	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓
PDMIT_E4	Coarse fish restocking	x	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 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 C-1: Monitoring and mitigation measures included in the YWSL Draft 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.
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.

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_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 EAR was originally drafted, as per the Yorkshire Water Drought Plan 2022, to include the Deerhill drought permit. The assessments presented in this EAR were based on its implementation. However, following further discussions with the Environment Agency, YWSL has decided to exclude the Deerhill Drought permit from this application and all references to it have been removed from the EAR. Nonetheless, given the time constraints around the application, the assessments below continue to assume a flow reduction associated with the implementation of the Deerhill drought permit and therefore overrepresent the hydrological impact on reaches Colne 2, Colne 3, Colne 4 and Calder 4.

This appendix assesses the potential impacts on the physical environment of the South West Area during the period of implementation of associated drought options, specifically the Middle Calder Area. This appendix should be read in conjunction with the Upper Calder EAR. Two EARs have been produced to aid clarity due to the large number of reservoirs in the South West, however the study area should be considered as continuous.

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

1. Scammonden Water – Black Brook drought permit
2. Colne Maintained Flow at Marsden Reservoir drought permit
3. Butterley Reservoir drought permit
4. Blackmoorfoot Reservoir - Hoyle House Clough drought permit
5. Scammonden Water - Bradshaw Clough drought permit
6. Brownhill Reservoir drought permit
7. Digley Reservoir drought permit
8. Blackmoorfoot Reservoir - Brow Grains 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 Colne 3 reach.

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

Annex 4 maps the intermittent water quality pressures associated with the Colne 4 reach

Annex 5 maps the intermittent water quality pressures associated with the Holme 3 reach

Annex 6 maps the intermittent water quality pressures associated with the Home 4 reach

Annex 7 maps the intermittent water quality pressures associated with the Calder 4 reach

Annex 8 documents the flow transposition in the absence of measured data (for illustrative time series) approach for those reaches where flow transposition has been utilised.

A2 DROUGHT OPTIONS

The Middle Calder Area comprise eight drought options at compensation flow reservoirs as reported in this appendix:

- Scammonden Water – Black Brook drought permit
- Colne Maintained Flow at Marsden Reservoir drought permit
- Butterley Reservoir drought permit
- Blackmoorfoot Reservoir - Hoyle House Clough drought permit
- Scammonden Water - Bradshaw Clough drought permit
- Brownhill Reservoir drought permit
- Digley Reservoir drought permit
- Blackmoorfoot Reservoir - Brow Grains drought permit

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

A2.1 SCAMMONDEN WATER - BLACK BROOK DROUGHT PERMIT

YWSL is licensed to abstract water from Scammonden Water for supply to customers. Under the 1965 Huddersfield Corporation Act, YWSL has a legal obligation to release flow from the reservoir to compensate the downstream receiving watercourse, the Black Brook, a tributary of the River Calder. Under the terms of the Act, YWSL must continuously discharge not less than 3.49 Ml/d (defined as 768,000 gallons/day continuous).

The drought permit application for Scammonden Water Black Brook is to reduce the compensation release by 50% to 1.75 Ml/d from the date the permit is granted and to reduce further to 1.15 Ml/d if regional stocks are below the Drought Control Line for four consecutive weeks or more, as defined in the YWSL Drought Plan. These conditions are set out in **Table A2.1**.

Table A2.1 Scammonden Water - Black Brook 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
Scammonden Water	Black Brook	SE 053169	3.49	1.75	1.74	1.15	2.34

A2.2 RIVER COLNE MAINTAINED FLOW AT MARSDEN DROUGHT PERMIT

Under the 1965 Huddersfield Corporation Act YWSL is required to maintain a flow in the River Colne at Marsden of no less than 7.27 Ml/d, defined as 1,600,000 gallons per day under the Act.

The drought permit application for the River Colne is to reduce the maintained flow by 50% to 3.64 Ml/d from the date the permit is granted and reduce further to 2.40 Ml/d if regional stocks are below the Drought Control Line for four consecutive weeks or more, as defined in the YWSL Drought Plan. These conditions are set out in **Table A2.2**.

Table A2.2 River Colne at Marsden 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
River Colne Maintained Flow at Marsden	R Colne	SE 042118	7.27	3.64	3.63	2.40	4.87

A2.3 BUTTERLEY RESERVOIR DROUGHT PERMIT

YWSL is licensed to abstract water from Butterley Reservoir for supply to customers. Under the 1965 Huddersfield Corporation Act, YWSL has a legal obligation to release flow from the reservoir to compensate the downstream receiving watercourse, the River Colne. Under the terms of an Environment Agency Enforcement Act, YWSL must continuously discharge not less than 8.07 Ml/d.

The drought permit application for Butterley Reservoir is to reduce the compensation release by 50% to 4.04 ML/d from the date the permit is granted and to reduce further to 2.66 Ml/d if regional reservoir stocks are below the Drought Control Line for four consecutive weeks or more, as defined in the YWSL Drought Plan. These conditions are set out in **Table A2.3**.

Table A2.3 Butterley 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
Butterley Reservoir	Wessenden Brook, R Colne	SE 048107	8.07	4.04	4.03	2.66	5.41

A2.4 BLACKMOORFOOT RESERVOIR - HOYLE HOUSE CLOUGH DROUGHT PERMIT

YWSL is licensed to abstract water from Blackmoorfoot Reservoir for supply to customers under the 1908 Huddersfield Water Act. YWSL has a legal obligation to release flow from the reservoir to compensate the downstream receiving watercourse, the Hoyle House Clough and the River Colne. Under the terms of the Act, the statutory requirement is to release 156,960 gallons/day, with six sevenths of this released between the hours of 6;00-18:00 Monday to Saturday, and one seventh of this being released between the hours of 18:00-6:00 Monday to Saturday, and nothing released on Sunday. YWSL release a compensation flow of 0.61 Ml/d under an ‘enforcement position’ agreed with the Environment Agency.

The drought permit application for Blackmoorfoot Hoyle House Clough is to reduce the compensation release by 50% to 0.31 Ml/d from the date the permit is granted and reduce further to 0.20 Ml/d if regional stocks are below the Drought Control Line for four consecutive weeks or more, as defined in the YWSL Drought Plan. These conditions are set out in **Table A2.4**.

Table A2.4 Blackmoorfoot Reservoir Hoyle House Clough 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
Blackmoorfoot Reservoir -Hoyle House Clough	Hoyle House Clough	SE 099131	0.61	0.31	0.30	0.20	0.41

A2.5 SCAMMONDEN WATER - BRADSHAW CLOUGH DROUGHT PERMIT

YWSL is licensed to abstract water from Scammonden Water for supply to customers. Under the 1965 Huddersfield Corporation Act, YWSL has a legal obligation to release flow from the reservoir to compensate the downstream receiving watercourse, Bradshaw Clough, a tributary of the River Calder. Under the terms of the Act, YWSL must continuously discharge not less than 1.36 Ml/d (defined as 300,000 gallons/day continuous).

The drought permit application for Scammonden Water Bradshaw Clough is to reduce the compensation release by 50% to 0.68 Ml/d from the date the permit is granted and to reduce further to 0.45 Ml/d if regional stocks are below the Drought Control Line for four consecutive weeks or more, as defined in the YWSL Drought Plan. These conditions are set out in **Table A2.5**.

Table A2.5 Scammonden Water Bradshaw Clough 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
Scammonden Water	Bradshaw Clough	SE 058143	1.36	0.68	0.68	0.45	0.91

A2.6 BROWNHILL RESERVOIR DROUGHT PERMIT

YWSL is licensed to impound water in Brownhill Reservoir for supply to customers. YWSL has a legal obligation to release flow from the reservoir to compensate the downstream receiving watercourse, the River Holme. Under the terms of the impoundment licence the following seasonal flows must be released: 6.90 Ml/d from November to March (winter); 5.40 Ml/d from April to May and August to October (spring and autumn); 4.80 Ml/d in June and July (summer).

The drought permit application for Brownhill is to reduce the compensation release by 50% to 3.45 Ml/d in winter, 2.70 Ml/d in spring and autumn, and 2.40 Ml/d in summer from the date the permit is granted. Further reductions would be permitted to 2.28 Ml/d in winter, 1.78 Ml/d in spring and autumn, and 1.58 Ml/d in summer if regional stocks are below the Drought Control Line for four consecutive weeks or more, as defined in the YWSL Drought Plan. These conditions are set out in **Table A2.6**.

Table A2.6 Brownhill 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
Brownhill Reservoir	River Holme	SE 118064	6.90 between Nov to Mar; 5.40 Apr to May; 4.80 Jun to Jul and; 5.40 Aug to Oct	3.45 between Nov to Mar; 2.70 Apr to May; 2.40 Jun to Jul and; 2.70 Aug to Oct	2.40 - 3.45	2.28 between Nov to Mar; 1.78 Apr to May; 1.58 Jun to July and; 1.78 Aug to Oct	3.22 - 4.62

A2.7 DIGLEY RESERVOIR DROUGHT PERMIT

YWSL is licensed to impound water in Digley Reservoir for supply to customers. YWSL has an obligation to release flow from the reservoir to compensate the downstream receiving watercourse, the Digley Brook and the River Holme. Under the terms of the licence, the statutory compensation release is a varied, seasonal compensation flow. These flows are; 10.60 Ml/d from November to January (winter); 5.80 Ml/d from February to May and August to October (spring and autumn); 4.50 Ml/d in June; and 3.20 Ml/d in July.

The drought permit application for Digley is to reduce the compensation release by 50% to 5.30 Ml/d in winter, 2.90 Ml/d in spring and autumn, 2.25 Ml/d in June, and 1.6 Ml/d in July from the date the permit is granted. Further reductions may occur to 3.50 Ml/d in winter, 1.91 Ml/d in spring and autumn, 1.49 Ml/d in June, and 1.06 Ml/d in July if regional stocks are below the Drought Control Line for four consecutive weeks or more, as defined in the YWSL Drought Plan. These conditions are set out in **Table A2.7**.

Table A2.7 Digley 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
Digley Reservoir	Digley Brook	SE 112069	10.60 Nov to Jan; 5.80 Feb to May; 4.50 June; 3.20 July; 5.80 August to Oct	5.30 Nov to Jan; 2.90 Feb to May; 2.25 June; 1.60 July; 2.90 August to Oct	1.60 – 5.30	3.50 Nov to Jan; 1.91 Feb to May; 1.49 June; 1.06 July; 1.91 August to Oct	2.14 – 7.10

A2.8 BLACKMOORFOOT RESERVOIR - BROW GRAINS DROUGHT PERMIT

YWSL is licensed to abstract water from Blackmoorfoot Reservoir for supply to customers under the 1869 Huddersfield Water Act. YWSL has a legal obligation to release flow from the reservoir to compensate the downstream receiving watercourse, the Brow Grains Dyke, and the Hall Dyke. Under the terms of the Act, the statutory requirement is to release 951 gallons per minute between the hours of 6:00-18:00 Monday to Saturday. YWSL currently releases a compensation flow of 2.67 Ml/d under an ‘enforcement position’ agreed with the Environment Agency.

The drought permit application for Blackmoorfoot Brow Grains Dyke is to reduce the compensation release by 50% to 1.33 Ml/d from the date the permit is granted and reduce further to 0.88 Ml/d if regional stocks are below the Drought Control Line for four consecutive weeks or more, as defined in the YWSL Drought Plan. These conditions are set out in **Table A2.8**.

Table A2.8 Blackmoorfoot Reservoir - Brow Grains 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
Blackmoorfoot Reservoir - Brow Grains Dyke	Brow Grains Dyke, R Holme	SE 085106	2.67	1.34	1.34	0.88	1.78

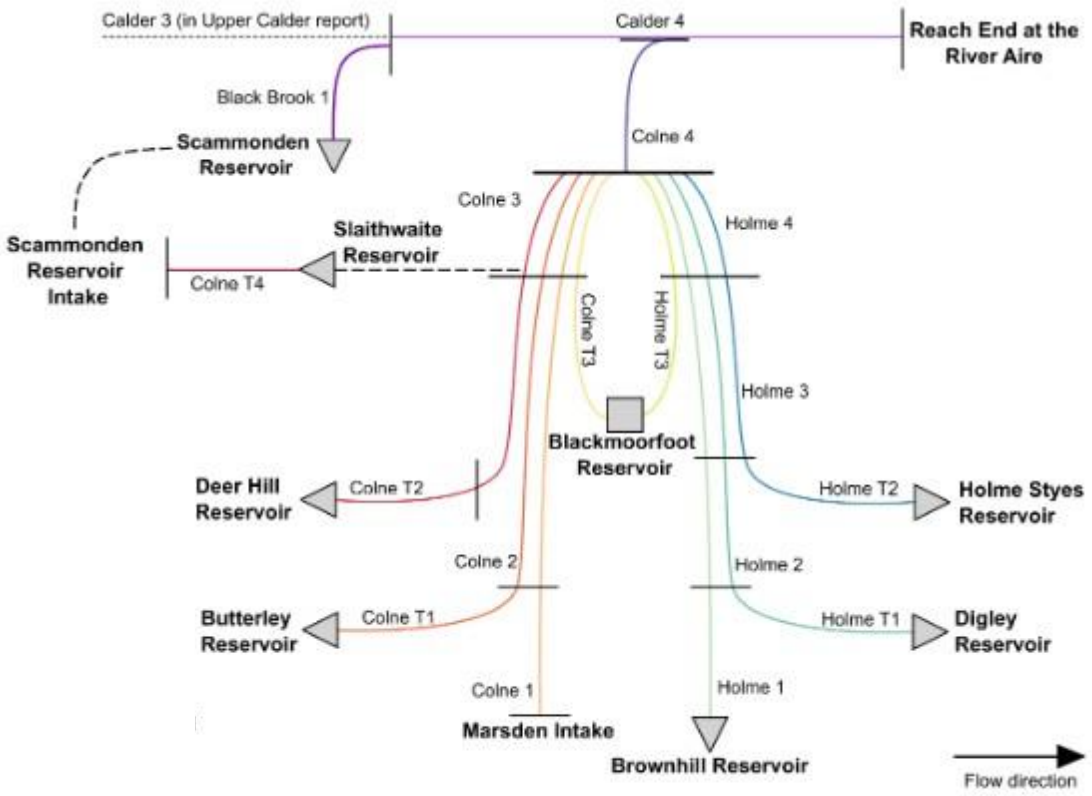
A3 STUDY AREA

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[2] 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 Middle Calder 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**. Though no longer part of the YWSL drought plan, Holme Styes Reservoir Drought Order is represented on **Figure A3.1** for consistency with the stand-alone EAR for the Holme Styes Reservoir Drought Order and to assist with cumulative assessment. No Middle Cader Area drought permit would impact the Holme T2 reach, as such, no assessment of impacts on this reach is provided in this report.

Figure A3.1 Middle Calder Area reach schematic



[2] Ricardo (2025). YWSL Drought Plan 2027. Environmental Assessment Methodology. Report for YWSL Services Ltd. February 2025.

Table A3.1 Middle Calder Area reach details

Reach name	Watercourse name	Reach start	Reach end	Down-stream reach	Drought measure								
					Scammonden Water – Black Brook	Colne Maintained Flow at Marsden Reservoir	Butterley Reservoir	Scammonden Water - Bradshaw Clough	Blackmoorfoot Reservoir - Hoyle House Clough	Blackmoorfoot Reservoir - Brow Grains	Digley Reservoir	Brownhill Reservoir	Upper Calder Drought Measures
Black Brook 1	Black Brook	Scammonden Reservoir	River Calder	Calder 4	✓								
Colne 1	River Colne	Marsden intake	Wessenden Brook	Colne 2		✓							
Colne 2	River Colne	Wessenden Brook	Hoyle House Clough	Colne 3		✓	✓						
Colne 3	River Colne	Hoyle House Clough	River Holme	Colne 4		✓	✓		✓				
Colne 4	River Colne	River Holme	River Calder	Calder 4		✓	✓		✓	✓	✓	✓	
Colne T1	Wessenden Brook	Butterley Reservoir	River Colne	Colne 2			✓						
Colne T3	Hoyle House Clough	Blackmoorfoot Reservoir	River Colne	Colne 3					✓				
Colne T4	Bradshaw Clough	Scammonden Reservoir intake	Slaithwaite Reservoir	N/A				✓					
Holme 1	River Holme	Brownhill Reservoir	Digley Brook	Holme 2								✓	
Holme 2	River Holme	Digley Brook	River Ribble	Holme 3							✓	✓	
Holme 3	River Holme	River Ribble	Mag Brook	Holme 4							✓	✓	
Holme 4	River Holme	Mag Brook	River Colne	Colne 4						✓	✓	✓	
Holme T1	Digley Brook	Digley Reservoir	River Holme	Holme 2							✓		
Holme T3	Mag Brook	Blackmoorfoot Reservoir	River Holme	Holme 4						✓			
Calder 4	River Calder	Black Brook	River Aire	N/A	✓	✓	✓		✓	✓	✓	✓	✓

The end of each study area has been defined as where the hydrological impacts have reduced to negligible due to the confluence of a significant tributary or larger river. No significant impacts related to the drought options occur below this point (see **Table A3.2**).

Table A3.2 South West (Calder) Area extent of zone of influence

Reach	Description	Downstream impacts
Calder 4	River Calder confluence with River Aire	The potential hydrological impact of the drought options on the River Aire downstream of the Calder confluence (downstream of Calder 4) is considered at an assessment point on the confluence, using the sum of the Calder at Methley and Aire at Oulton Lemonroyd flow gauges. At that assessment point reference condition flow statistics were: • Summer Q95 947 Ml/d, summer Q99 839 Ml/d • Annual Q50 2140 Ml/d, annual Q95 1002 Ml/d. With a maximum reduction in flow of: • Summer 52.41 Ml/d • Annual 61.35 Ml/d. The Aire downstream of the Calder confluence assessment point statistics identifies the following negligible impacts at the end of the reach: • Dry summer/autumn conditions (6.5% reduction in Qs95 and 7.3% reduction in Qs99) • Winter refill period (2.9% reduction in Q50 and 6.1% reduction in Q95).

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[3], 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.

A3.3 CUMULATIVE REACHES WITH OTHER EARS

Simultaneous deployment of the Environment Agency's Holme Styes Drought Order and the Middle Calder drought options has the potential for a cumulative impact on Holme 3 and the downstream reaches. The hydrological magnitude of impact as a result of this cumulative impact would be no worse than the magnitude of impact on these reaches assessed in this report as a result of the Calder Middle options alone. As such, the physical environment impacts considered in this report are deemed applicable to the cumulative impact as a result of the Holme Styes Drought Order and the Middle Calder drought options being operated simultaneously.

Though this report focuses on the drought options within the Middle Calder Area, the assessment considers cumulative impacts with the drought options within the Upper Calder Area as the options in these areas would be deployed through the same drought trigger.

[3] Ricardo (2025). YWSL Drought Plan 2027. Environmental Assessment Methodology. Report for YWSL 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[4] 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)[5] This also includes an updated draft of the supplementary guidance on the environmental assessment for water company drought planning.

A4.2 BLACK BROOK 1

A4.2.1 Reach introduction

Black Brook 1 is potentially impacted by a Scammonden Water Black Brook 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 waterbodies:

- Black Brook from Source to River Calder (GB104027062570)

A4.2.2 Reach setting

Black Brook 1, located on main EAR **Figure 4.1,** comprises an 8.9 km stretch of Black Brook from the outflow of Scammonden Reservoir to the confluence with the River Calder. The reach is dominated by reservoir outflows with an additional catchment area of 24.5km^2 along the length of the reach. Calder 4 (see **Section A4.17** below) is downstream.

A4.2.3 River flow regime

The normal minimum compensation flow from Scammonden Reservoir is 3.49 Ml/d, and during the implementation of this drought option, it is likely that the level in the 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. The maximum reduction in the compensation flow is 2.34 Ml/d (from 3.49 Ml/d to 1.15 Ml/d, when regional reservoir storage is below the regional Drought Control Line for four consecutive weeks or more). This represents a reduction of up to 67% in the flow at the top of this reach.

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 Black Brook 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

[4] Ricardo (2025). YWSL Drought Plan 2027. Environmental Assessment Methodology. Report for YWSL Services Ltd. February 2025.
[5] Environment Agency (2024) Water company drought plan guideline. Final, March 2025.

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 Black Brook 1 as described in **Section A4.2.3.1**. There are no significant flow pressures associated with discharges within Black Brook 1.

A4.2.3.1 Significant flow pressures

There are two separate licensed abstractions depleting flow in Black Brook 1 for industrial, commercial and public services use.

One of the abstractions has a peak daily licensed abstraction rate of 3.18Ml/d. The use of the abstraction is listed as paper and printing production ('Black Burn brook – Stainland') with potential flow impacts. An abstraction at that rate could reduce flows in the reach, in combination with the drought option, to zero.

The other abstraction has a peak daily licensed abstraction rate of 0.68Ml/d. This abstraction is for the purpose of textiles and leather production ('Black Brook') with potential flow impacts. An abstraction at that rate could reduce flows in the reach, in combination with drought option, by a 59%.

YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures. A walkover has been included downstream of this abstraction in the schedule of monitoring for Black Brook 1 (see main EAR Section 6) .

A4.2.4 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 26 September 2018 at a reservoir outflow of 3.79Ml/d.

Black Brook 1 is a fairly sinuous reach which falls ~128m over 8.9km, a slope of 0.8°. The channel is shaded for much of its length by riparian tree cover. Where the channel is visible through tree cover, the channel width is between ~2-5m. There are three RHS sites on the reach: approximately 440m downstream from the reservoir is RHS site ID 20665; 1.4km downstream from the reservoir is RHS site ID 26384; and, 2.5km downstream from the reservoir is RHS site ID 18200. Eroding and stable cliffs have been identified at site 20665 and areas of erosion are also apparent on the extant aerial imagery, most notably in the upper section of Black Brook 1. At RHS site 20665, cobbles were observed as dominant, with occasional artificial, boulder, pebble and sand also observed. Where visible on aerial imagery, the channel surface indicates that smooth flow predominates. RHS data show varied flow types. At site 20665, unbroken standing waves dominated, however there was frequent areas of smooth flow and occasional broken standing waves were observed. Further down the reach, at RHS site 26384, three pool and six riffles were observed as well as one unvegetated point bar. The survey also noted that <33% of the channel was ponded by artificial channel impoundment. At the further downstream RHS site 18200, two pool and six riffles were observed with no point bars noted. The survey also did not note any channel impoundment or channel modification.

From aerial imagery and RHS data, the left banks have been identified of being composed predominantly of earth and brick or laid stone, right banks are composed of cobble and bedrock in the lower reaches, with small amounts of boulders, concrete and cobble also observed. In the upper reaches both banks are characterised by a mixture of bare, simple and complex vegetation, in the lower reaches the left bank is composed wholly of complex vegetation while the right bank is predominantly complex with bare and uniform vegetation also present. Bank top vegetation at RHS site 20665 was a mixture of uniform, simple and complex vegetation. The left and right banks at the RHS site 20665 was noted as being predominantly vertical or undercut banks and steep (>45°) and whole bank and toe reinforcement was also noted as being common. There are several ponds present along Black Brook 1, mostly in the mid to lower sections of Black Brook 1, with wetlands noted as occurring on the left bank at RHS site 20665. Surrounding land-use is generally broadleaf woodland and rough pasture in the upper reaches, trending to broadleaf woodland and improved grassland in the lower reaches. Suburban/urban land use increases in the lower reaches, particularly when the reach passes through

Greetland and West Vale prior to the confluence with the River Calder. Black Brook 1 also passes by numerous parkland and gardens in and around Greetland and West Vale.

Black Brook 1 supports both low and high energy environments, as indicated by the presence of both depositional and erosional features in the channel and the flow structure identified. The substrate identified as present is considered to be suitable for the presence of spawning habitat for fish species, with riffles considered highly likely to be present. The presence of larger substrates in the watercourse, along with the bank profiles, will provide refuge potential and cover for juvenile and adult fish. The extensive coverage of trees in the riparian habitat will ensure a high input of allochthonous energy into the watercourse, which will be reflected in the macroinvertebrate composition, provide additional cover to fish and potential resting opportunities for otter. The presence of some large areas of woodland within the surrounding land use means that breeding otter may be supported in Black Brook 1. The movement/migration of fish and sediments through Black Brook 1 may be influenced by the presence of weirs.

The drought option reduction in flow could lead to several potential impacts within Black Brook 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) 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 13 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 Black Brook 1 from the drought option is therefore assessed as **major**.

A4.2.5 River water quality

For this assessment the most downstream water monitoring point of the two present in Black Brook 1 has been used, Black Brook At Greetland (NE-49500035), due to this site having superior data quality. Water quality modelling identifies two continuous discharges, YWSL Scammonden Dam WwTW and Barsey Green WwTW, presenting a significant risk to total ammonia in Black Brook 1. Scammonden Dam WwTW has also been identified as a significant risk to phosphate. Two CSOs are also identified as posing a potential intermittent water quality pressure in this reach. See Annex 2 for a full list of discharges considered in the assessment.

A summary description of the potential risks to water quality in Black Brook 1 as a result of the drought option is presented in **Table A4.1**.

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

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were consistent with High WFD status (0.2 mg/l) throughout the monitoring period with none of results achieving Moderate status or lower. No seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Seasonality was apparent with concentration rising in late winter/ early spring and declining late spring early summer.	Orthophosphate concentrations were generally consistent with Good (0.045mg/l) or High WFD status (0.022mg/l) with three results achieving Moderate status or lower. No seasonality was apparent.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	None apparent
WwTW presenting increased risk	Risk of medium-term chronic, regular, temporary water quality pressures (acute toxicity of ammonia) downstream of Scammonden Dam WwTW and Barsey Green WwTW.	None	Risk of medium-term chronic, regular, temporary water quality pressures downstream of Scammonden Dam WwTW
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 two listed CSOs 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 WwTW	Moderate risk from drought options associated with CSO discharge	Moderate risk from drought options associated with reduction in dilution of WwTW

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 Black Brook 1 as a result of drought options is presented in **Table A4.2**.

Table A4.2 Summary of potential changes in the physical environment of Black Brook 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*	• Two separate flow pressures have been identified, one with potential for periods of time with zero flow if operated in-combination with the drought option without mitigation.

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. There is also a moderate risk to sediment dynamics.
Water quality *Moderate risk*	• Moderate risk from medium-term chronic, regular, temporary water quality pressures (acute toxicity of ammonia) downstream of each of Scammonden Dam WwTW and Barsey Green WwTW. • Moderate risk from medium-term chronic, regular, temporary water quality pressure (phosphate) downstream of Scammonden Dam WwTW • Moderate risk from short term acute, infrequent, temporary water quality pressures locally downstream of two listed CSOs during rainfall events. • Reported ammonia, phosphate and dissolved oxygen water quality is variable although predominantly consistent with High or Good status and 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 phosphate has been assessed.

Insert Figure A4.1

A4.3 COLNE 1

A4.3.1 Reach introduction

Colne 1 is potentially impacted by a River Colne Maintained Flow at Marsden drought permit. A summary of physical environment information for this reach is provided in **Figure A4.2**. The reach includes part of the main channel of the following river waterbody:

- River Colne from Source to Wessenden Brook (GB104027063250).

A4.3.2 Reach setting

Colne 1, located on main EAR **Figure 4.1,** comprises a 0.9km stretch of the River Colne from the Marsden intake to the confluence with the Wessenden Brook (**Table A3.1**). The reach is dominated by reservoir outflows with an additional catchment area of 1.5km^2 along the length of the reach. Colne 2 (see **Section A4.4** below) is downstream.

A4.3.3 River flow regime

The normal minimum flow which YWSL must ensure is maintained downstream of the Marsden intake is 7.27 Ml/d. During the implementation of this drought option, the maximum reduction in the maintained flow is 4.87 Ml/d (from 7.27 Ml/d to 2.40 Ml/d, when regional reservoir storage is below the regional Drought Control Line for four consecutive weeks or more). This represents a reduction of up to 67% in the flow at the top of this reach.

The hydrological impact of drought options on Colne 1 is therefore assessed as a **major** hydrological impact at any time of year. The confidence in this hydrological assessment is high with the assessment point being downstream of the maintained flow point.

There is one significant flow pressures influencing flow in Colne 1 as described in **Section A4.3.3.1**. There are no significant discharges within Colne 1. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.3.3.1 Significant flow pressures

The abstraction has a peak daily licensed abstraction rate of 0.64Ml/d. This abstraction is used for textile and leather production (‘River Colne’) with potential flow impacts. An abstraction at that rate could reduce flows in the reach, in combination with the option, by a further 27%.

YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures. A walkover has been included downstream of this abstraction in the schedule of monitoring for Colne 1 (see main EAR Section 6).

A4.3.4 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 26 September 2018 at a reservoir outflow of 9.57Ml/d.

Colne 1 is a fairly straight reach which falls ~15m over 0.9km, a slope of 1.0°. Riparian tree cover ranges between scattered to continuous on both banks along the reach, particularly in the first 0.3km of the reach. The channel is not visible for most of its length on aerial imagery and there are no recent RHS surveys undertaken in the reach. Where it is visible channel widths have been measured as between 8-10m, although it widens slightly in the mid sections of the reach. Extant aerial imagery shows a limited number of in-channel features with at least 2 vegetated side bars at the end of Colne 1. A large online pond is located between 0.2km and 0.3km downstream. Some boulders have been noted protruding through the flow surface at the end of the reach. No other in-channel features could be identified. Where visible on aerial imagery, the channel surface indicates that smooth flow predominates, although there are some areas of broken flow, notably around the end of the reach. Where banks are vegetated, it is assumed that they are composed of earth. Bank reinforcement is noted to be common in the lower

sections of the reach from 0.3km downstream as the channel flows through Marsden. Surrounding land use is predominantly broadleaf woodland to 0.3km downstream to suburban/urban land use thereafter.

Colne 1 is likely to support both high and low energy environments, however the low extent of depositional features and straight planform of the watercourse suggest high energy environments dominate. The large substrate types likely to be present will provide significant habitat opportunities for fish and white-clawed crayfish, with the earth banks providing burrowing opportunities for white-clawed crayfish. Although suitable habitat for spawning has not been identified, its absence from the watercourse cannot be assumed. The extensive coverage of trees in the riparian habitat will ensure a high input of allochthonous energy into the watercourse, which will be reflected in the macroinvertebrate composition, and provide additional cover to fish and white-clawed crayfish. The migration/movement of fish, white-clawed crayfish and sediment is likely to be influence by the presence of a couple of weirs.

The reduction in flow associated with the drought option could lead to several potential impacts within Colne 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) 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 4 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 Colne 1 from the drought option is therefore assessed as **major**.

A4.3.5 River water quality

For this assessment the only monitoring point present in Colne 1, Colne At Marsden Above Conf Wessenden Brook (NE-49500639) has been used. Data at this site is limited to 2013 - 2017. There are no continuous or intermittent water quality pressures identified in this reach. A summary description of the potential risks to water quality in Colne 1 as a result of the drought option is presented in **Table A4.3**.

Table A4.3 Potential risks to water quality in Colne 1 as a result of the drought option

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were consistent with High WFD status (0.2 mg/l) throughout the monitoring period. No seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. No seasonality was apparent.	Orthophosphate concentrations were mostly consistent with Good (0.028 mg/l) and High (0.013 mg/l) WFD status with one result achieving Poor status. No seasonality was apparent.
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

A4.3.6 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 Colne 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 Colne 1 as a result of the drought option

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 flow pressure within the reach with potential for periods of time with flow reductions up to 27% without mitigation
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. There is also a moderate risk to sediment dynamics.
Water quality *Minor risk*	• Reported ammonia, phosphate and dissolved oxygen water quality is variable although predominantly consistent with High or Good status and 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 phosphate 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 COLNE 2

A4.4.1 Reach introduction

Colne 2 is potentially impacted by a River Colne Maintained Flow at Marsden and Butterley Reservoir drought permits. 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 Colne from Wessenden Brook to River Holme (GB104027063330).

A4.4.2 Reach setting

Colne 2, located on main EAR **Figure 4.1,** comprises a 6.5km stretch of the River Colne from the confluence with the Wessenden Brook down to the confluence with Hoyle House Clough (**Table A3.1**). Colne 3 (see **Section A4.5** below) is downstream.

A4.4.3 River flow regime

There is no gauged flow data available for this reach of the River Colne, so 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 Huddersfield Longroyd Bridge (further details are provided in **Annex 8**). The Huddersfield Longroyd Bridge daily record was first adjusted to allow for the effects of the reservoirs in the upper catchment. Measured daily flows downstream of the Marsden intake and outflows from Butterley reservoir were then added back on to the estimated (transposed) data series, to provide an estimated flow record for the River Colne just downstream of the Wessenden Brook confluence. This enabled the creation of an estimated daily flow record for the River Colne downstream of the Wessenden Brook confluence covering the period 1990-2024 with moderate to high confidence.

This reach is affected by the combined impacts of the Butterley Reservoir and River Colne Marsden intake maintained flow drought options. The maximum combined flow reduction from these two options is 10.28 Ml/d (4.87 Ml/d from the reduction in the maintained flow downstream of the Marsden intake, and 5.41 Ml/d from the reduced compensation flow from Butterley Reservoir).

The residual flow in the River Colne would not be lower than the sum of the minimum compensation from Butterley Reservoir and the River Colne Marsden intake maintained flow (2.66 Ml/d + 2.40 Ml/d = 4.61 Ml/d). As such, the potential reduction in summer Q_{95} and Q_{99} flows is 65% and 67% respectively, and the potential reduction in annual Q_{95} and Q_{50} flows is 64% and 40% respectively.

The hydrological impact of drought options on Colne 2 is therefore assessed as a **major** hydrological impact at any time of year.

There is one significant flow pressures influencing flow in Colne 2 as described in **Section A4.3.3.1**. There are no significant discharges within Colne 2. 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 abstraction in this reach presenting a significant flow pressure which has a peak daily licensed abstraction rate of 23.87Ml/d. This abstraction is a non-consumptive abstraction for industrial, commercial, energy and public services use (‘Park Gate Clough – Marsden’ and ‘River Colne – Marsden’) with potential flow impacts. An abstraction at that rate could reduce flows in the depleted reach (~500m long), 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 Colne 2 (see main EAR Section 6). 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 25 September 2018 at an estimated river flow at the flow assessment point for the reach of 20.33Ml/d.

Colne 2 is a fairly sinuous reach which falls ~64m over 6.5km, a slope of 0.6°. Riparian tree cover ranges between none to semi-continuous on both banks along the reach, as confirmed by the furthest upstream RHS site (ID 21113). The channel is visible on aerial imagery for some of its length. Channel width has been measured as between 8-20m. Where the channel is visible some features are visible, most notably 4 mid channel bars (all of which were vegetated) and 3 side bars (two of which were vegetated), one unvegetated side bar was observed at RHS site 21113. Boulders have been noted protruding through the flow surface, RHS site 21113 confirmed this where exposed boulders dominated throughout the channel. Where visible on aerial imagery, the channel surface indicates that smooth flow predominates, with some broken flow noted and these attributed to riffles. Flow variation was observed at RHS site 21113, rippled flow dominated, however there were also areas of frequent smooth flow, unbroken standing waves, and occasional chaotic flow and broken standing waves. Banks at the RHS site 21113 were steep (>45º). Where banks are vegetated, it is assumed that they are composed of earth, particularly in the mid sections of the reach. At the RHS site 21113, the banks are dominated by earth or laid brick, minor components of concrete and boulder were also observed. Bank reinforcement is common throughout the reach, particularly so in the first 0.8km and last 0.7km of the reach as the channel flows through Marsden and Slaithwaite. Surrounding land-use is predominantly suburban/urban development for 0.8km downstream, with a mixture of improved grassland, broadleaf woodland and some open water (as ponds and millponds) up to 6km downstream after which land use is suburban/urban for the remainder of Colne 2. At the furthest downstream RHS site (site ID 27674), three pool and ten riffles were observed as well as three unvegetated point bars. The survey also noted that >33% of the channel had been realigned and over-deepened, with no observed channel impoundment.

Colne 2 is likely to support a more balanced extent of high and low energy environments, with a greater extent of depositional features identified as present in the reach. The large substrate types present for the whole reach, as indicated by the RHS site 21113, will provide significant habitat opportunities for fish and white-clawed crayfish, with the earth and reinforced banks providing burrowing and refuge opportunities for white-clawed crayfish. Although suitable habitat for spawning has not been identified, its absence from the watercourse cannot be assumed. The presence of trees in the riparian habitat will ensure some input of allochthonous energy into the watercourse and provide additional cover to fish and white-clawed crayfish. The presence of suitable marginal vegetation to support water vole is unknown, and so suitable habitat is considered likely to be present on a precautionary basis. The migration/movement of fish, white-clawed crayfish and sediment is likely to be influence by the presence of a number of weirs.

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

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for the duration of drought options.
- Potentially minor risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins 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 habitat types.
- Minor risk to longitudinal connectivity from eight 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 Colne 2 from drought options is therefore assessed as **minor**.

A4.4.5 River water quality

For this assessment the second water monitoring site present in Colne 2, River Colne At Slaithwaite Footbridge (NE-49500641) has been used, with this site providing the greatest data record. 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 Colne 2 as a result of drought options is presented in **Table A4.5**.

Table A4.5 Potential risks to water quality in Colne 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. No seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. No seasonality was apparent.	Orthophosphate concentrations were inconsistent with Good (0.028 mg/l) and High (0.013mg/l) WFD status with some of results achieving Moderate status or lower. No 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

A4.4.6 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 Colne 2 as a result of drought options is presented in **Table A4.6**.

Table A4.6 Summary of potential changes in the physical environment of Colne 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 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 flow depleted reach (~500m) with potential for periods of time with zero flow without mitigation
River habitats *Minor risk*	• The major reduction in flow will present a change to the current low energy system. This has 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 one listed CSOs during rainfall events. • Reported ammonia and dissolved oxygen water quality is consistent with High status and with no apparent flow sensitivity. Though phosphate water quality is more variable and often consistent with Moderate status, there is no relationship between flow and phosphate quality. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and phosphate has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought options implemented.

Insert Figure A4.3

A4.5 COLNE 3

A4.5.1 Reach introduction

Colne 3 is potentially impacted by a Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, and Blackmoorfoot Reservoir – Hoyle House Clough drought permits. A summary of physical environment information for this reach is provided in **Figure A4.4**. The reach includes part of the following river waterbody:

- River Colne from Wessenden Brook to River Holme (GB104027063330).

A4.5.2 Reach setting

Colne 3, located on main EAR **Figure 4.1,** comprises a 6.0km stretch of the River Colne from the confluence with Hoyle House Clough down to the confluence with the River Holme. Colne 4 (see **Section A4.6** below) is downstream.

A4.5.3 River flow regime

Flows in this reach have been estimated using the Gustard flow transposition method with the daily gauged flow record at Huddersfield Longroyd Bridge, adjusted for the effects of reservoirs in the catchment upstream of the gauge (further details in **Annex 8**). Measured daily flows downstream of the Marsden intake and outflows from Butterley, Deerhill and Blackmoorfoot reservoirs were then added back on to the estimated (transposed) data series, to provide an estimated flow record for the River Colne downstream of the Hoyle House Clough confluence. This enabled the creation of an estimated daily flow record for the River Colne downstream of the Hoyle House Clough confluence covering the period 1990-2024 with moderate to high confidence.

This reach is affected by the combined impacts of the River Colne Marsden intake maintained flow drought option and the Butterley, Deerhill and Blackmoorfoot (Hoyle House Clough) reservoir drought options. The maximum combined flow reduction from these four options is 11.63 Ml/d, which represents reductions of 52% and 64% in the summer Q_{95} and Q_{99} flow statistics respectively and would therefore be assessed as a major hydrological impact in summer conditions. During a winter refill period, the combined flow reduction represents reduction of up to 49% and 20% in the year round Q_{95} and Q_{50} flow statistics, which is assessed as a major hydrological impact in winter also.

At the lower end of this reach, flow is measured at the Huddersfield Longroyd Bridge gauge. The maximum combined flow reduction of 11.63 Ml/d represents reductions of 41% and 61% in the summer Q_{95} and Q_{99} flow statistics respectively and would therefore be assessed as a major hydrological impact in dry autumn conditions. During a winter refill period, the combined flow reduction represents reductions of 38% and 18% in the year round Q_{95} and Q_{50} flow statistics at Huddersfield Longroyd Bridge, which is assessed as a major hydrological impact in winter.

The hydrological impact of drought options on Colne 3 is therefore assessed as **major** for both summer conditions and any winter refill period while drought options remain in place.

There is one significant flow pressure influencing flow in Colne 3 as described in **Section A4.5.3.1.** There are no significant discharges within Colne 3. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.5.3.1 Significant flow pressures

There is one abstraction presenting a significant flow pressure influencing flow in Colne 3. The abstraction has a peak daily licensed abstraction rate of 7.56 Ml/d. This abstraction used for industrial, commercial and public services use (Huddersfield Narrow Canal) with potential flow impacts. An abstraction at that rate could reduce flows in the depleted reach during environmental drought, in combination with drought options, to zero.

YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures. A walkover has been included downstream of this abstraction in the schedule of monitoring for Colne 3 (see main EAR Section 6).

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 25 September 2018 at an estimated river flow at the flow assessment point for the reach of 38.79Ml/d.

Colne 3 is a fairly sinuous reach flowing through a shallow V-shaped valley which falls ~47m over 6.0km, a slope of 0.5°. Riparian tree cover ranges between scattered to continuous on both banks along the reach. The channel is visible on aerial imagery for much of its length, particularly where urbanisation increases. Channel width has been measured as between 7-20m, with width varying significantly in urban areas due to anthropogenic modification and upstream and downstream of weirs. Extant aerial imagery shows a wide array of in-channel features with 11 mid channel bars (10 of which are vegetated), 18 side bars (12 of which are vegetated), and 2 point bars (none were vegetated). 1 island was noted in the channel and this was located immediately downstream of a weir. There is also significant marginal vegetation in sections of the channel where both banks are reinforced. It is possible that these features are berms, although it is likely that addition field evidence would be needed to confirm if this is the case. The sediment bar features suggest particle sizes around of pebble and cobble. Boulders have been noted protruding through the flow surface throughout the channel and are generally found around channel bars and downstream of weirs. At the YWSL baseline monitoring site (13543), it was observed that pebbles/gravel (45%) was the dominant substrate, with boulders (25%), cobbles (25%) and sand (5%) present. Where visible on aerial imagery, the channel surface indicates that smooth flow predominates, however a total of 38 areas of broken flow have been identified and these are taken to be related to riffles. At the YWSL baseline monitoring site, it was recorded that riffle (50%) and run (45%) flows were dominant, with evidence of backwater (5%) flow as well. Where banks are vegetated it is assumed that they are composed of earth. Bank reinforcement is common throughout the reach, particularly in urban areas and around large buildings flanking the channel. Land-use throughout the reach is a mixture of improved grassland and rough pasture with some broadleaf woodland in the mid sections of Colne 3. Suburban/urban development is present throughout Colne 3.

Colne 3 is likely to be dominated by low energy environments, as indicated by the presence of many depositional features in the channel and extensive presence of marginal vegetation. Spawning habitat for fish is likely to be present in Colne 3, with the presence of riffles identified as likely. Features providing cover/refuge to adult and juvenile fish are considered likely to be present, notably the marginal vegetation in Colne 3, and the earth and reinforced banks and likely substrate present will provide suitable habitat for white-clawed crayfish. The regular presence of trees in the riparian habitat will provide an input of allochthonous energy in the watercourse and provide additional cover and habitat opportunity for fish and white-clawed crayfish. The movement/migration of fish, white-clawed crayfish and sediment is likely to be impacted by the presence of a large number of weirs.

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

- Major risk of changes in the energy of the system associated with up to 65% reduction in flow for the duration of drought options.
- 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 15 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 Colne 3 from drought options is therefore assessed as **major**.

A4.5.5 River water quality

For this assessment the second of two water monitoring sites present in Colne 3, Colne at Market Street, Milnsbridge (NE-49500638) has been used due to its superior data quality. There are 10 frequently spilling CSOs potentially presenting an environmental risk in the reach. A summary description of the potential risks to water quality in Colne 3 as a result of drought options is presented in **Table A4.7**.

Table A4.7 Potential risks to water quality in Colne 3 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 a sample achieving Moderate status. No seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Limited seasonality was apparent.	Orthophosphate concentrations were invariably consistent with Good (0.032 mg/l) or High (0.015 mg/l) WFD status with some of results achieving Moderate (0.096 mg/l) status. No 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 10 listed CSOs during rainfall events.		None
Other point source pressures presenting risk	None	None	None
Summary	Moderate risk from drought options associated with CSO discharge	Moderate risk from drought options associated with CSO discharge	Minor 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 Colne 3 as a result of drought options is presented in **Table A4.8**.

Table A4.8 Summary of potential changes in the physical environment of Colne 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 64% 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 flow pressure with potential for periods of time with zero flow if operated in-combination with the drought option without mitigation.

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. There is also a moderate risk to sediment dynamics.
Water quality *Moderate risk*	• Moderate risk from short term acute, infrequent, temporary water quality pressures locally downstream of 10 listed CSOs during rainfall events. • Reported ammonia and dissolved oxygen water quality is consistent with High status and with no apparent flow sensitivity. Though phosphate water quality is more variable and often consistent with Moderate status, there is no relationship between flow and phosphate quality. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and phosphate has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought options implemented.

Insert Figure A4.4

A4.6 COLNE 4

A4.6.1 Reach introduction

Colne 4 is potentially impacted by a Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoor Reservoir – Brow Grains, Digley Reservoir, and Brownhil Reservoir drought permits. A summary of physical environment information for this reach is provided in **Figure A4.5**. The reach includes part of the following river waterbody:

- Colne from River Holme to River Calder (GB104027062550).

A4.6.2 Reach setting

Colne 4, located on main EAR **Figure 4.1,** comprises a 7.2 km stretch of the River Colne from the confluence with the River Holme down to the confluence with the River Calder. Calder 4 (see **Section A4.17** below) is downstream.

A4.6.3 River flow regime

Downstream of the River Holme confluence, a daily flow series has been produced by summing the daily gauged flows at the Huddersfield Queens Mill (River Holme) and Huddersfield Longroyd Bridge (River Colne) gauges, and an estimate of the flow accretion due to the very small increase in catchment areas downstream of these two gauges to their confluence. (This estimate was based on a simple catchment area ratio with the incremental catchment between the two gauges and the downstream gauge at Colne Bridge; the Gustard flow transposition was not found to give satisfactory results, due to the very small catchment area increment of only 1.2 km^2).

Note that at low flows, the estimated daily mean flow values downstream of the confluence are in fact higher than the corresponding daily gauged flows at Colne Bridge, at the lower end of the reach. The reasons for this are not clear but it may be partly due to a significant chemical works abstraction (of up to 67 Ml/d) between the confluence and the Colne Bridge gauge. The abstraction is described as being partly medium loss (general use) and partly low loss (general cooling), however it is not clear from the information currently available how much of this abstraction is returned to the river and how much is either used or discharged via sewer to be treated at Huddersfield WwTW. With these uncertainties, the confidence associated with the hydrological assessment is medium.

This reach is affected by the combined impacts of seven of the YWSL drought options located in the River Holme and River Colne catchments upstream of the confluence of these two watercourses.

The combined flow reduction of all of these options varies according to the time of year, but during the summer period from April to September ranges from 18.77 Ml/d to 20.92 Ml/d when regional reservoir storage is below the regional Drought Control Line for four consecutive weeks or more. A reduction of up to 20.92 Ml/d represents reductions of 30% and 38% in the summer Q_{95} and Q_{99} flow statistics respectively and would therefore be assessed as a major hydrological impact in summer conditions.

During a winter refill period from October to March, if regional storage is below the control line for 4 weeks or more, the combined flow reduction from all eight of the Holme and Colne drought options ranges from 20.92 Ml/d up to 25.13 Ml/d. The reduction of up to 25.13 Ml/d represents reduction of up to 33% and 13% in the year round Q_{95} and Q_{50} flow statistics, which is assessed as a major hydrological impact in winter also.

At the lower end of this reach, flow is measured at the Colne Bridge gauge. The percentage reductions are higher at the downstream end of the reach than at the upstream end, due to daily gauged flows being lower than the daily estimated flows at the top of the reach during low flow periods. This is likely to be due to abstractions or other losses in this reach upstream of the Colne Bridge gauge, such as the chemical works abstraction as referred to previously.

At the Colne Bridge gauge, the maximum combined flow reduction is 20.92 Ml/d in the summer, but the residual flow in the River Colne would not be lower than the sum of the minimum compensation flows which occurs in June (2.4 Ml/d + 2.66 Ml/d + 0.46 Ml/d + 0.2 M/d + 0.88 Ml/d + 1.49 Ml/d + 1.58 Ml/d = 9.67 Ml/d). This leads to the reduction in the summer Q_{95} and Q_{99} flow statistics to be 42% and 67%

respectively, with the latter based on the sum of the minimum compensation flows. This would therefore be assessed as a major hydrological impact in summer conditions.

For a winter period at the Colne Bridge Gauge, the maximum combined flow reduction of up to 25.13 Ml/d represents reductions of up to 45% and 14% in the year round Q_{95} and Q_{50} flow statistics, which is assessed as a major hydrological impact in winter.

The hydrological impact of drought options on Colne 4 is therefore assessed as **major** for both summer conditions and during any winter refill period while drought options remain in place.

There are two significant flow pressures influencing flow in Colne 4 as described in **Section A4.6.3.1**. There are no significant discharges within Colne 4. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.6.3.1 Significant flow pressures

The furthest upstream of the two significant flow pressures in this reach is an abstraction for the Huddersfield Broad Canal ('River Colne at Aspley, Huddersfield') which, as advised by the Environment Agency, abstracts 10-15Ml/d as an annual average. A 15 Ml/d abstraction could reduce flows (compared to the summer Q95 statistic) by a further 30% in combination with the reduction associated with the drought permits.

The further downstream abstraction in this reach presenting a significant flow pressure has a peak daily licensed abstraction rate of 67.20Ml/d. The abstraction is used for chemical production ('River Colne and Tributaries –Dalton Works') with potential flow impacts. Abstractions 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. A walkover has been included downstream of these abstractions in the schedule of monitoring for Colne 4 (see main EAR Section 6).

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 27 September 2018 at an estimated river flow at the flow assessment point for the reach of 96.77Ml/d.

Colne 4 is fairly sinuous and falls ~23m over 7.2km, a slope of 0.2°. Riparian tree cover varies along Colne 4 from none to isolated to continuous. Channel width varies throughout Colne 4 between 14-22m. Extant aerial imagery shows a wide array of in-channel features with 6 mid channel bars (4 of which are vegetated), 9 side bars (2 of which are vegetated) and 1 unvegetated point bars. One very large island (~115m in length) has been identified, located at ~0.5km downstream. No channel substrate could be identified on aerial imagery exposed boulders were found within 50% of the channel. The YWSL baseline monitoring site (13544) observed the dominant substrate to be pebbles/gravel (40%) and cobbles (35%), with boulders (15%) and sand (10%) also present. 27 areas of broken flow have been identified in the reach, which are likely caused by riffles. The remainder of the channel surface indicated smooth flow. At the YWSL baseline monitoring site, the recorded dominant flow was glide (50%), with sections of run (30%), backwater (15%) and riffle (5%). Due to the length of the reach and the variety of land use the reach flows through, it is expected that banks are composed of a wide range of materials, both natural and artificial. Surrounding land-use is a mixture of suburban/urban land use as the reach flows through Huddersfield for much of its length. Parkland and gardens and improved grassland is also present, scattered along Colne 4.

Colne 4 is likely to comprise a variety of low and high energy environments as identified by the presence of both erosional and depositional features and the likely flow structure identified. The likely presence of riffles identifies the potential for spawning habitat to be present for fish, with the larger substrates present providing refuge and cover opportunities for juvenile and adult fish and white-clawed crayfish. The regular occurrence of trees in the riparian corridor will provide some allochthonous energy input into the watercourse, provide resting opportunities for fish, refuge opportunities for white-clawed crayfish and provide some resting opportunities for otter. Although the presence of woodland in the surrounding land use is limited, there are some that are large enough to potentially support breeding

otter. The presence of a number of weirs in the reach may have impacts upon the migration/movement of fish and sediment.

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

- Major risk of changes in the energy of the system associated with up to 38% reduction in flow for the duration of drought options.
- 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 eight 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 Colne 4 from drought options is therefore assessed as **major**.

A4.6.5 River water quality

For this assessment the most upstream of four water monitoring sites present in Colne 4, Colne At King's Bridge Road (NE-49500633) has been used with this site having the best data quality. There are 22 frequently spilling CSOs potentially presenting an environmental risk in the reach. A summary description of the potential risks to water quality in Colne 4 as a result of drought options is presented in **Table A4.9**.

Table A4.9 Potential risks to water quality in Colne 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) throughout the monitoring period. No seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Seasonality was apparent.	Orthophosphate concentrations were mostly results achieving Moderate (0.112 mg/l) status or lower. No seasonality was apparent.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	Weak
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 22 listed CSOs during rainfall events.		None
Other point source pressures presenting risk	None	None	None
Summary	Moderate risk from drought options	Moderate risk from drought options	Minor risk from drought options

	Total ammonia	Oxygen	Phosphate
	associated with CSO discharge	associated with CSO discharge	

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 Colne 4 as a result of drought options is presented in **Table A4.10**.

Table A4.10 Summary of potential changes in the physical environment of Colne 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 throughout the reach at any time of year that drought options implemented.
Flow depleted reaches/significant flow pressure *Major risk*	• One significant flow pressure within the reach with potential for periods of time with zero flow without mitigation. • One significant flow pressure within the reach with potential for a further reduction in flow of by up to 30% in-combination with the drought permits without mitigation.
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. There is also a moderate risk to sediment dynamics.
Water quality *Moderate risk*	• Moderate risk short term acute, infrequent, temporary water quality pressures locally downstream of 22 listed CSOs during rainfall events. • Reported ammonia and dissolved oxygen water quality is consistent with High status and with no apparent flow sensitivity. Though phosphate water quality is more variable and often consistent with Moderate status, there is only a weak relationship between flow and phosphate quality. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and phosphate has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought options implemented.

Insert Figure A4.5

A4.7 COLNE T1

A4.7.1 Reach introduction

Colne T1 is potentially impacted by a Butterley Reservoir drought permit. A summary of physical environment information for this reach is provided in **Figure A4.6**. The reach includes part of the following river waterbody:

- Wessenden Brook from Butterly Reservoir to River Colne (GB104027063190).

A4.7.2 Reach setting

Colne T1, located on main EAR **Figure 4.1,** comprises 1.2km stretch of Wessenden Brook from the outflow of Butterley Reservoir to the confluence with the River Colne. The reach is dominated by reservoir outflows with an additional catchment area of 1.1km^2 along the length of the reach. Colne 2 (see **Section A4.4** above) is downstream.

A4.7.3 River flow regime

The normal minimum compensation flow from Butterley Reservoir to Wessenden Brook is 8.07 Ml/d, and during the implementation of this drought option, it is likely that the level in the 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. The maximum reduction in the compensation flow is 5.40 Ml/d (from 8.07 Ml/d to 2.66 Ml/d, when regional reservoir storage is below the regional Drought Control Line for four consecutive weeks or more). This represents a reduction of up to 67% in the flow at the top of this reach and is therefore assessed as a major hydrological impact at any time of year. With this being immediately downstream of the reservoir, the confidence associated with this assessment is high.

The hydrological impact of the drought option on Colne T1 is therefore assessed as **major** for both summer conditions and during any winter refill period while drought options remain in place.

There are two significant flow pressures influencing flow in Colne T1 as described in **Section A4.7.3.1**. There are no significant discharges within Colne T1. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.7.3.1 Significant flow pressures

There are two separate licensed abstractions depleting flow in Colne T1 for industrial, commercial and public services use.

One of the abstractions has a peak daily licensed abstraction rate of 0.55Ml/d. This abstraction is used for textiles and leather production (‘Wessenden Brook – Marsden’) with potential flow impacts. An abstraction at that rate could reduce flows in the reach, in combination with drought option, by a further 20%.

The other abstraction has a peak daily licensed abstraction rate of 6.79Ml/d. This abstraction is used for textiles and leather production (‘Wessenden Brook’) with potential flow impacts. Abstractions at that rate could reduce flows in the reach, in combination with drought option, to zero.

YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures. A walkover has been included downstream of these abstractions in the schedule of monitoring for Colne T1 (see main EAR Section 6).

A4.7.4 River habitats

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

Colne T1 is fairly straight reach which falls ~57m over 1.2km, a slope of 2.7°. Riparian tree cover is continuous in the initial 0.2km of the reach with no to isolated tree cover thereafter. The channel is not visible for most of its length on aerial imagery. Where the channel is visible, prior to the confluence with the River Colne, channel widths have been measured as between 7-8m, although these may not be

representative of the natural channel width due to the anthropogenic modification around the channel at this point. At the RHS site (site ID 18556), bankfull widths was recorded as 4m. No in-channel features could be identified, however, the RHS survey identified vegetated side bars. Where visible on aerial imagery, the channel surface indicates that smooth flow predominates. Flow variation was recorded at the RHS site where unbroken standing waves dominated, however occasional areas of rippled and smooth flow were also observed. Bed substrate at the RHS survey site was dominated, when visible, by cobble, however frequent areas of bedrock and occasional artificial material were also recorded. The RHS survey site identified exposed bedrock within the channel. In the upper reaches (to ~0.2km downstream) the vegetation types suggest banks are composed of earth. Bank reinforcement is common in the lower sections of the reach as the channel flows through Marsden. At the RHS site, the left bank was comprised dominantly of bricks with minor components of earth; this bank had been reinforced, though some undercutting was observed. The right bank was comprised predominantly of brick, with minor components of earth and rip-rap. The right bank had been reinforced and resectioned. Greater than 33% of the channel had been realigned at the RHS site. Surrounding land use is predominantly broadleaf woodland to 0.2km downstream to suburban/urban land use thereafter.

Colne T1 is likely to be dominated by high energy environments, as indicated by the relatively straight planform and moderate slope, however low energy environments are highly likely to be present. The relatively sparse tree cover will provide some allochthonous energy and some potential cover for fish. The substrate of the watercourse is likely to be dominated by large substrate types, providing cover and refuge potential for fish. The presence of potentially suitable spawning habitat cannot be ruled out. The large substrate types will also provide suitable habitat opportunities for white-clawed crayfish and the earth banks are suitable for burrowing. The reinforced banks may also provide refuge opportunities for white-clawed crayfish. The presence of a couple of weirs in the reach is likely to have impacts upon the movement/migration of fish and sediment.

The drought options reduction in flow could lead to several potential impacts within Colne T1:

- 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) 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 eight 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 Colne T1 from the drought option is therefore assessed as **major**.

A4.7.5 River water quality

For this assessment the first and only water quality monitoring site present in Colne T1, Wessenden Brook at Fall Lane, Marsden (NE-49500726) has been used. No intermittent or continuous water quality pressures have been identified in this reach. A summary description of the potential risks to water quality in Colne T1 as a result of drought option is presented in **Table A4.11**.

Table A4.11 Potential risks to water quality in Colne T1 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. No seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Seasonality was apparent.	Orthophosphate concentrations were mostly consistent with Moderate status or lower. No seasonality was apparent.
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

A4.7.6 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 Colne T1 as a result of drought option is presented in **Table A4.12**.

Table A4.12 Summary of potential changes in the physical environment of Colne T1 as a result of drought option

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*	• Two separate flow pressures are present in this reach, one with potential for periods of time with zero flow without mitigation
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. There is also a moderate risk to sediment dynamics.
Water quality *Minor risk*	• Reported ammonia and dissolved oxygen water quality is consistent with High status and with no apparent flow sensitivity. Though phosphate water quality is more variable and often consistent with Moderate status, there is only a weak relationship between flow and phosphate quality. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and phosphate has been assessed. • There are no continuous or intermittent water quality pressures identified as presenting increased risk with drought options implemented.

Insert Figure A4.6

A4.8 COLNE T3

A4.8.1 Reach introduction

Colne T3 is potentially impacted by a Blackmoorfoot Reservoir Hoyle House Clough drought permit. A summary of physical environment information for this reach is provided in **Figure A4.7**. The reach includes part of the following river waterbody:

- River Colne from Wessenden Brook to River Holme (GB104027063330)

A4.8.2 Reach setting

Colne T3, located on main EAR **Figure 4.1,** comprises a 1.7km stretch of Hoyle House Clough from the outflow of Blackmoorfoot Reservoir to the confluence with the River Colne. The reach is dominated by reservoir outflows with an additional catchment area of 1.5km^2 along the length of the reach. Colne 3 (see **Section A4.5** above) is downstream.

A4.8.3 River flow regime

The normal minimum compensation flow from Blackmoorfoot Reservoir to Hoyle House Clough is 0.61 Ml/d, and during the implementation of this drought option, it is likely that the level in the 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. In addition it is understood that the reservoir is managed so as to minimise overflows, but any overflows that do occur are channelled into the Brow Grains Dyke on the southern side of the reservoir, and therefore contribute to flows in the Holme catchment rather than the Colne catchment.

The maximum reduction in the compensation flow is 0.41 Ml/d (from 0.61 Ml/d to 0.20 Ml/d, when regional reservoir storage is below the regional Drought Control Line for four consecutive weeks or more). This represents a reduction of up to 67% in the flow at the top of this reach and is therefore assessed as a major hydrological impact at any time of year.

The hydrological impact of the drought permit on Colne T3 is therefore assessed as a **major** hydrological impact at any time of year. With this reach being immediately downstream of the reservoir, the confidence in the assessment is high.

There are no significant flow pressures, either abstractions or discharges, influencing flow in Colne T3. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

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 26 September 2018 at a reservoir outflow of 0.98Ml/d.

Colne T3 is a fairly straight reach which falls ~129m over 1.7km, a slope of 4.3°. Riparian tree cover varies between scattered to continuous on both banks along Colne T3. The channel is not visible on aerial imagery and therefore measurements of channel width and identification of in-channel features cannot be identified. The channel width at the YWSL baseline monitoring site (13557) is 1.63m, downstream at the RHS site (site ID 18577), bankfull width was recorded as 6m. Due to the steepness of the channel broken flow is likely to be common. Flow at the YWSL baseline monitoring site is dominated by ripple flow (70%). Downstream at the RHS site, where visible, chute flow dominated and occasional areas of unbroken standing waves were observed. Bed substrate varied at the YWSL monitoring site, boulders dominated (45%). Downstream at the RHS site, gravel was abundant and frequent areas of artificial material and pebble were observed. Where banks are vegetated it is assumed that they are composed of earth. At the RHS site, the left bank was predominantly comprised of bricks, with earth and concrete also noted. The left bank had been reinforced and resectioning was noted. The right bank was also comprised predominantly of bricks, with earth also noted. The right bank had also been reinforced and resectioned. The RHS survey noted that 60% of the channel had been resectioned. Bank reinforcement cannot be directly observed within the rest of the reach, however it is assumed that

reinforcement of the channel banks occurs as the channel flows through Linthwaite. Surrounding land-use is mixture of suburban/urban land use on the left bank with rough pasture on the right until ~1km downstream where land use is predominantly suburban/urban. There is a small pond on the right bank ~0.6km downstream.

Colne T3 is likely to be dominated by high energy environments, as indicated by the gradient of the watercourse and relatively straight planform, however low energy environments are likely to be present. The substrate of the watercourse is dominated by large substrate types, providing cover and refuge potential for fish. The presence of potentially suitable spawning habitat cannot be ruled out. The regular occurrence of trees in the riparian corridor will provide allochthonous energy into the watercourse, which will influence the macroinvertebrate composition present, and provide additional cover for fish. The very low flow as consequence of drought options may not be sufficient to maintain longitudinal connectivity, impacting, the movement of fish and sediments in the reach. There are two weirs noted in this reach however these are associated with the reservoir spillway so are not expected to impede connectivity along the reach.

The drought options reduction in flow could lead to several potential impacts within Colne T3:

- 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) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars and islands) and protrusion of bedrock outcrops and bed elements (such as larger particles) through the flow surface for duration of drought option at very low flows.
- Potentially major risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for duration of drought option at very low flows.
- Major risk to longitudinal connectivity, due to the steep gradient of this reach. Pools may become disconnected and riffles could dry.
- 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. Coarse sediment dynamics are unlikely to be affected.

The overall risk to river habitats on Colne T3 from the drought option is therefore assessed as **major**.

A4.8.5 River water quality

For this assessment, in the absence of a suitable water quality monitoring site in this reach, the most suitable water monitoring point present in the downstream reach Colne 3, Colne at Market Street, Milnsbridge (NE-49500638) 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 Colne T3 as a result of drought options is presented in **Table A4.13**.

Table A4.13 Potential risks to water quality in Colne T3 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 a sample achieving Moderate status. No seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Limited seasonality was apparent.	Orthophosphate concentrations were invariably consistent with Good (0.032 mg/l) or high (0.015 mg/l) WFD status with some of results achieving Moderate (0.096 mg/l) status. No seasonality was apparent.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	Non 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

A4.8.6 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 Colne T3 as a result of drought options is presented in **Table A4.14**.

Table A4.14 Summary of potential changes in the physical environment of Colne T3 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 *None*	• There are no flow depleted reaches within Colne T3.
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. There is also a moderate risk to 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. • Reported ammonia and dissolved oxygen water quality is consistent with High status and with no apparent flow sensitivity. Though phosphate water quality is more variable and often consistent with Moderate status, there is no relationship between flow and phosphate quality. As such only a minor risk associated with change in dilution

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
	of diffuse pollution pressures to ammonia, dissolved oxygen and phosphate has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought options implemented.

Insert Figure A4.7

A4.9 COLNE T4

A4.9.1 Reach introduction

Colne T4 is potentially impacted by a Scammonden Water Bradshaw Clough 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:

- Colne from Wessenden Brook to R Holme (GB104027063330).

A4.9.2 Reach setting

Colne T4, located on main EAR **Figure 4.1,** comprises a 2.0km stretch of Bradshaw Clough from the intake of Scammonden Reservoir to the inflow into Slaithwaite Reservoir. The reach is dominated by reservoir outflows with an additional catchment area of 2.9km^2 along the length of the reach.

A4.9.3 River flow regime

There is limited hydrology data for this reach so a representative hydrograph to illustrate the flow change as a result of this drought option is unable to be generated for inclusion in **Figure A4.8**. The normal minimum compensation flow from Scammonden Reservoir to Bradshaw Clough is 1.36 Ml/d, and during the implementation of this drought option, it is likely that the level in the 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. The maximum reduction in the compensation flow is 0.91 Ml/d (from 1.36 Ml/d to 0.45 Ml/d, when regional reservoir storage is below the regional Drought Control Line for four consecutive weeks or more). This represents a reduction of up to 67% in the flow at the top of this reach.

The hydrological impact of the drought permit on Colne T4 is therefore assessed as a **major** hydrological impact at any time of year. With the assessment point used for this assessment being downstream of the point of flow change, this assessment is assigned high confidence.

There is one significant flow pressure influencing flow in Colne T4 as described in **Section A4.9.3.1**. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.9.3.1 Significant flow pressures

Though no licensed daily quantities are available, the Environment Agency have advised that the Canal and Rivers Trust abstraction (NE/027/0011/026) should be considered as significant flow pressure in this reach. YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures. A walkover has been included downstream of this abstraction in the schedule of monitoring for Colne T4 (see main EAR Section 6).

A4.9.4 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 25 September 2018 with an assumed flow of at least 1.364 Ml/d.

Colne T4 is a fairly straight reach which falls ~96m over 2.0km, a slope of 2.8°. Riparian tree cover along the reach is semi-continuous to continuous in the upper section of Colne T4, isolated to scattered in the mid-section of Colne T4 and increasing to continuous around the reservoir inflow. Where visible in the mid sections of the reach the channel width is between ~1-2m. In the visible sections of the reach there are boulders present protruding through the surface of the channel, with abundant coarse sediment. A waterfall is noted on OS maps, located immediately prior to the reservoir inflow. No other features were visible. Where the channel surface is visible the flow is generally smooth with some areas of broken flow, apparent over boulder steps. It is likely that channel banks are composed of earth and boulders. In the upper section of Colne T4 surrounding land use is broadleaf woodland, trending to rough pasture in the mid sections and back to broadleaf woodland immediately prior to and around the inflow to the reservoir.

Due to an absence of RHS information, only limited habitat information can be concluded for Colne T4. The site is likely to be dominated by high energy environments, as indicated by the straight planform and moderate slope. The presence of boulders in the watercourse along with the likely coarse substrate typical in a watercourses of this type will provide significant habitat opportunities for white-clawed crayfish with soft earth banks also suitable for the creation of burrows. The extensive coverage of trees in the riparian habitat will ensure a high input of allochthonous energy into the watercourse, which will be reflected in the macroinvertebrate composition, and provide some refuge for white-clawed crayfish. The presence of suitable marginal vegetation to support water vole is unknown, and so suitable habitat is considered likely to be present on a precautionary basis. The movement of sediment and white-clawed crayfish through the reach is likely to be influenced by the presence of a couple of weirs and naturally by the presence of a waterfall.

The drought options reduction in flow could lead to several potential impacts within Colne T4:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for the duration of drought options.
- 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 4 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 Colne T4 from drought options is therefore assessed as major.

A4.9.5 River water quality

There are no suitable water quality monitoring points in this reach. As such, a suitable site in the downstream reach (from the midpoint of Colne 2), River Colne At Slaithwaite Footbridge (NE-49500641), has been used. No continuous or intermittent water quality pressures are identified in this reach. A summary description of the potential risks to water quality in Colne T4 as a result of drought options is presented in **Table A4.15**.

Table A4.15 Potential risks to water quality in Colne T4 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. No seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. No seasonality was apparent.	Orthophosphate concentrations were inconsistent with Good (0.028 mg/l) and High (0.013mg/l) WFD status with some of results achieving Moderate status or lower. No seasonality was apparent.

	Total ammonia	Oxygen	Phosphate
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

A4.9.6 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 Colne T4 as a result of drought options is presented in **Table A4.16**.

Table A4.16 Summary of potential changes in the physical environment of Colne T4 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 *Moderate*	• One significant flow pressure reducing flow in this reach as advised by the Environment Agency.
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. There is also a moderate risk to sediment dynamics.
Water quality *Minor risk*	• Reported ammonia and dissolved oxygen water quality is consistent with High status and with no apparent flow sensitivity. Though phosphate water quality is more variable and often consistent with Moderate status, there is no relationship between flow and phosphate quality. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and phosphate 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 A4.8

A4.10 HOLME 1

A4.10.1 Reach introduction

Holme 1 is potentially impacted by a Brownhill 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:

- Holme from Source to New Mill Dike (GB104027057600).

A4.10.2 Reach setting

Holme 1, located on main EAR **Figure 4.1,** comprises a 0.5km stretch of the River Holme from the outflow of Brownhill Reservoir to the confluence with Digley Brook. The reach is dominated by reservoir outflows with an additional catchment area of 0.5km^2 along the length of the reach. Holme 2 (see **Section A4.12** below) is downstream.

A4.10.3 River flow regime

YWSL is required to release a seasonally-varying compensation flow from Brownhill Reservoir to the River Holme, which would be reduced in stages under the proposed drought option. During the implementation of the drought option, it is likely that the level in Brownhill 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. The flow reduction in this reach would vary from 3.22 Ml/d to 4.62 Ml/d depending on the time of year, which equates to a 67% flow reduction.

The hydrological impact of the drought permit on Holme 1 is therefore assessed as a **majo**r hydrological impact at any time of year. With this reach being immediately downstream of the reservoir, the confidence in the assessment is high.

There are no significant flow pressures, either abstractions or discharges, influencing flow in Holme 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 12 September 2018 at a reservoir outflow of 5.92Ml/d.

Holme 1 is a fairly straight reach, flowing through a deep V-shaped valley, which falls ~9m over 0.5km, a slope of 0.9°. The channel is heavily shaded with extensive deciduous riparian tree cover along most of its length. Channel bankfull width at the RHS site (Site ID 26445) was recorded as 8.2m. Flow type recorded at the RHS site was varied, frequent unbroken standing waves, smooth, rippled and chaotic flow were recorded. Bed substrate at the RHS site was dominated by boulders and abundant bedrock. Within the channel exposed boulders and bedrock were observed. Banks were recorded as steep (>45°) and composite. Banks were predominately comprised of brick, however, areas of boulder and earth were observed on the left bank. Both banks had been reinforced. Land use on both banks is predominantly broadleaf woodland around the channel with a mixture of suburban/urban land use on the right bank beyond the broadleaf woodland. There is an industrial unit located on the left channel bank at ~0.4km to the end of Holme 1.

Holme 1 is likely to be dominated by high energy environments, as indicated by the slope of the watercourse, valley shape and absence of depositional features. The extensive coverage of trees in the riparian habitat will ensure a high input of allochthonous energy into the watercourse, which will be reflected in the macroinvertebrate composition, and provide some cover to fish and white-clawed crayfish, in addition to the likely presence of large substrate types typical in watercourses of this type. The likely sediment composition of the banks will provide suitable burrow refuge potential for white-clawed crayfish also, although the brick at the RHS survey site will limit habitat opportunities. The movement/migration of fish and sediments through Holme 1 may be influenced by the presence of the weir and culvert.

The drought options reduction in flow could lead to several potential impacts within Holme 1:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for the duration of the 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 and two weirs in the reach.
- 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 Holme 1 from drought options is therefore assessed as moderate.

A4.10.5 River water quality

For this assessment the only water monitoring point present in Holme 1, Ramsden Clough at Bank Lane, Holmebridge (NE-49500571) has been used. A summary description of the potential risks to water quality in Holme 1 as a result of drought options is presented in **Table A4.17**.

Table A4.17 Potential risks to water quality in Holme 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. Some seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Some seasonality was apparent.	Orthophosphate concentrations predominantly consistent with High WFD status (0.013 mg/l) with 3 results falling to Moderate or lower on 10.03.2014, 22.09.2014 and 12.03.2015.
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

A4.10.6 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 Holme 1 as a result of drought option is presented in **Table A4.18**.

Table A4.18 Summary of potential changes in the physical environment of Holme 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 Holme 1.
River habitats *Moderate risk*	• The major reduction in flow will lead to a potential change in the energy of the system. This has the potential for moderate risk of changes in available habitat for different species requirements and a moderate risk to longitudinal connectivity. There is also a minor risk of reduction in total wetted aquatic habitat in the reach and a minor risk of change in sediment dynamics.
Water quality *Minor risk*	• Reported ammonia, phosphate and dissolved oxygen water quality is predominantly consistent with High or Good status and 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 phosphate has been assessed. • There are no continuous or intermittent water quality pressures in this reach.

Insert Figure A4.9

A4.11 HOLME 2

A4.11.1 Reach introduction

Holme 2 is potentially impacted by the Digley Reservoir and Brownhill Reservoir drought permits. A summary of physical environment information for this reach is provided in **Figure A4.10**. The reach includes part of the following river waterbody:

- Holme from Source to New Mill Dike (GB104027057600).

A4.11.2 Reach setting

Holme 2, located on main EAR **Figure 4.1,** comprises a 2.8km stretch of the River Holme from the confluence with Digley Brook to the confluence with the River Ribble. Holme 3 (see **Section A4.13** below) is downstream.

A4.11.3 River flow regime

There is no gauged flow data available for this reach of the River Holme, so flows at the upstream end of this reach have been estimated using the Gustard flow transposition method (further details in **Annex 8**), based on catchment parameter ratios and gauged flow data from an available downstream gauge at Huddersfield Queens Mill. The Huddersfield record was first adjusted to allow for effluent discharges upstream of the gauge location (from Meltham and Neiley wastewater treatment works) and the effects of the reservoirs in the upper catchment. Measured outflows from Digley and Brownhill reservoirs were then added back on to the estimated (transposed) data series, to provide an estimated flow record for the River Holme just downstream of the Digley Brook confluence. This enabled the creation of an estimated daily flow record for the River Holme downstream of the Digley Brook confluence covering the period 1990-2024 with moderate to high confidence.

The River Holme downstream of the Digley Brook confluence is influenced by both the Digley and Brownhill Reservoir drought options. The maximum combined flow reduction from these two options varies according to the time of year: from April to September the flow reduction is between 5.36 Ml/d and 7.51 Ml/d whilst from October to March it is between 7.51 Ml/d and 11.72 Ml/d. In practice, however, the flow downstream of the Digley Brook confluence would not be reduced below the combined compensation release from Digley and Brownhill reservoirs, which under the relevant drought permits is a minimum of 2.53 Ml/d from April to September or 3.69 Ml/d from October to March. The combined drought options therefore represent reductions of up to 67% in the summer Q_{95} and Q_{99} flow statistics, and would therefore be assessed as a major hydrological impact in summer conditions. During a winter refill period, the combined flow reduction represents reduction of up to 67% in the year round Q_{95} and Q_{50} flow statistics, which is assessed as a major hydrological impact in winter also.

The hydrological impact of the drought permit on Holme 2 is therefore assessed as a **major** hydrological impact at any time of year.

There are no significant flow pressures influencing flow in Holme 2. There are no significant discharges within Colne 2. 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 and with additional information for a representative 500m reach from survey information on 2 September 2018 at a reservoir outflow of 12.17Ml/d.

Holme 2 is fairly straight reach which falls ~37m over 2.8km, a slope of 0.7°. The channel flows through the urban areas of Holmbridge and Holmfirth with a variable degree of channel shading. Where the channel is visible, the channel is between 5 – 7m wide, increasing in width down the reach. Where the channel is visible, extant aerial imagery shows the presence of boulders within the channel. Several berm features are potentially present in the channel, where the channel flows through Holmbridge and Holmfirth and likely represent a fluvial response to anthropogenic modification. Side bars and a vegetated mid bar were observed during reach walkovers, and five weirs are present along the reach.

Where visible, the channel is largely riffle with shallow pool sequence. Rippled flow dominated with areas of unbroken standing waves and smooth flow common. There are occasional sections of exposed bedrock within the reach. There are two RHS sites within the reach the upper site, site ID 21104 and the further downstream survey site, site ID 26416. The sites recorded a total of three pools, 11 riffles and no bars. Reinforced banks are extensive, with undercutting present, poaching and bank erosion was also observed in the lower reaches. Both banks were vegetated along the reach, due to the nature of the vegetation it is predicted that banks are composed of earth and are reinforced and resectioned through the urban areas. Land-use on both banks is predominantly suburban/urban development within the lower reaches, with areas of rough pasture, broadleaf woodland and open water within the reach.

Holme 2 is likely to support both high and low energy environments, with the presence of depositional features in the reach indicative of low energy conditions. The variable presence of trees in the riparian habitat will provide some cover for fish, which will add to that provided by the large in-stream boulders and provide some allochthonous energy into the watercourse. The presence of suitable marginal vegetation to support water vole is unknown, and so suitable habitat is considered likely to be present on a precautionary basis. The movement/migration of fish and sediments through the reach may be impacted by the presence of a number of weirs.

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

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for the duration of drought options.
- 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 5 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 Holme 2 from drought options is therefore assessed as **major**.

A4.11.5 River water quality

There are no routine water quality monitoring sites in Holme 2, as such, for this assessment, the most upstream site present in Holme 3, Holme at Holmfirth Town Centre (Below) (NE-49500656) has been used. No continuous or intermittent water quality pressures are present in this reach. A summary description of the potential risks to water quality in Holme 2 as a result of drought options is presented in **Table A4.19**.

Table A4.19 Potential risks to water quality in Holme 2 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were consistent with Good (0.3 mg/l) and High (0.2mg/l) WFD status	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%)	Orthophosphate concentrations were inconsistent with Good (0.028 mg/l) and High

	Total ammonia	Oxygen	Phosphate
	throughout the monitoring period. Limited seasonality was apparent.	throughout the monitoring period. Seasonality was apparent.	(0.013mg/l) WFD status with some results achieving Moderate (0.087mg/l) status or lower.
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

A4.11.6 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 Holme 2 as a result of drought options is presented in **Table A4.20**.

Table A4.20 Summary of potential changes in the physical environment of Holme 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 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 Holme 2.
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. There is also a moderate risk to sediment dynamics.
Water quality *Minor risk*	• Reported ammonia and dissolved oxygen water quality is consistent with High status and with no apparent flow sensitivity. Though phosphate water quality is more variable and often consistent with Moderate status, there is no relationship between flow and phosphate quality. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and phosphate 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 A4.10

A4.12 HOLME 3

A4.12.1 Reach introduction

Holme 3 is potentially impacted by the Digley Reservoir and Brownhill Reservoir drought permits. A summary of physical environment information for this reach is provided in **Figure A4.11**. The reach includes part of the following river waterbody:

- Holme from Source to New Mill Dike (GB104027057600).
- Holme from New Mill Dike to River Colne (GB104027063301)

A4.12.2 Reach setting

Holme 3, located on main EAR **Figure 4.1,** comprises a 5.9km stretch of the River Holme from the confluence with the River Ribble to the confluence with Mag Brook. Holme 4 (see **Section A4.14** below) is downstream.

A4.12.3 River flow regime

There is no gauged flow data available for this reach of the River Holme, so flows at the upstream end of this reach have been estimated using the Gustard flow transposition method (further details in **Annex 8**), based on catchment parameter ratios and gauged flow data from an available downstream gauge at Huddersfield Queens Mill. The Huddersfield record was first adjusted to allow for effluent discharges upstream of the gauge location (from Meltham and Neiley wastewater treatment works) and the effects of the reservoirs in the upper catchment. Measured outflows from Digley, Brownhill and Holme Styes reservoirs were then added back on to the estimated (transposed) data series, to provide an estimated flow record for the River Holme just downstream of the River Ribble confluence. This enabled the creation of an estimated daily flow record for the River Holme downstream of the River Ribble confluence covering the period 1990-2024 with moderate to high confidence.

The River Holme downstream of the River Ribble confluence is influenced by the Digley and Brownhill reservoir drought options. The maximum combined flow reduction from these two options varies according to the time of year, as set out in the Holme 2 reach above. The combined drought options therefore represent maximum reductions of up to 51% and 57% in the summer Q_{95} and Q_{99} flow statistics respectively, and would therefore be assessed as a major hydrological impact in summer conditions. During a winter refill period, the flow downstream of the River Ribble confluence would not be reduced below the combined compensation release from Digley, Brownhill and Holme Styes reservoirs, which under the relevant drought permits is a minimum of 5.67 Ml/d from October to January. The combined flow reduction therefore represents reductions of up to 64% and 41% in the year round Q_{95} and Q_{50} flow statistics, with the Q_{95} reduction based on the minimum compensation flow between November and January. This is assessed as a major hydrological impact in winter.

The hydrological impact of the drought permit on Holme 3 is therefore assessed as a **major** hydrological impact at any time of year.

There is one significant flow pressure influencing flow in Holme 3, a water company discharge increasing flow. There are no significant abstractions or flow depleted reaches within Holme 3. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

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 10 October 2018 at a reservoir outflow of 20.09Ml/d.

Holme 3 is fairly straight reach which falls ~52m over 5.9km, a slope of 0.5°. The channel flows through the urban areas of Holmfirth, Honley and the outskirts of Huddersfield with a variable degree of channel shading. Where the channel is visible, the channel is between 2.5 – 15m wide, increasing in width along the reach. Extant aerial imagery shows the presence of boulders within the channel. The RHS survey

site (21094) confirms the abundant presence of boulders, that are often exposed, and indicates that the substrate at the site is dominated by cobbles. The survey also notes occasional sections of exposed bedrock. Several bars and pools were observed along the reach, with siltation occurring in areas where the channel widens. Ten weirs are present along the reach, as well as a waterfall in the lower section. Where visible, the channel surface is generally smooth, with rippled flow dominating and chute flow common. Reinforced banks are extensive where the reach passes through urban areas, also confirmed by the RHS survey. Bankside vegetation is present in the reach, so it is predicted that banks are composed of earth where they are not reinforced. The RHS site confirmed the presence of earth on both banks and indicates that the banks are steep (>45º). Land-use on both banks is predominantly suburban/urban development with some areas broadleaf woodland.

Holme 3 (River Holme) is likely to support both high and low energy environments, with the presence of depositional features in the reach indicative of low energy conditions. The variable presence of trees in the riparian habitat will provide some cover for fish, which will add to that provided by the large in-stream boulders and provide some allochthonous energy into the watercourse. The presence of suitable marginal vegetation to support water vole is unknown, and so suitable habitat is considered likely to be present on a precautionary basis. The movement/migration of fish and sediments through the reach may be impacted by the presence of a number of weirs and the waterfall.

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

- Major risk of changes in the energy of the system associated with up to 64% reduction in flow for the duration of drought options.
- 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 10 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 Holme 3 from drought options is therefore assessed as **major**.

A4.12.5 River water quality

For this assessment the first water monitoring point present in Holme 3, River Holme At Smithy Place, Brockholes (NE-49500663) has been used. There are eight frequently spilling CSOs potentially presenting an environmental risk in the reach. Though Neiley WwTW presents a flow pressure in this reach, SIMCAT modelling has not flagged WwTW as a significant continuous water quality pressure as a result of the YWSL drought permits impacting this reach. A summary description of the potential risks to water quality in Holme 3 as a result of drought options is presented in **Table A4.21**.

Table A4.21 Potential risks to water quality in Holme 3 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. Some seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Seasonality was apparent.	Orthophosphate concentrations were invariably consistent with High (0.013 mg/l) or Good (0.028 mg/l) WFD status, noting 32% of samples were recorded as Moderate status (0.087 mg/l).
Flow sensitivity (diffuse pollution)	None apparent	None apparent	None apparent
WwTW presenting increased continuous pressure 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 eight listed CSOs during rainfall events.		None
Other point source pressures presenting risk	None	None	None
Summary	Moderate risk from drought options associated with CSO discharge	Moderate risk from drought options associated with CSO discharge	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 Holme 3 as a result of drought options is presented in **Table A4.22**.

Table A4.22 Summary of potential changes in the physical environment of Holme 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 64% in river flows throughout the reach at any time of year that drought options implemented.
Flow depleted reaches/significant flow pressures *Minor risk*	• There are no flow depleted reaches within Holme 3. • There is one potential flow pressure associated with a water company discharge.
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. There is also a moderate risk to sediment dynamics.
Water quality *Moderate risk*	• Risk of short term acute, infrequent, temporary water quality pressures locally downstream of eight listed CSOs during rainfall events. • SRP quality is variable between Moderate and High WFD status with no apparent flow sensitivity. As such a minor risk to water quality has

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
	been assessed associated with change in dilution of diffuse pollution pressures to SRP. • Measured ammonia and dissolved oxygen saturation water quality is predominantly consistent with High or Good WFD status and with no apparent flow sensitivity. • No continuous water quality pressures are present in this reach.

Insert Figure A4.11

A4.13 HOLME 4

A4.13.1 Reach introduction

Holme 4 is potentially impacted by the Digley Reservoir, Brownhill Reservoir and Blackmoorfoot Reservoir Brow Grains drought permits. A summary of physical environment information for this reach is provided in **Figure A4.12**. The reach includes part of the following river waterbody:

- Holme from New Mill Dike to R Colne (GB104027063301).

A4.13.2 Reach setting

Holme 4, located on main EAR **Figure 4.1,** comprises a 5.3km stretch of the River Holme from the confluence with Mag Brook to the confluence with the River Colne. Colne 4 (see **Section A4.6** above) is downstream.

A4.13.3 River flow regime

As for the reaches on the River Holme upstream (Holme 2 and Holme 3), flows at the upstream end of this reach have been estimated using the Gustard flow transposition method (further details in **Annex 8**), based on catchment parameter ratios and gauged flow data from an available downstream gauge at Huddersfield Queens Mill. The Huddersfield record was first adjusted to allow for effluent discharges upstream of the gauge location (from Meltham and Neiley wastewater treatment works) and the effects of the reservoirs in the upper catchment. Measured outflows from Digley, Brownhill, Holme Styes and Blackmoorfoot reservoirs were then added back on to the estimated (transposed) data series, to provide an estimated flow record for the River Holme downstream of the Mag Brook confluence. This enabled the creation of an estimated daily flow record for the River Holme downstream of the Mag Brook confluence covering the period 1990-2024 with moderate to high confidence.

The River Holme downstream of the Mag Brook confluence is influenced by the Digley, Brownhill and Blackmoorfoot (Brow Grains Dyke) reservoir drought options. The maximum combined flow reduction from these four options varies according to the time of year: from April to September the flow reduction is between 7.14 Ml/d and 9.29 Ml/d whilst from October to March it is between 9.29 Ml/d and 13.5 Ml/d. The combined drought options therefore represent reductions of up to 25% and 30% in the summer Q_{95} and Q_{99} flow statistics respectively, and would therefore be assessed as a major hydrological impact in summer conditions. During a winter refill period, the combined flow reduction represents reduction of up to 34% and 14% in the year round Q_{95} and Q_{50} flow statistics, which is assessed as a major hydrological impact in winter also.

The hydrological impact of the drought permit on Holme 4 is therefore assessed as a **major** hydrological impact at any time of year.

There is one significant flow pressure influencing flow in Holme 4 as described in **Section A4.13.3.1** leading to a depleted reach. There are no significant discharges within Holme 4. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.13.3.1 Significant flow pressures

There is one abstraction in this reach presenting a significant flow pressure which has a peak daily licensed abstraction rate of 181.84Ml/d, without a hands-off-flow condition (‘River Holme – Huddersfield’). The abstraction is used for hydroelectric power generation. An abstraction at that rate could reduce flows in the depleted reach (~900m in length), 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 Holme 4 (see main EAR Section 6). YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures.

A4.13.4 River habitats

River habitats have been characterised at a whole reach scale. No additional information for a representative 500m reach has been surveyed. A requirement for a walkover of this reach is stipulated in the EMP.

Holme 4 is a fairly sinuous reach which falls ~23m over 5.3km, a slope of 0.2°. The channel flows through the urban areas of Brockholes, Honley and Huddersfield with a variable degree of channel shading. Where the channel is visible through tree cover, the channel is between ~13-17m wide in the upper sections, decreasing to 10-12m wide in the lower section of the reach prior to the confluence with the River Colne. In the few visible sections of the reach, 4 channel bars are noted along with some boulders. Unvegetated side bars were identified at both RHS survey sites (site ID 21097 and 25675), where one was observed at each survey site. Some erosion of channel banks is noted at ~4.7km downstream from the start of the reach. At RHS site 25675, there was one pool, and three riffles observed. Where visible, the channel surface is generally smooth, with some areas of broken flow, likely indicating the presence of riffles. The RHS survey sites showed considerable flow variation, at both sites occasional to frequent broken waves, abundant rippled flow, and frequent unbroken standing waves. At RHS site ID 21097 abundant areas of smooth flow were observed. Exposed boulders were observed at RHS site ID 21097. In areas where bankside vegetation is present it is assumed that the banks are composed of earth, this is confirmed by both RHS sites where earth forms up to 60% of the bank material. The RHS sites also noted significant areas of bedrock bank on both banks. Smaller areas of concrete and clay banks were also observed. Banks are reinforced (confirmed in both RHS sites) and resectioned through the urban areas particularly in Holmfirth, Honley and Huddersfield. Land-use on both banks is predominantly suburban/urban development with some areas of improved grassland, broadleaf woodland and parkland and gardens between 4.7 – 7.7km downstream.

Holme 4 is likely to support both high and low energy flows, with erosional and depositional features present. The flow structure identifies the potential presence of riffles, which could support spawning habitat (although this cannot be ruled out in the other two reaches), with habitat to support juveniles and adult fish also likely to be present. The variable presence of trees in the riparian habitat will provide some cover for fish and provide some allochthonous energy into the watercourse. The presence of suitable marginal vegetation to support water vole is unknown, and so suitable habitat is considered likely to be present on a precautionary basis. The movement/migration of fish and sediment may be significantly impacted by the presence of a large number of weirs in Holme 4.

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

- Major risk of changes in the energy of the system associated with up to 34% reduction in flow for the duration of drought options.
- 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 six 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 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 Holme 4 from drought options is therefore assessed as **major**.

A4.13.5 River water quality

For this assessment the only water monitoring point present in Holme 4, River Holme At Queens Mill Road (NE-49500662) has been used. There are seven frequently spilling CSOs potentially presenting an environmental risk in the reach. A summary description of the potential risks to water quality in Holme 4 as a result of drought options is presented in **Table A4.23**.

Table A4.23 Potential risks to water quality in Holme 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) with two instances of results achieving Good (0.3 mg/l) status or lower. Some seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) with one result achieving Good (75%) status. No seasonality was apparent.	Orthophosphate concentrations were predominately consistent with Moderate (0.116 mg/l) or lower. Seasonality is apparent.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	Moderate
WwTW presenting increased continuous pressure 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 CSOs during rainfall events.		None
Other point source pressures presenting risk	None	None	None
Summary	Moderate risk from drought options associated with CSO discharge	Moderate risk from drought options associated with CSO discharge	Moderate risk from drought options associated with change in dilution of diffuse pollution pressures.

A4.13.6 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 Holme 4 as a result of drought options is presented in **Table A4.24**.

Table A4.24 Summary of potential changes in the physical environment of Holme 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 34% in river flows throughout the reach at any time of year that drought options implemented.
Flow depleted reaches *Major risk*	• One flow depleted reach ~900m with potential for periods of time with zero flow without mitigation
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
	longitudinal connectivity. There is also a minor risk to sediment dynamics.
Water quality *Moderate impacts*	• Moderate risk from short term acute, infrequent, temporary water quality pressures locally downstream of seven listed CSO during rainfall events. • SRP quality is variable 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 A4.12

A4.14 HOLME T1

A4.14.1 Reach introduction

Holme T1 is potentially impacted by a Digley 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:

- Holme from Source to New Mill Dike (GB104027057600).

A4.14.2 Reach setting

Holme T1, located on main EAR **Figure 4.1,** comprises a 1.1km stretch of Digley Brook from the outflow of Digley Reservoir to the confluence with the River Holme. The reach is dominated by reservoir outflows with an additional catchment area of 0.7km^2 along the length of the reach. Holme 2 (see **Section A4.12** above) is downstream.

A4.14.3 River flow regime

YWSL is required to release a seasonally-varying compensation flow from Digley Reservoir to Digley Brook, which would be reduced in stages under the proposed drought option. During the implementation of the drought option, it is likely that the level in Digley 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. The flow reduction in this reach would vary from 2.14 Ml/d to 7.10 Ml/d depending on the time of year, which equates to a 67% flow reduction.

The hydrological impact of the drought permit on Holme T1 is therefore assessed as a **major** hydrological impact at any time of year. This reach is immediately downstream of the reservoir so confidence in the hydrological impacts is high.

There are no significant flow pressures, either abstractions or discharges, influencing flow in Holme T1. There are no flow depleted reaches within Holme T1. 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 and with additional information for a representative 500m reach from survey information on 20 September 2018 at a reservoir outflow of 6.28Ml/d.

Holme T1 is a fairly straight reach which falls ~59m over 1.1km, a slope of 3.0°. The channel is heavily shaded with extensive deciduous riparian tree cover along most of its length. Where the channel is visible through tree cover, the channel is between 3-5m wide. Where the channel is visible, extant aerial imagery shows the presence of boulders within the channel but no other features could be observed. Where visible, the channel surface is generally broken with some sections indicative of smooth flow. Due to the nature of the vegetation it is predicted that banks are composed of earth. At ~0.6km downstream the left bank appears to be reinforced adjacent to housing. Land-use on both banks is predominantly broadleaf woodland around the channel and improved grassland beyond. Suburban/urban land use increases towards the end of Holme T1 as the reach flows through Holmbridge.

Holme T1 is likely to support mainly high energy environments, indicated by the slope of the watercourse, likely flow structure and absence of depositional features. The extensive coverage of trees in the riparian habitat will ensure a high input of allochthonous energy into the watercourse, which will be reflected in the macroinvertebrate composition, and provide some cover to fish, in addition to that provided by the large in-channel boulders. The movement/migration of fish and sediments through Holme T1 may be influenced by the presence of the weir.

The drought options reduction in flow could lead to several potential impacts within Holme T1:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for the duration of drought options.
- 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.
- Moderate risk to longitudinal connectivity from 1 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 Holme T1 from drought options is therefore assessed as **major**.

A4.14.5 River water quality

For this assessment the first water monitoring point, River Holme at Holmfirth Town Centre (Below) (NE-49500656), present in a downstream reach (Holme 3) has been used in the absence of any monitoring in this reach or the next downstream reach (Holme 2). No continuous or intermittent water quality pressures are present in this reach. A summary description of the potential risks to water quality in Holme T1 as a result of drought options is presented in **Table A4.25**.

Table A4.25 Potential risks to water quality in Holme T1 as a result of drought options

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were consistent with High WFD status (0.2 mg/l) with four results achieving Good status (0.3 mg/l). No seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Seasonality was apparent.	Orthophosphate concentrations were inconsistent with Good WFD status (0.028 mg/l) with some results achieving Moderate (0.087 mg/l) status or lower.
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	Minor risk from drought options	Minor risk from drought options	Moderate 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 Holme T1 as a result of drought options is presented in **Table A4.26**.

Table A4.26 Summary of potential changes in the physical environment of Holme T1 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 *None*	• There are no flow depleted reaches within Holme T1.
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. There is also a moderate risk to sediment dynamics.
Water quality *Moderate risk*	• SRP quality is variable 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 A4.13

A4.15 HOLME T3

A4.15.1 Reach introduction

Holme T3 is potentially impacted by a Blackmoorfoot Reservoir Brow Grains drought permit. A summary of physical environment information for this reach is provided in **Figure A4.14**. The reach includes the following river waterbody:

- Mag Brook from Source to River Holme (GB104027063590).

A4.15.2 Reach setting

Holme T3, located on main EAR **Figure 4.1,** comprises a 5.9 km stretch of Brow Grains Dyke and Mag Brook from the outflow of Blackmoorfoot Reservoir to the confluence with the River Holme. The reach is dominated by reservoir outflows with an additional catchment area of 25.0km^2 along the length of the reach. Holme 4 (see **Section A4.14** above) is downstream.

A4.15.3 River flow regime

During the implementation of this drought option, it is likely that the level in Blackmoorfoot 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 1.78 Ml/d (the maximum reduction under this drought option) 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 permit on Holme T3 is therefore assessed as a **major** hydrological impact at any time of year. This reach is immediately downstream of the reservoir so confidence in the hydrological impacts is high.

There are four significant flow pressures influencing flow in Holme T3, three abstraction licences as described in **Section A4.15.3.1** and one flow addition associated with Maltham WwTW. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

4.15.3.1.1 Significant flow pressures

There are three licensed abstractions depleting flow in Holme T3. The most upstream being a non-consumptive abstraction of 2.33 Ml/d for hydroelectric power generation (‘Brow Grains Dike at New Bridge Road, Meltham’). An abstraction at that rate could reduce flows in the depleted reach (~100m in length), in combination with drought option, to zero. A walkover reach covering the section of the river has been included in the schedule of monitoring for Holme T3 (see main EAR Section 6).

The other two flow pressures are associated with abstraction for textile and leather production. The first being a 0.325 Ml/d abstraction (‘Meltham Dyke via Mill Dam’) and the second being a 0.35 Ml/d abstraction (‘Mag Brook-Honley-Huddersfield’ and ‘Stream To Mill Dam-Honley’). An abstraction at these flow rates could reduce flows in the reach, in combination with the drought option, by a further 36.9% and 40.9% respectively.

YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures. A walkover has been included downstream of these abstractions in the schedule of monitoring for Holme T3 (see main EAR Section 6).

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 5 October 2018 at a reservoir outflow of 2.75Ml/d.

Holme T3 is fairly straight reach which falls 153m over 5.9m, a slope of 1.6°. Riparian tree cover is scattered to continuous along the reach. The channel is visible for some of its length on aerial imagery. Where the channel is visible, channel widths have been measured between 3-6m, with the channel at its widest at the confluence with the River Holme. At the upper RHS site (site ID 18584) the channel bankfull width was recorded as 4m wide, at the middle RHS site (site ID 18153), the channel bankfull width was recorded as 7m, and at the further downstream RHS site (site ID 18154), the channel bankfull width width was recorded as 5m. At the YWSL water baseline monitoring site 13533, the channel width is 5.3m. Where visible on aerial imagery, the channel surface indicates that smooth flow predominates with several areas of broken flow, likely representing riffles. This is confirmed by the YWSL water baseline monitoring site 13533, where rippled flow dominated (45%). Over the three RHS sites (site ID 18584, 18153 and 18154) there was a total of 0 pools, two riffles and two unvegetated point bars observed. At RHS site 18153 it was recorded that <33% of the channel had been realigned and at RHS site 18584 there was >33% of the channel realigned and over-deepened recorded. Bed substrate is dominated by pebbles/gravel (45%), however areas of cobble (30%), boulder (10%) and sand (10%) were also observed at the YWSL water baseline monitoring site 13533. OS maps note the presence of a waterfall at the end of the reach, which indicates the presence of bedrock in the channel. Where visible, two side bars and one mid-channel bar have been identified in the channel. Vegetation and bank side poaching suggest the banks are composed of earth. Surrounding land use is predominantly rough pasture and improved grassland with some broadleaf woodland in the lower sections of the reach. Suburban/urban land use is generally limited to individual buildings throughout Holme T3.

Holme T3 is likely to comprise a mixture of high and low energy environments, as indicated by the relatively shallow gradient of the watercourse and presence of depositional features within Holme T3. The presence of riffles in Holme T3 indicates spawning habitat is likely to be present, with large substrate types providing cover/refuge potential for adult and juvenile fish. The regular occurrence of trees in the riparian corridor will provide additional cover for fish and an input of allochthonous energy. The presence of a number of weirs and one waterfall in Holme T3 may have impacts upon the movement/migration of fish and sediments.

The drought options reduction in flow could lead to several potential impacts within Holme T3:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for the duration of drought options.
- 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 six noted weirs and a waterfall, 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 Holme T3 from drought options is therefore assessed as **major**.

A4.15.5 River water quality

For this the assessment the Hall Dike Above Meltham WPC Works (NE-49500340) site has been used. There are no significant continuous or intermittent water quality pressures in this reach. Though Meltham WwTW presents a flow pressure in this reach, SIMCAT modelling has not flagged WwTW as a significant continuous water quality pressure as a result of the YWSL drought permits impacting this reach. A summary description of the potential risks to water quality in Holme T3 as a result of drought options is presented in **Table A4.27**.

Table A4.27 Potential risks to water quality in Holme T3 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. Some seasonality was apparent.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Seasonality was apparent.	Orthophosphate concentrations inconsistent with 'Good' WFD status (0.028 mg/l) with some results achieving 'Moderate' status or lower.
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

A4.15.6 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 Holme T3 as a result of drought options is presented in **Table A4.28**.

Table A4.28 Summary of potential changes in the physical environment of Holme T3 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*	• Three significant abstractions identified in this reach, one which would abstract all the flow in the river, in combination with the drought option, without mitigation and result in a depleted reach (~100m in length). • There is one potential flow pressure associated with a water company discharge.
River habitats *Major risk*	• The major reduction in flow will lead to a potentially major change in the energy of the system. This has the potential for major risks to total wetted aquatic habitat, available habitat for different species and longitudinal connectivity. There is also a moderate risk to sediment dynamics.

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
Water quality *Minor risk*	• No water quality data directly for the reach, but local reported water quality is predominantly consistent with 'Good' status for dissolved oxygen and ammonia; lower quality for phosphate and with no strong associations between reducing flow and poorer water quality. 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 A4.14

A4.16 CALDER 4

A4.16.1 Reach introduction

Calder 4 is potentially impacted by the Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoot Reservoir – Brow Grains, Digley Reservoir, Brownhill Reservoir, Scammonden Water – Black Brook and the Upper Calder Drought Measures. A summary of physical environment information for this reach is provided in **Figure A4.15**. The reach includes all of the main channel of part of the following river waterbodies:

- Calder from Ryburn Confluence to River Colne (GB104027062642).
- Calder from River Colne to River Chald (GB104027062631).
- Calder from River Chald to River Aire (GB104027062632).

A4.16.2 Reach setting

Calder 4, located on main EAR **Figure 4.1,** comprises a 56.7km stretch of the River Calder from the confluence with the Black Brook down to the confluence with the River Aire.

A4.16.3 River flow regime

Flows are gauged at three locations on this reach, Elland, Dewsbury and Methley, however for the purposes of estimating flows at the upstream end of the reach the Elland gauge has been used, as the Elland gauge is approximately 3.5km downstream of the Black Brook confluence. This reach is affected by the combined impacts of all eight of the drought options located in the River Holme and River Colne catchments upstream of the confluence of these two watercourses, along with a further nine drought options which affect the Upper Calder upstream of the River Colne confluence.

The combined flow reduction to the start of the reach is due to nine drought options which affect the River Calder downstream of the Black Brook confluence. This flow reduction is 31.49 Ml/d during the summer period of April to September inclusive, and from 31.39 Ml/d to 36.22 Ml/d during the winter period of October to March inclusive. The maximum combined reduction in summer of 31.49 Ml/d equates to percentage reductions of up to 19% and 21% in the summer Q_{95} and Q_{99} flow statistics respectively, and is therefore assessed as a **moderate** hydrological impact in dry autumn conditions. During a winter refill period, the maximum combined flow reduction of 36.22 Ml/d from all nine drought options equates to 20% and 8% reductions in the year round Q_{95} and Q_{50} flow statistics respectively, and is therefore assessed as a **minor** hydrological impact in the winter period.

The hydrological impact of drought options on Calder 4 is therefore assessed as **moderate** for summer conditions and **minor** for any winter refill period while drought options remain in place. No flow transposition has been required for this assessment point so the hydrological assessment is made with high confidence.

An additional assessment point was reviewed downstream of the River Colne confluence which included additional flow reductions from the Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoot Reservoir – Brow Grains, Digley Reservoir and Brownhill Reservoir.

The Elland gauged record and catchment parameters were adjusted to allow for the effects of all the upstream reservoir catchments and effluent discharges from a number of wastewater treatment works (Eastwood, Redacre, Ripponden, High Royd and Halifax). An estimated flow record for the River Calder was then produced by summing the daily mean flows at the Elland and Colne Bridge gauges, plus an estimate for the flow accretion between the two gauges and the confluence, using the Gustard flow transposition method based on the adjusted gauged record at Elland (see **Annex 8**). The daily dry weather flow from Huddersfield wastewater treatment works was also added back on to the estimated flow record as this joins the River Calder in locations close to the River Colne confluence (but downstream of both Elland and Colne Bridge gauges).

This flow reduction is from 50.26 Ml/d to 52.41 Ml/d during the summer period of April to September inclusive, and from 53.41 Ml/d to 61.35 Ml/d during the winter period of October to March inclusive. The maximum combined reduction in summer of 52.41 Ml/d equates to percentage reductions of up to 16% and 17% in the summer Q_{95} and Q_{99} flow statistics respectively, and is therefore assessed as a **moderate** hydrological impact in summer conditions. During a winter refill period, the maximum combined flow reduction of 61.35 Ml/d equates to 17% and 8% reductions in the year round Q_{95} and Q_{50} flow statistics respectively, and is therefore assessed as a **minor** hydrological impact in the winter period.

Therefore, the hydrological impact of drought options on River Calder downstream of the River Colne confluence is assessed as **moderate** for a summer/autumn period and **minor** for any winter refill period while drought options remain in place.

There is one significant flow pressure associated with abstractions influencing flow in Calder 4 as described in **Section A4.16.3.1**. There is one significant discharge within Calder 4 associated with Caldervale (Wakefield) WwTW. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.16.3.1 Significant flow pressures

There is one abstraction causing a significant flow pressure in this reach, with a peak daily licensed abstraction rate of 27.3Ml/d for chemical production (‘River Calder – Dalton Works – Huddersfield’) with potential flow impacts. An abstraction at that rate could reduce flows in the reach, in combination with drought options, by a further 20%.

YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures. A walkover has been included downstream of this abstraction in the schedule of monitoring for Calder 4 (see main EAR Section 6).

A4.16.4 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 14 September 2018 at an estimated river flow at the flow assessment point for the reach of 223.78Ml/d.

Calder 4 is fairly sinuous and falls 56m over 56.7km, a slope of 0.1°. Riparian tree cover varies from none to isolated to continuous. Channel width varies throughout between 21-48m, at the RHS site 19952, the channel bankfull width is 48m in width. Extant aerial imagery shows a wide array of in channel features with 11 mid channel bars (4 of which are vegetated), 17 side bars (5 of which are vegetated) and 3 unvegetated point bars, two natural berms were identified at RHS site 19952. A total of eight islands have also been identified, with several located downstream of weirs. The two RHS sites (site ID 25072 and 25725) in the first ~13km of the reach, recorded a total of one riffle, no bars or pools and at one of the sites (site ID 25072) there was >33% of the channel realigned and over deepening observed. The other RHS site (site ID 18683) ~1.7km from reach end did not observe any pools, riffles, bars or channel modifications. No channel substrate could be identified on aerial imagery, at the RHS survey site 19952 though, where visible, cobble dominated with areas of gravel and pebble also present. RHS site 19952 recorded abundant rippled flow and smooth flow with frequent areas of unbroken standing waves also observed. Due to the variety of land use, it is expected that banks are composed of a wide range of materials, both natural and artificial. At the RHS site 19952, the banks were composed predominantly of earth, and areas of rip-rap were identified. The banks have been extensively reinforced and resectioned and there are areas of embankments on the right bank. Bank erosion is noted throughout and is extensive at ~13.6km downstream. Surrounding land-use is a mixture of suburban/urban. Calder 4 flows through significant urban areas of West Yorkshire, namely Mirfield, Dewsbury, Wakefield and Castleford, improved grassland, tilled land and parkland and gardens. Some open water, in the form of large lakes, are present, notably on the south side of Wakefield.

Calder 4 is likely to comprise a variety of low and high energy environments as identified by the presence of both erosional and depositional features and the likely flow structure identified. The presence of riffles identifies the potential for spawning habitat to be present for fish, with the larger substrates present providing refuge and cover opportunities for juvenile and adult fish. The regular

occurrence of trees in the riparian corridor will provide some allochthonous energy input into the watercourse and provide some resting opportunities for otter. There are some areas of extensive woodland that have potential to support breeding otter. Movement/migration of fish and sediment in Calder 4 is likely to be impacted by the presence of a number of weirs.

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

- Up to moderate risk of changes in the energy of the system associated with up to 21% reduction in flow for periods of time during dry autumn conditions and minor effects during winter refill 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 option, noting the retention of an overall variable flow pattern.
- 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 few changes to the range and abundance of flow types.
- Minor risk to longitudinal connectivity from eighteen in-channel structures 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 sources will be largely dormant during environmental drought. Coarse sediment dynamics are unlikely to be affected.

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

A4.16.5 River water quality

For this assessment the fourth furthest downstream water quality monitoring site of the 11 present in Calder 4, Calder at Cooper Bridge (NE-49500601), has been used due to its superior data quality. There are 27 frequently spilling CSO potentially presenting an environmental risk in the reach. Though Caldervale (Wakefield) WwTW presents a flow pressure in this reach, SIMCAT modelling has not flagged WwTW as a significant continuous water quality pressure as a result of the YWSL drought permits impacting this reach. A summary description of the potential risks to water quality in Calder 4 as a result of drought options is presented in **Table A4.29**.

Table A4.29 Potential risks to water quality in Calder 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) throughout the monitoring period with some of result achieving Good (0.6 mg/l) status or lower. Seasonality was apparent.	Dissolved oxygen saturation (%) values were mostly consistent with High WFD status (80%) throughout the monitoring period with two results achieving Moderate (65%). Seasonality was apparent.	Orthophosphate concentrations were variable with most results achieving Moderate (0.127 mg/l) status or lower. Seasonality was apparent with concentration rising in late winter/ early spring and declining late spring early summer.
Flow sensitivity (diffuse pollution)	None apparent	Weak	Strong
WwTW presenting increased continuous pressure 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 27 listed CSOs during rainfall events.		None
Other point source pressures presenting risk	None	None	None
Summary	Moderate risk from drought options associated with CSO discharge	Moderate risk from drought options associated with CSO discharge	Moderate risk from drought options associated with change in dilution of diffuse pollution pressures.

A4.16.6 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 Calder 4 as a result of drought options is presented in **Table A4.30**.

Table A4.30 Summary of potential changes in the physical environment of Calder 4 as a result of drought options

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
River flows *Moderate impacts (autumn)* *Minor impacts (winter)*	• Reductions of up to 21% in summer river flows throughout the reach.
Flow depleted reaches/flow pressures *Major risk*	• One abstraction has been identified as flow pressures in this reach with potential for a further reduction in flow by 20% in combination with the drought options. • There is one potential flow pressure associated with a water company discharge.
River habitats *Minor risk*	• The, up to, moderate reduction in flow will present minor change in the energy of the system. This has the potential for minor risks to total wetted aquatic habitat, available habitat for different species, longitudinal connectivity and sediment dynamics.

Physical environment aspect reviewed	Assessment of risk from implementation of drought options
Water quality *Moderate risk*	• Moderate risk from short term acute, infrequent, temporary water quality pressures locally downstream of 27 listed CSO during rainfall events. • SRP quality is variable 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 Good status and no apparent/weak flow sensitivity for dissolved oxygen and ammonia. • No identified risk associated with continuous discharges.

Insert Figure A4.15

ANNEX 1 – REGULATED ABSTRACTIONS IN MIDDLE CALDER AREA REACHES

DP reach	Licence No.	Use Description	NGR 1	Max Annual Quantity (m^3/day)	Max Daily Quantity (m^3/day)	Significant flow pressure
Black Brook 1	2/27/12/127	General Use Relating To Secondary Category (Medium Loss)	SE0789 2059	181844	682	Yes
Black Brook 1	2/27/12/226	General Use Relating To Secondary Category (Medium Loss)	SE0676 1884	1136524	3182.3	Yes
Colne 1	2/27/11/053	General Use Relating To Secondary Category (Medium Loss)	SE0441 18	145470	636	Yes
Colne 2	2/27/11/108	Lake & Pond Throughflow	SE0541 1227	4091481	23867	Yes
		Lake & Pond Throughflow	SE0580 1248			
Colne 3	2/27/11/006	Boiler Feed	SE1041 53	30117	146.381	No
		Process Water	SE1041 53			
Colne 3	2/27/11/013(A)	General Use Relating To Secondary Category (Medium Loss)	SE0960 1460	9092	45.45	No
Colne 3	2/27/11/042	Process Water	SE1021 51	31822	159.11	No
Colne 3	NE/027/0011/011	Non-Evaporative Cooling	SE1417 916087	1684800	7560	Yes
Colne 3	NE/027/0011/021	Supply To A Canal For Throughflow	SE1062 115613	-	-	No
Colne 4	2/27/11/059	General Cooling (Existing Licences Only) (Low Loss) / General Use Relating To Secondary Category (Medium Loss)	SE1633 1832	24600000	67200	Yes
		General Cooling (Existing Licences Only) (Low Loss)	SE1669 1837			
		General Cooling (Existing Licences Only) (Low Loss)	SE1683 1889			
		General Use Relating To Secondary Category (Medium Loss)	SE1633 1832			
		General Use Relating To Secondary Category (Medium Loss)	SE1669 1837			
		General Use Relating To Secondary Category (Medium Loss)	SE1683 1889			

DP reach	Licence No.	Use Description	NGR 1	Max Annual Quantity (m^3/day)	Max Daily Quantity (m^3/day)	Significant flow pressure
Colne 4	NE/027/0011/023	Supply To A Canal For Throughflow	SE1499 716219	24600000	-	Yes[6]
Colne T1	2/27/11/101	General Use Relating To Secondary Category (Medium Loss)	SE0491 16	129688	545.52	Yes
Colne T1	2/27/11/102	General Cooling (Existing Licences Only) (Low Loss) / General Use Relating To Secondary Category (Medium Loss)	SE0471 08	1652506	6787.32	Yes
		General Cooling (Existing Licences Only) (Low Loss)	SE0471 08			
		General Use Relating To Secondary Category (Medium Loss)	SE0471 08			
		General Use Relating To Secondary Category (Medium Loss)	SE0471 08			
Colne T4	2/27/11/064	Transfer Between Sources (Post Water Act 2003)	SE0541 43	5840000	-	No
		Potable Water Supply - Direct	SE0541 43			
Colne T4	NE/027/0011/026	Supply To A Canal For Throughflow	SE0692 014330	-	-	Yes[7]
Holme 2	2/27/10/079	General Use Relating To Secondary Category (Medium Loss)	SE1273 0715	95000	360	No
Holme 3	2/27/10/025	General Cooling (Existing Licences Only) (Low Loss)	SE1461 14	8183	27.276	No
Holme 4	2/27/10/088	Hydroelectric Power Generation	SE1351 31	18184000	181840	Yes
Holme 4	2/27/10/126/R01	Spray Irrigation - Direct	SE1312 014600	4800	136	No
Holme T3	2/27/10/030	General Use Relating To Secondary Category (High Loss)	SE1351 23	50000	350	Yes
		General Use Relating To Secondary Category (High Loss)	SE1345 1221			
Holme T3	2/27/10/125/R01	General Use Relating To Secondary Category (Medium Loss)	SE1082 011080	56064	325	Yes
Holme T3	NE/027/0010/001	Hydroelectric Power Generation	SE0871 610637	599184	2333	Yes
Calder 4	2/27/13/049	General Use Relating To Secondary Category (Medium Loss)	SE1832 09	57825	327.312	No

[6] Though no license daily quantities, the Environment Agency have advised that the annual averaged abstraction is in the range 10-15 Ml/d

[7] Though no license daily quantities, the Environment Agency have advised that is abstraction should be considered as significant flow pressure

DP reach	Licence No.	Use Description	NGR 1	Max Annual Quantity (m^3/day)	Max Daily Quantity (m^3/day)	Significant flow pressure
Calder 4	2/27/13/050	General Use Relating To Secondary Category (Medium Loss)	SE208192	36368	227.3	No
Calder 4	2/27/13/091	General Use Relating To Secondary Category (Medium Loss)	SE337194	15000	3273.12	No
Calder 4	2/27/13/109	Non-Evaporative Cooling	SE3432719865	1550000	5640	No
Calder 4	2/27/13/163	General Use Relating To Secondary Category (Medium Loss)	SE2456 2129	15000	90.92	No
Calder 4	2/27/13/201	Transfer Between Sources (Pre Water Act 2003)	SE1770 2050	1136500	27300	Yes
Calder 4	2/27/13/211/R01	General Use Relating To Secondary Category (Medium Loss)	SE2314020493	350000	960	No
Calder 4	NE/027/0013/011	Heat Pump	SE3365520066	1000000	5184	No
Calder 4	NE/027/0013/012	Hydroelectric Power Generation	SE3583521230	500000000	1728000	No[8]
Calder 4	NE/027/0013/031	Mineral Washing	SE3542023418	730000	2000	No
		Mineral Washing	SE3542023418			
Calder 4	NE/027/0013/015	Transfer Between Sources (Post Water Act 2003)	SE3582321265	-	-	No
		Transfer Between Sources (Post Water Act 2003)	SE3583421261			
		Transfer Between Sources (Post Water Act 2003)	SE3583521265			

[8]Though the quantity listed for this abstraction is significant in relation to the flow in Calder 4, this has been screened out of further consideration since it would only lead to a depleted reach over a weir. It is assumed that a suitable HOF is in place to ensure that flows to maintain the fish pass structure on the weir are protected under low flow conditions.

ANNEX 2 – REGULATED DISCHARGES IN MIDDLE CALDER AREA REACHES

Name	Permit Reference	Outfall NGR	Significant Water Quality Pressure	Intermittent/ Continuous
Anchor Street/CSO	WRA9172	SE 15163 16663	Yes	Intermittent
Armitage Fold/CSO	3658(SS)	SE 13362 13819	Yes	Intermittent
Aspley Wakefield Rd/CSO	WRA9173	SE 15122 16255	Yes	Intermittent
Barber Row/No 2 CSO	WRA7520	SE 09540 14495	Yes	Intermittent
Bargate/No 2 CSO	WRA7458	SE 09726 14544	Yes	Intermittent
Beaumont Park /CSO	YWS01910	SE1264214116	Yes	Intermittent
Ben Shaws/CSO	1898	SE 15207 17533	Yes	Intermittent
Birds Royd Lane/No 2 CSO	YWS01757	SE 14726 22552	Yes	Intermittent
Bog Green Lane/CSO	EPR/UP3123GW A1	SE 17776 20220	Yes	Intermittent
Bradley Mills/2 CSO	WRA7164	SE 15218 17545	Yes	Intermittent
Bramston Street/CSO	YWS00952	SE 14488 22546	Yes	Intermittent
Bridgehouse/Upper STW/3XDWF Overflow	YWS01395 YWS01397	SE 17290 21120	Yes	Intermittent
Brockholes Lane/CSO	WADC770	SE 15092 10976	Yes	Intermittent
Brow Bridge/CSO	WRA9266	SE 09644 21280	No	Intermittent
Carr Pit Road/No 2 CSO	WRA8455	SE 15147 16495	Yes	Intermittent
Causeway Side 13/CSO	WRA7460	SE 09587 14130	Yes	Intermittent
Colne Road/CSO	WRA8557	SE 15037 16169	Yes	Intermittent
Cooper Bridge/CSO	YWS00971	SE 17599 20604	Yes	Intermittent
Corn Mill/No 2 CSO	WRA8437	SE 14015 12140	Yes	Intermittent
Crosland Street/HLR	YWS01880	SE 13280 16060	Yes	Intermittent
Daisy Street/CSO	WRA9171	SE 15147 16495	Yes	Intermittent
Dark Lane/No 2 CSO	YWS01773	SE 11985 23379	Yes	Intermittent
Deighton/STW- storm overflow	YWS01394	SE 17250 19480	Yes	Intermittent
Deighton/STW- storm overflow	YWS01396	SE 16970 19080	Yes	Intermittent
Dobb Lane/No 2 CSO	WRA8425	SE 12612 07087	No	Intermittent
Eastgate Elland/CSO	WRA8657	SE 10995 21475	Yes	Intermittent
Elland Lane/CSO	C5059	SE 11094 21538	Yes	Intermittent
Elland Lowfields/SPS	YWS00665 YWS00666	SE 11260 21800	Yes	Intermittent
Elland Millgate/CSO	WADC148	SE 10690 21280	Yes	Intermittent
Elland West Vale/SPS	YWS00667 YWS00668	SE 10007 21124	Yes	Intermittent
Factory Lane/CSO	YWS02074	SE 12028 15862	Yes	Intermittent
Fartown Bradford Rd/CSO	2579	SE 15207 17533	Yes	Intermittent

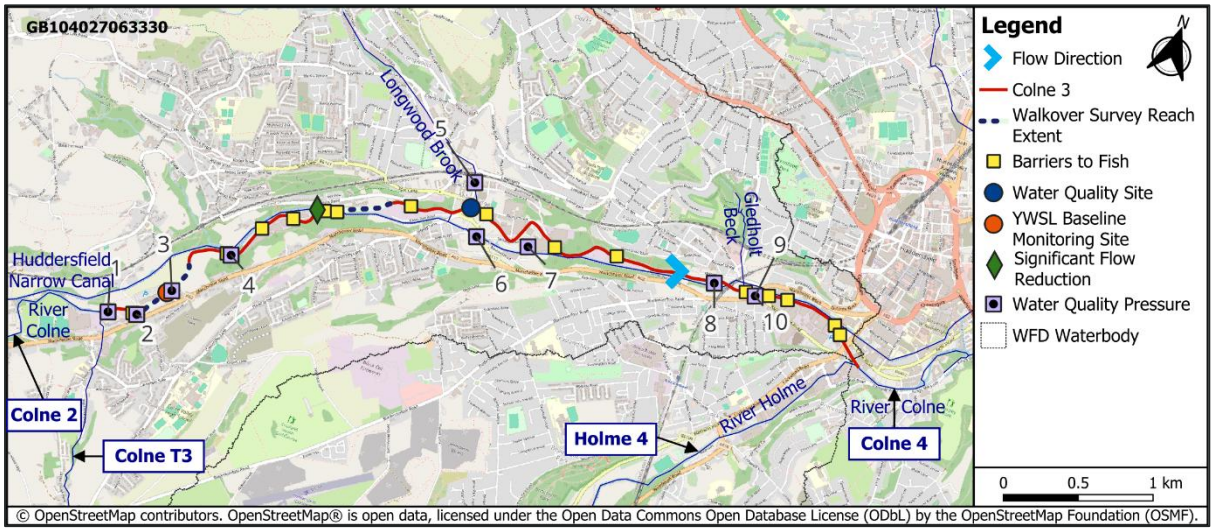
Name	Permit Reference	Outfall NGR	Significant Water Quality Pressure	Intermittent/ Continuous
Fartown Green Road/CSO	WRA9311 1	SE 14970 18640	No	Intermittent
Fernlea Grove/CSO	WRA7519	SE 10183 15131	Yes	Intermittent
Gas Works Lane/CSO	WRA8762	SE 10922 21500	Yes	Intermittent
Gasworks Street/CSO	WRA9178	SE 15208 17129	Yes	Intermittent
Gordon Terrace/CSO	WRA7457	SE 09896 14778	Yes	Intermittent
Holmbridge Mill/CSO	YWUCD2/55	SE 12061 06706	No	Intermittent
Honley Bridge/No 2 CSO	WRA8438	SE 14045 12015	Yes	Intermittent
Honley Eastgate/CSO	YWS01307	SE 13999 12140	Yes	Intermittent
Honley Huddsfld Rd/2 CSO	WRA8441	SE 14042 12580	Yes	Intermittent
Honley Newtown/No 2 CSO	WRA8678	SE 14002 12134	Yes	Intermittent
Hoults Lane/CSO	WRA8440	SE 09678 21322	No	Intermittent
Hoyles Memorial Gdns/CSO	EPR/UP3320GE	SE 09642 21288	No	Intermittent
Huddersfield Rd 106/CSO	WRA8659	SE 10995 21475	Yes	Intermittent
Huddersfield Leeds Rd/CSO	YWS01226	SE 16760 18930	Yes	Intermittent
Ivy Street/CSO	WRA8489	SE 15382 16286	Yes	Intermittent
Jack Bridge West/CSO	1897	SE 15154 17340	Yes	Intermittent
Kings Mill Lane/No 2 CSO	2325	SE 1512 1625	Yes	Intermittent
Lillands Lane/CSO	YWS01143	SE 14057 22645	Yes	Intermittent
Lockwood Scar/CSO	WRA9182	SE 13690 15117	Yes	Intermittent
Longlands Road /No 2 CSO	WRA8449 1	SE 15013 10048	Yes	Intermittent
Longley Park/CSO	WRA8682	SE 15037 16169	Yes	Intermittent
Longroyd Manch Road/CSO	WRA9302	SE 13567 16072	Yes	Intermittent
Lords Lane Brighouse/CSO	YWS00993	SE1499722533	Yes	Intermittent
Lower Edge Road/CSO	WRA8764	SE 11094 21538	Yes	Intermittent
Milns Shaw Lane/No 2 CSO	WRA8765	SE 11682 15808	Yes	Intermittent
Milnsbridge/CSO	WRA8766 A1	SE 11548 16143	Yes	Intermittent
Neiley/No 2 STW- storm overflow	YWS00109	SE 14670 11530	Yes	Intermittent
Park Hill Farm	WADC1219 A1	SE 35741 21362	Yes	Intermittent
Park Road Elland/CSO	WRA7904	SE 11230 21790	Yes	Intermittent
Park Road/CSO	C4856 A1	SE 11244 21795	Yes	Intermittent
Pollard Street/No 2 CSO	YWS01777	SE 14834 22555	Yes	Intermittent
Queens Mill Road/CSO	YWS01912	SE 14131 15635	Yes	Intermittent
Queens Square/CSO	YWS02174	SE 14130 12692	Yes	Intermittent
Red Doles Road/CSO	2623	SE 15500 17750	Yes	Intermittent
River Street/CSO	YWS01173	SE 15683 22178	Yes	Intermittent
Rochdale Road/CSO	WRA8442	SE 09678 21322	No	Intermittent
Saddleworth Road/CSO	2515 1	SE 06574 20785	Yes	Intermittent
Scar Fold/CSO	WRA9271	SE 14078 08096	No	Intermittent
Scar Lane/CSO	WRA8780	SE 11564 15976	No	Intermittent

Name	Permit Reference	Outfall NGR	Significant Water Quality Pressure	Intermittent/ Continuous
Somerset Road/CSO	WRA8681	SE 15120 16250	Yes	Intermittent
South Lane/CSO	WRA8660	SE 10995 21475	Yes	Intermittent
Springdale Avenue/CSO	WRA9301	SE 13567 16072	Yes	Intermittent
Stockwell Hill/ CSO	YWS00743	SE 13573 13662	Yes	Intermittent
Sunnybank/CSO	WRA8661	SE 08861 20857	No	Intermittent
Thirstin Road/No 2 CSO	WRA8436	SE 13443 12176	No	Intermittent
Thistle Street/CSO	WRA8569	SE 15207 17533	Yes	Intermittent
Thornhills Beck Lane/CSO	WRA8439 4	SE 15090 22520	Yes	Intermittent
Water Street/No 2 CSO	WRA8435	SE 13693 15139	Yes	Intermittent
West Vale/CSO	2515	SE 09424 21127	Yes	Intermittent
Willow Lane/CSO	YWS02170	SE 15207 17533	Yes	Intermittent
Willow Lane Beck/CSO	WRA9304	SE 15207 17533	Yes	Intermittent
Wistons Lane/CSO	WRA8662	SE 10995 21475	Yes	Intermittent
Wood Bottom/CSO	WRA7455	SE 05360 12048	Yes	Intermittent
Woodhouse Lane/CSO	YWS00141	SE 15883 21823	Yes	Intermittent
Wyke Old Lane/CSO	WRA8426 1	SE 14860 25130	No	Intermittent
Barr Lane STW	E682(SS)	SE 25316 14571	No	Continuous
Barsey Green STW	1433	SE 06720 20002	Yes	Continuous
Caldervale (Wakefield) STW	C4106	SE 35064 20411	No	Continuous
Claphouse Fold STW	3808	SE 29373 12256	No	Continuous
Coxley Lane STW	E734(SS)	SE 27772 17206	No	Continuous
Crofton STW	2207	SE 36181 18482	No	Continuous
Denholme (Doe Park) WwTW	2251	SE 07635 34257	No	Continuous
Dunford Bridge STW	E684(SS)	SE 16141 02461	No	Continuous
Grange Lane STW	E736(SS)	SE 25008 16030	No	Continuous
Great Cliff WwTW	2413	SE 30049 15775	No	Continuous
Haigh STW	C4955	SE 29742 12535	No	Continuous
Harden STW	E687(SS)	SE 15276 03573	No	Continuous
Hollingwell Hill STW	E718(SS)	SE 10671 31257	No	Continuous
Horbury (Dudfleet) STW	C4107	SE 29993 17074	No	Continuous
Huddersfield STW Colne Bridge	WRA7409	SE 17809 20466	No	Continuous
Huddersfield STW Cooper Bridge	WRA7409	SE 18527 20835	No	Continuous
Lemonroyd WwTW	WRA7220	SE 38350 28155	No	Continuous
Little Lepton STW	1612	SE 18646 14248	No	Continuous
Low Common STW	C4586	SE 40409 25578	No	Continuous
Meltham STW	WRA6680	SE 11317 11660	No	Continuous
Mill Lane WwTW	WA6472	SE 39655 24903	No	Continuous
Mitchell Laithes WwTW	E15	SE 26130 19630	No	Continuous
Neiley STW	2255/15	SE 14630 11560	No	Continuous
North Dean Garage	2003	SE 09650 21350	No	Continuous
Notton Village STW	1389	SE 34590 14102	No	Continuous
Owlwood (Garforth) STW	2225	SE 41791 28885	No	Continuous

Name	Permit Reference	Outfall NGR	Significant Water Quality Pressure	Intermittent/ Continuous
Private	3534	SE 07601 14200	No	Continuous
Private	EPRUP3425GL	SE 14195 16083	No	Continuous
Private	WRA7185	SE 08820 14230	No	Continuous
Private	WRA7185	SE 08820 14230	No	Continuous
Sandy Lane STW	WRA6603	SE 13333 13944	No	Continuous
Scammonden Dam STW	2747	SE 05433 16997	Yes	Continuous
Seckar Wood STW	NPSWQD009922	SE 32930 13756	No	Continuous
Smalley Bight (Stanley, Wakefield)	E743(SS)	SE 35292 23932	No	Continuous
Standedge Visitor Centre	WRA7689	SE 04000 11960	No	Continuous
Town Hall	3653	SE 14850 16450	No	Continuous
West Bretton STW	C5412	SE 29277 13308	No	Continuous
Wheldale (Castleford) STW	WRA6659	SE 44663 26729	No	Continuous
Woolley STW	2776	SE 32683 13732	No	Continuous

ANNEX 3 – COLNE 3 SIGNIFICANT INTERMITTENT WATER QUALITY PRESSURES

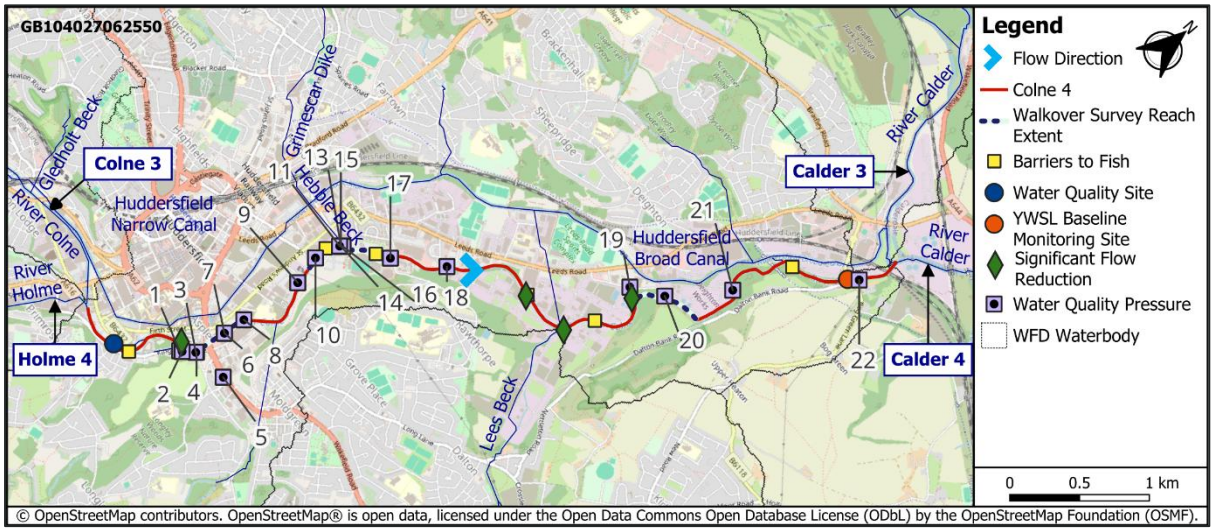
Map and table of the significant intermittent water quality pressures on the Colne 3 reach.



Map Number	CSO Name
1	Barber Row/No 2 CSO
2	Bargate/No 2 CSO
3	Gordon Terrace/CSO
4	Fernlea Grove/CSO
5	Milnsbridge/CSO
6	Milns Shaw Lane/No 2 CSO
7	Factory Lane/CSO
8	Crosland Street/HLR
9	Longroyd Manch Road/CSO
10	Springdale Avenue/CSO

ANNEX 4 – COLNE 4 SIGNIFICANT INTERMITTENT WATER QUALITY PRESSURES

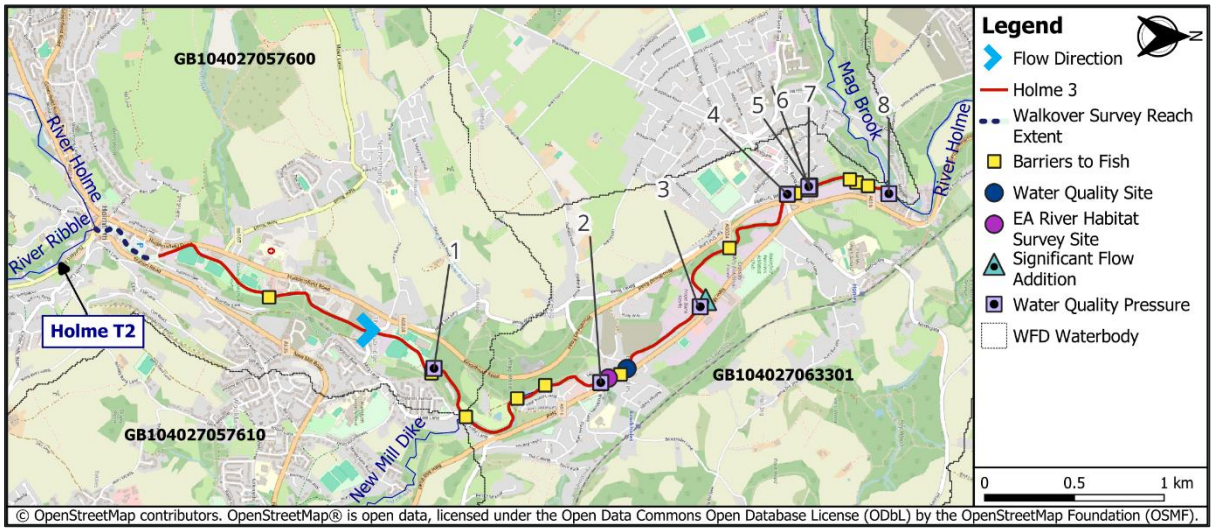
Map and table of the significant intermittent water quality pressures on the Colne 4 reach.



Map Number	CSO Name
1	Colne Road/CSO
2	Longley Park/CSO
3	Somerset Road/CSO
4	Kings Mill Lane/CSO
5	Aspley Wakefield Rd/CSO
6	Ivy Street/CSO
7	Carr Pit Road/No 2 CSO
8	Daisy Street/CSO
9	Anchor Street/CSO
10	Gasworks Street/CSO
11	Willow Lane Beck/CSO
12	Willow Lane/CSO
13	Fartown Bradford Rd/CSO
14	Ben Shaws/CSO
15	Jack Bridge West/CSO
16	Thistle Street/CSO
17	Bradley Mills/2 CSO
18	Red Doles Road/CSO
19	Huddersfield Leeds Rd/CSO
20	Deighton/STW- storm overflow
21	Deighton/STW- storm overflow
22	Bog Green Lane/CSO

ANNEX 5 – HOLME 3 SIGNIFICANT INTERMITTENT WATER QUALITY PRESSURES

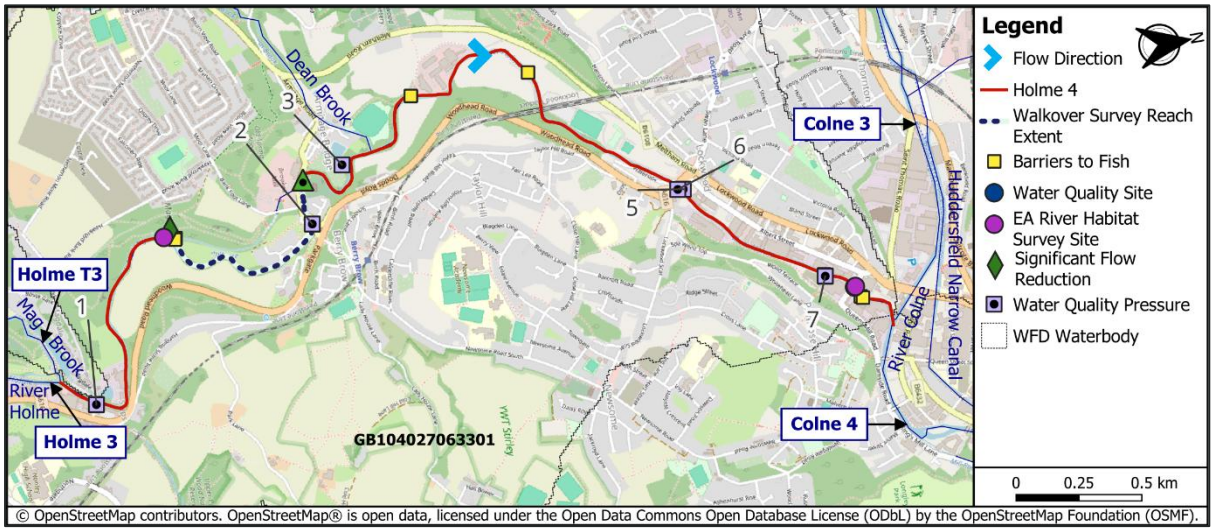
Map and table of the significant intermittent water quality pressures on the Holme 3 reach.



Map Number	CSO Name
1	Longlands Road/No 2 CSO
2	Brockholes Lane/CSO
3	Neiley/No 2 STW- storm overflow
4	Honley Bridge/No 2 CSO
5	Honley Eastgate/CSO
6	Corn Mill/No 2 CSO
7	Honley Newtown/No 2 CSO
8	Honley Huddsfld Rd/2 CSO

ANNEX 6 – HOLME 4 SIGNIFICANT INTERMITTENT WATER QUALITY PRESSURES

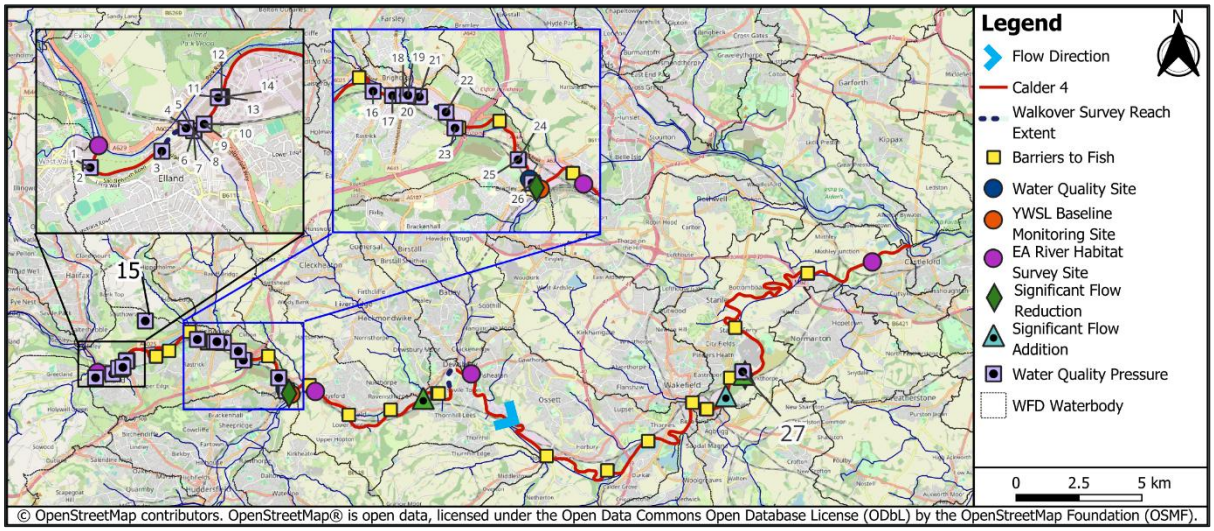
Map and table of the significant intermittent water quality pressures on the Holme 4 reach.



Map Number	CSO Name
1	Queens Square/CSO
2	Stockwell Hill/CSO
3	Armitage Fold/CSO
4	Beaumont Park/CSO
5	Water Street/No 2 CSO
6	Lockwood Scar/CSO
7	Queens Mill Road/CSO

ANNEX 7 – CALDER 4 SIGNIFICANT INTERMITTENT WATER QUALITY PRESSURES

Map and table of the significant intermittent water quality pressures on the Calder 4 reach.



Map Number	CSO Name
1	Elland West Vale/SPS
2	Elland West Vale/SPS
3	Elland Millgate/CSO
4	Gas Works Lane/CSO
5	Eastgate Elland/CSO
6	Huddersfield Rd 106/CSO
7	South Lane/CSO
8	Wistons Lane/CSO
9	Lower Edge Road/CSO
10	Elland Lane/CSO
11	Park Road/CSO
12	Elland Lowfields/SPS
13	Elland Lowfields/SPS
14	Park Road Elland/CSO
15	Dark Lane/No 2 CSO
16	Lillands Lane/CSO
17	Bramston Street/CSO
18	Birds Royd Lane/No 2 CSO
19	Pollard Street/No 2 CSO
20	Lords Lane Brighouse/CSO
21	Thornhills Beck Lane/CSO
22	River Street/CSO
23	Woodhouse Lane/CSO
24	Brighouse/Upper STW/3XDWF/Overflow
25	Brighouse/Upper STW/3XDWF/Overflow
26	Cooper Bridge/ CSO
27	Park Hill Farm/CSO

ANNEX 8 – FLOW TRANSPOSITION IN THE ABSENCE OF MEASURED DATA (FOR ILLUSTRATIVE TIME SERIES)

The Gustard[9] 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:

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 1990-2024, 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 Naturalised. Where those abstractions or discharges are YWSL then daily data have been used in the Naturalisation. For all other identified abstractions or discharges the permitted value has been used in the 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 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 six reaches of the Middle Calder Area EAR:

- Colne 2
- Colne 3
- Holme 2
- Holme 3
- Holme 4
- Calder 4 (Additional mid-reach assessment point at the River Colne Confluence)

Following informal site visit on 07/06/2020 and review of catchment boundaries on the FEH, it is apparent that the catchment area of Deerhill is included within the Holme catchment whilst that of Blackmoorfoot is included within Colne catchment. Therefore, for catchment parameter estimation, Deerhill Reservoir catchment is included within the River Holme adjustments whilst Blackmoorfoot Reservoir catchment is included within the River Colne adjustments.

[9]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.

Colne 2

Aspect	Point	Data source
Donor gauge	River Colne at Longroyd Bridge	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for naturalisation	28.1Ml/d	Derived from EA dataset for the 1990-2024 period
Naturalisation of donor gauge	• Butterley Reservoir outflow removed from flow series • Marsden Intake outflow removed from flow series • Deerhill Reservoir outflow removed from flow series • Blackmoorfoot (Hoyle House Clough) Reservoir outflow removed from flow series • Butterley Reservoir catchment area removed from flow scaling • Marsden Intake catchment area removed from flow scaling • Blackmoorfoot Reservoir catchment area removed from flow scaling	• YWSL daily flow and level data • YWSL daily abstraction data • FEH
Naturalisation of recipient AP scaling	• Butterley Reservoir catchment area removed from flow scaling • Marsden Intake catchment area removed from flow scaling	• FEH
Post processing of recipient AP (flow)	• Butterley Reservoir outflow added to flow series • Marsden Intake outflow added to flow series	• YWSL daily abstraction data • YWSL daily flow and level data

Catchment descriptors were collected, for each relevant site, from the FEH Webservice[10] as listed below:

	Area km^2	SAAR mm	SPR-HOST	BFI-HOST
Donor gauge	72.3	1300	32.1	0.520
Naturalised donor gauge	42.2	1198	17.6	0.667
Recipient AP (raw)	31.3	1448	53.0	0.308
Naturalised recipient AP	2.5	1357	37.4	0.479

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

Q95 and lower flow scaling factor	Q50 and higher flow scaling factor
0.042	0.142

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

Colne 3

Aspect	Point	Data source
Donor gauge	River Colne at Longroyd Bridge	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for naturalisation	28.1Ml/d	Derived from EA dataset for the 1990-2024 period
Naturalisation of donor gauge	• Butterley Reservoir outflow removed from flow series • Marsden Intake outflow removed from flow series • Deerhill Reservoir outflow removed from flow series • Blackmoorfoot (Hoyle House Clough) Reservoir outflow removed from flow series • Butterley Reservoir catchment area removed from flow scaling • Marsden Intake catchment area removed from flow scaling • Blackmoorfoot Reservoir catchment area removed from flow scaling	• YWSL daily flow and level data • YWSL daily abstraction data • FEH
Naturalisation of recipient AP scaling	• Butterley Reservoir catchment area removed from flow scaling • Marsden Intake catchment area removed from flow scaling • Blackmoorfoot Reservoir catchment area removed from flow scaling	FEH
Post processing of recipient AP (flow)	• Butterley Reservoir outflow added to flow series • Marsden Intake outflow added to flow series • Deerhill Reservoir outflow added to flow series • Blackmoorfoot (Hoyle House Clough) Reservoir outflow added to flow series	• YWSL daily abstraction data • YWSL daily flow and level data

Catchment descriptors were collected, for each relevant site, from the FEH Webservice[11] as listed below:

	Area km^2	SAAR mm	SPR-HOST	BFI-HOST
Donor gauge	72.3	1300	32.1	0.520
Naturalised donor gauge	42.2	1198	17.6	0.667
Recipient AP (raw)	52.5	1375	41.3	0.422
Naturalised recipient AP	22.4	1283	26.3	0.567

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

Q95 and lower flow scaling factor	Q50 and higher flow scaling factor
0.451	0.849

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

Holme 2

Aspect	Point	Data source
Donor gauge	Huddersfield Queens Mill	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for naturalisation	39.9Ml/d	Derived from EA dataset for the 1990-2023 period
Naturalisation of donor gauge	• Brownhill Reservoir outflow removed from flow series • Digley Reservoir outflow removed from flow series • Holme Styes Reservoir outflow removed from flow series • Blackmoorfoot (Brow Grains Dike) Reservoir outflow removed from flow series • Meltham WwTW removed from flow series • Neiley WwTW removed from flow series • Brownhill Reservoir catchment area removed from flow scaling • Digley Reservoir catchment area removed from flow scaling • Holme Styes Reservoir catchment area removed from flow scaling • Deerhill Reservoir catchment area removed from flow scaling	• YWSL daily flow and level data • YWSL daily mean discharges or dry weather flows when not available • FEH
Naturalisation of recipient AP scaling	• Brownhill Reservoir catchment area removed from flow scaling • Digley Reservoir catchment area removed from flow scaling	• FEH
Post processing of recipient AP (flow)	• Digley Reservoir outflow added to flow series • Brownhill Reservoir outflow added to flow series	• YWSL daily flow and level 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	97.4	1237	25.1	0.605
Naturalised donor gauge	74.6	1149	18.1	0.681
Recipient AP (raw)	20.6	1536	46.7	0.366
Naturalised recipient AP	1.3	1285	13.0	0.667

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

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

Q95 and lower flow scaling factor	Q50 and higher flow scaling factor
0.017	0.014

Holme 3

Aspect	Point	Data source
Donor gauge	Huddersfield Queens Mill	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for naturalisation	39.9Ml/d	Derived from EA dataset for the 1990-2023 period
Naturalisation of donor gauge	• Brownhill Reservoir outflow removed from flow series • Digley Reservoir outflow removed from flow series • Holme Styes Reservoir outflow removed from flow series • Blackmoorfoot (Brow Grains Dike) Reservoir outflow removed from flow series • Meltham WwTW removed from flow series • Neiley WwTW removed from flow series • Brownhill Reservoir catchment area removed from flow scaling • Digley Reservoir catchment area removed from flow scaling • Holme Styes Reservoir catchment area removed from flow scaling • Deerhill Reservoir catchment area removed from flow scaling	• YWSL daily flow and level data • YWSL daily mean discharges or dry weather flows when not available • FEH
Naturalisation of recipient AP scaling	• Brownhill Reservoir catchment area removed from flow scaling • Digley Reservoir catchment area removed from flow scaling • Holme Styes Reservoir catchment area removed from flow scaling	• FEH
Post processing of recipient AP (flow)	• Digley Reservoir outflow added to flow series • Brownhill Reservoir outflow added to flow series • Holme Styes Reservoir outflow added to flow series • Neiley WwTW added to flow series	• YWSL daily flow and level data • YWSL daily mean discharges or dry weather flows when not available

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	97.4	1237	25.1	0.605

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

Naturalised donor gauge	74.6	1149	18.1	0.681
Recipient AP (raw)	33.0	1446	35.7	0.482
Naturalised recipient AP	11.5	1278	13.1	0.712

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

Q95 and lower flow scaling factor	Q50 and higher flow scaling factor
0.161	0.124

Holme 4

Aspect	Point	Data source
Donor gauge	Huddersfield Queens Mill	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for naturalisation	39.9Ml/d	Derived from EA dataset for the 1990-2023 period
Naturalisation of donor gauge	• Brownhill Reservoir outflow removed from flow series • Digley Reservoir outflow removed from flow series • Holme Styes Reservoir outflow removed from flow series • Blackmoorfoot (Brow Grains Dike) Reservoir outflow removed from flow series • Meltham WwTW removed from flow series • Neiley WwTW removed from flow series • Brownhill Reservoir catchment area removed from flow scaling • Digley Reservoir catchment area removed from flow scaling • Holme Styes Reservoir catchment area removed from flow scaling • Deerhill Reservoir catchment area removed from flow scaling	• YWSL daily flow and level data • YWSL daily mean discharges or dry weather flows when not available • FEH
Naturalisation of recipient AP scaling	• Brownhill Reservoir catchment area removed from flow scaling • Digley Reservoir catchment area removed from flow scaling • Holme Styes Reservoir catchment area removed from flow scaling • Deerhill Reservoir catchment area removed from flow scaling	FEH
Post processing of recipient AP (flow)	• Digley Reservoir outflow added to flow series • Brownhill Reservoir outflow added to flow series • Holme Styes Reservoir outflow added to flow series • Blackmoorfoot (Brow Grains Dike) Reservoir outflow added to flow series • Neiley WwTW added to flow series • Meltham WwTW added to flow series	• YWSL daily flow and level data • YWSL daily mean discharges or dry weather flows when not available

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	97.4	1237	25.1	0.605
Naturalised donor gauge	74.6	1149	18.1	0.681
Recipient AP (raw)	90.3	1230	26.1	0.570
Naturalised recipient AP	67.5	1130	18.8	0.642

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

Q95 and lower flow scaling factor	Q50 and higher flow scaling factor
0.853	0.924

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

Calder 4 (Additional mid-reach assessment point at the River Colne Confluence)

Aspect	Point	Data source
Donor gauge	Calder at Elland	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for Naturalisation	165.6Ml/d	Derived from EA dataset for the 1990-2024 period
Re naturalisation of donor gauge	• Reservoir outflows/ maintained flows upstream of the Elland flow gauge removed from flow series. • Upstream WwTWs (Eastwood, Redacre, Ripponden, High Royd and Halifax) removed from flow series • Reservoir/maintained flow point catchments upstream of the Eland flow gauge removed from flow scaling	• YWSL daily flow and level data • YWSL daily mean discharges or dry weather flows when not available • FEH
Naturalisation of recipient AP catchment descriptors	• Reservoir/maintained flow point catchments upstream of the River Calder below the River Colne confluence removed from flow scaling	• FEH
Post processing of recipient AP	• Reservoir outflows/ maintained flows upstream of the River Calder below the River Colne confluence added to flow series. • Upstream WwTWs (Eastwood, Redacre, Ripponden, High Royd, Halifax, Neiley, Meltham and Huddersfield) added to flow series	• YWSL daily flow and level data • YWSL daily mean discharges or dry weather flows when not available

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	341.9	1257	38.5	0.455
Naturalised donor gauge	259.8	1223	33.8	0.505
Recipient AP (raw)	640.0	1183	31.4	0.528
Naturalised recipient AP	53.1	886	19.1	0.638

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

Q95 and lower flow scaling factor	Q50 and higher flow scaling factor
0.258	0.084

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

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APPENDIX B – ENVIRONMENTAL RECEPTORS

B1 INTRODUCTION

This EAR was originally drafted, as per the Yorkshire Water Drought Plan 2022, to include the Deerhill drought permit. The assessments presented in this EAR were based on its implementation. However, following further discussions with the Environment Agency, it has been identified that additional watercourses potentially affected by this permit were not included in the original assessment. Work is ongoing to determine whether the environmental assessment requires updating in relation to the Deerhill drought permit.

As a result, the Deerhill drought permit has been excluded from this application, and all references to it have been removed from the EAR. Nonetheless, given the time constraints around the application, the assessments below continue to assume a flow reduction associated with the implementation of the Deerhill drought permit and therefore overrepresent the hydrological impact on reaches Colne 2, Colne 3, Colne 4 and Calder 4.

This appendix assesses the potential impacts on the environmental Receptors of the Middle Calder Area river catchment during the period of implementation of associated drought options.

The Middle Calder Area Reservoirs comprise eight drought options as reported in this appendix:

1. Scammonden Water – Black Brook drought permit
2. Colne Maintained Flow at Marsden Reservoir drought permit
3. Butterley Reservoir drought permit
4. Blackmoorfoot Reservoir - Hoyle House Clough drought permit
5. Scammonden Water - Bradshaw Clough drought permit
6. Brownhill Reservoir drought permit
7. Digley Reservoir drought permit
8. Blackmoorfoot Reservoir - Brow Grains 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 2022 Environmental Assessment Methodology[1].

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

The assessment of environmental 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**. Note that the only local wildlife sites mapped on the figure are those which were agreed with the Environment Agency in 2019 as having water dependent receptors.

This appendix is set out in the following sections:

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

9. Statutory designated sites
10. NERC and local wildlife sites
11. NERC and other protected species
12. WFD Receptors

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

13. Invasive non-native species (INNS)
14. 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

[Insert Figure B1.1]

[Insert Figure B1.2]

B2 BASELINE & SENSITIVITY

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

B2.1 BLACK BROOK 1

B2.1.1 Statutory designated sites

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

B2.1.2 NERC and local wildlife sites

Table B2-1 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 B2-1: 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)*
North Dean Wood LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Deciduous woodland -214004, 213560, 213173, 213417. 213313, 213129, 213088, 212369, 212212, 212284, 209057, 208454, 208565, 208941, 208462, 208665, 207909, 207668, 207765, 206589, 206492, 206121, 206449, 206470	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)	Not sensitive	No

B2.1.3 NERC and other protected species

Table B2-2 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

One nationally scarce macroinvertebrate species (*Atherix ibis)* was observed in Site 41 in September 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.**

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

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 no surveys or records have been recorded 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 these species are considered to be susceptible to drought order 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. The data showed no surveys or records have been recorded in the impacted reach. However, 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, YWSL 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. However, 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 water vole likely to be present in the reach at the time of the implementation of a drought permit. Based on the limited available information water vole are considered to be susceptible to drought permit 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[3]) and one notable fish species (bullhead).

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 B2-2: 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)*
Notable Species – Invertebrates Yellow-legged water 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

[3] The National Fish Populations Database (NFPD) does not differentiate between brown trout (*Salmo trutta*) and sea trout (*Salmo trutta morpha trutta).* For consistency, the term ' brown trout' will be used throughout this report to refer to all individuals of *Salmo trutta*, unless specifically referring to brown trout or sea trout.

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. 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.	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, predation, inter and intra-species competition etc.	High	Yes
Notable Species – Fish -Bullhead *(Cottus gobio)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, provision of cover, predation, inter and intra-species competition etc.	High	Yes
NERC and Notable species – Birds There are many bird 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: - Eurasian Curlew (*Numenius arqauta*) - Swallow (*Hirundo rustica*) - Reed Bunting (*Emberiza schoeniclus*) - Common Tern (*Sterna hirundo*) - House Martin (*Delichon urbica*)	Not sensitive	No

B2.1.4 WFD Receptors

B2.1.4.1 Macroinvertebrates

The WFD waterbody GB104027062570 Black Brook from Source to River Calder classifies as 'good' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by three Environment Agency monitoring sites, U/S Red Lane Dyke (ID 1484), Penny Hill (ID 40) and Greetland (ID 41). Flow series data was unavailable within the impacted reach.

The WFD status of the macroinvertebrate community in Black Brook 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.

Assessment of the hydrological sensitivity of the macroinvertebrate community was undertaken by analysis of recorded LIFE scores. Baseline data indicates that under present conditions, the macroinvertebrate community in Black Brook 1 is highly sensitive to reduced flows (**Figure B2-1**). See **Table B2-3** for guidance in interpreting raw LIFE scores.

Table B2-3: LIFE score sensitivities

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

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the sites. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-1**.

Data from the monitoring sites show variation in $WHPT_{ASPT}$ scores over the period 2011 to 2023 but remain consistent with the standard to achieve moderate to high WFD status over the monitoring period. $WHPT_{ASPT}$ scores ranged between 5.54 and 6.99, averaging 6.45 with the lowest $WHPT_{ASPT}$ score of 5.54 at Site 41 in Autumn 2020, and the highest score of 6.99 at Site 1484 in Spring 2022. The $WHPT_{ASPT}$ expected scores for ranged between 6.71 to 7.46 across the sites, with four of the 30 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.77 and 0.98 (0.9) with the lowest $WHPT_{ASPT}$ EQR of 0.77 at Site 1484 in Spring 2023, and the highest EQR of 0.98 at Site 40 in Autumn 2011.

In Black Brook 1 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity with $WHPT_{NTAXA}$ scores ranging between 15 and 32, averaging 25.97, with the lowest $WHPT_{NTAXA}$ score of 15 at Site 41 in Spring 2021, and the highest score of 32 at Site 40 in Autumn 2011. The $WHPT_{NTAXA}$ expected scores ranged between 21.6 to 26.9 across the sites, with 1 of the 30 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.56 - 1.48 (1.08) with the lowest $WHPT_{NTAXA}$ EQR of 0.56 at Site 41 in Spring 2021, and the highest EQR of 1.48 at Site 1484 in Autumn 2023.

The indicative WFD classification for these sites is based on the worst classification between WHPT ASPT and NTAXA, these ranged between 'Poor' on 1 occurrence to 'High' on 7 occurrences. **Table B2-4** 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		

$LIFE_{FAMILY}$ 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 7.2 and 8.32, averaging 7.73, with the lowest $LIFE_{FAMILY}$ score of 7.2 at Site 41 in Autumn 2023, and the highest score of 8.32 at Site 1484 in Autumn 2022. The $LIFE_{FAMILY}$ expected scores ranged between 7.67 to 7.89 across the sites, with 3 of the 30 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.91 - 1.05 (0.99) with the lowest $LIFE_{FAMILY}$ EQR of 0.91 at Site 1484 in Autumn 2023, and the highest EQR of 1.05 at Site 1484 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 54 and 92.86, averaging 72.39, with the lowest PSI_{FAMILY} score of 54 at Site 1484 in Autumn 2023, and the highest score of 92.86 at Site 1484 in Autumn 2021. The PSI_{FAMILY} expected scores ranged between 66.63 to 76.62 across the sites, with 14 of the 30 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.71 and 1.23, averaging 1, with the lowest PSI_{FAMILY} EQR of 0.71 at Site 1484 in Autumn 2023, and the highest EQR of 1.23 at Site 1484 in Autumn 2021.

A total of four INNS species, including *Crangonyx pseudogracilis, Potamopyrgus antipodarum, Chelicorophium curvispinum* and *Dugesia tigrine* were recorded as present at two sites between 2011 to 2023. One designated species, *Atherix ibis*, was recorded as present at two sites between 2015 to 2021.

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 B2-5: Macroinvertebrate Observed and EQR Summary

Site ID	Site NGR	Survey count	Survey Range	LIFE $_{Family}$ EQR Score	LIFE $_{Family}$ Score	PSI $_{Family}$ EQR Score	PSI $_{Family}$ Score	WHPT $_{ASPT}$ EQR Score	WHPT $_{ASPT}$ EQR Class	WHPT $_{ASPT}$ Score	WHPT $_{NTAXA}$ EQR Score	WHPT $_{NTAXA}$ EQR Class	WHPT $_{NTAXA}$ Score
40	SE0637018417	6	2011 to 2015	0.98 - 1.03 (1)	7.61 - 8.08 (7.85)	0.93 - 1.09 (1.02)	69.57 - 77.5 (73.93)	0.88 - 0.98 (0.93)	G - H (G)	6.19 - 6.96 (6.69)	0.86 - 1.31 (1.16)	H - H (H)	21 - 32 (29)
41	SE0991721431	11	2013 to 2023	0.94 - 1.02 (0.99)	7.2 - 7.91 (7.64)	0.86 - 1.13 (0.99)	57.6 - 80 (67.92)	0.83 - 0.97 (0.9)	M - G (G)	5.54 - 6.73 (6.19)	0.56 - 1.11 (0.91)	P - H (H)	15 - 29 (24)
1484	SE0598717644	13	2012 to 2023	0.91 - 1.05 (0.98)	7.21 - 8.32 (7.76)	0.71 - 1.23 (0.99)	54 - 92.86 (75.46)	0.77 - 0.95 (0.89)	M - G (G)	5.77 - 6.99 (6.56)	0.8 - 1.48 (1.2)	H - H (H)	18 - 32 (26)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High

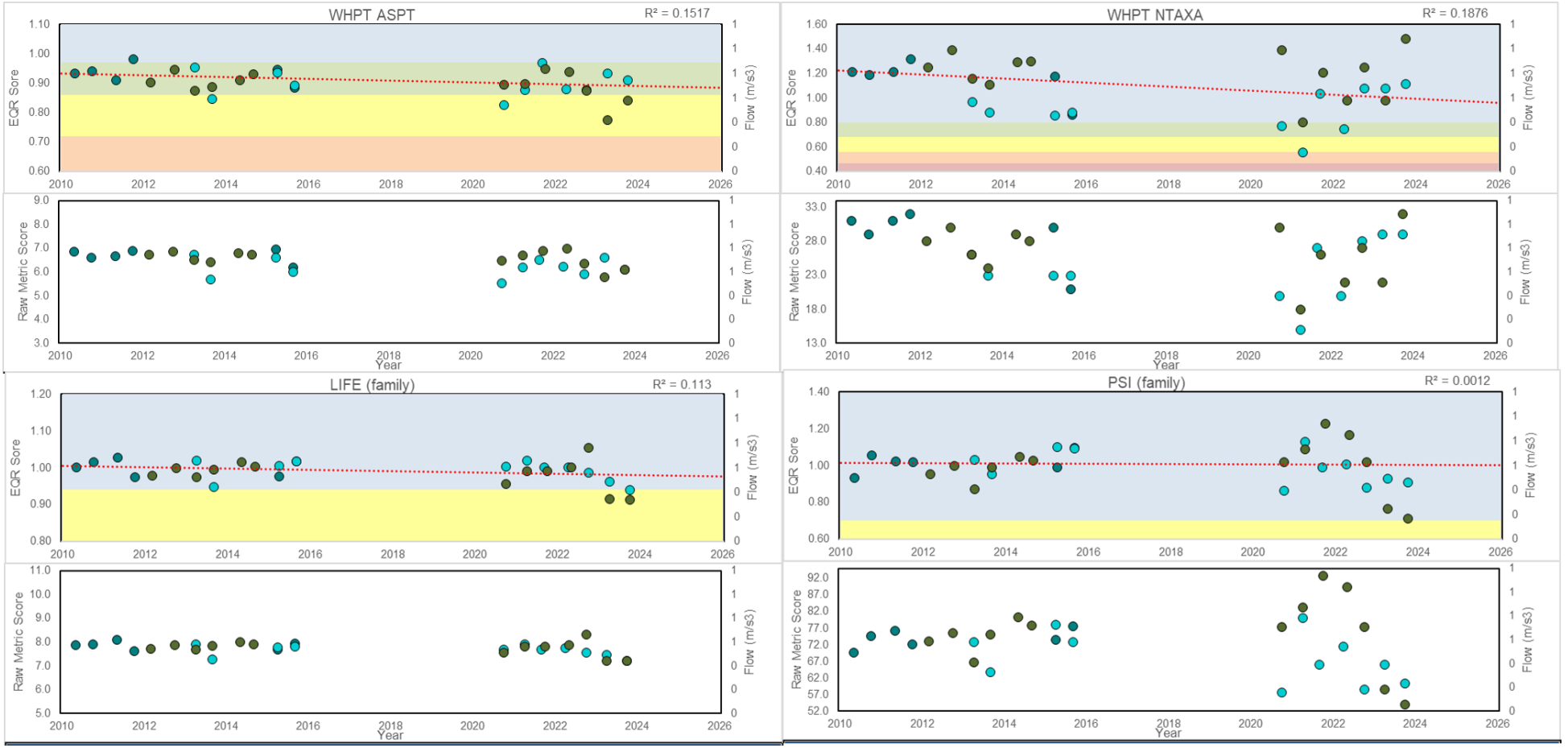


Figure B2-1: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.1.4.2 Fish

Waterbody GB104027062570 Black Brook from Source to River Calder classifies as 'good' for fish in 2022, Cycle 3. The classification is informed by two sites, Gate Head Lane (ID 11837) classified as 'moderate' and Freudenberg (ID 8299) classified as 'good', improving from 'moderate' in 2019.

Baseline data is available for six sites, Barkisland (ID 11821), Freudenberg, Gate Head Lane, Penny Hill (WR) (ID 11958), D/S Holywell Brook Confluence (ID 80005) and U/S Holywell Brook Confluence (ID 80006). Penny Hill (WR) was surveyed in 2010 and Barkisland in 2015. D/S Hollywell Brook Confluence and U/S Hollywood Brook Confluence were both surveyed in 2024. Gate Head lane was surveyed in 2015 and 2021. Freudenberg was surveyed in 2010 through to 2013, 2015, 2017, 2019, 2021 and 2023. **Table B2-6** details survey sites within the Black Brook 1 reach.

The WFD status of the fish community in Black Brook 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 Freudenberg is individually classified as 'moderate' with a site EQR of 0.3864, based on the FCS2 EQR scores from the 2023 survey. The site has a relatively low diversity, with only two species present from an expected four species. The EQR score for trout was high at 0.7137, additionally bullhead are present at a level that meets/exceeds expectations, with an EQR score of 1. Trout have a significantly higher observed density than expected. Minnow and stone loach were expected to be present at the site in varied degrees of prevalence, however both species were not recorded. The generally low diversity of the site contributed to the 'moderate' overall site classification.

The site Barkisland is individually classified as moderate with a site EQR of 0.214, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively poor diversity, with one species present from an expected four species. Trout had a high EQR score of 0.9387, with a observed density significantly higher than expected. Bullhead and stone loach were both absent from the site, although they were expected to be present. The low EQR score for bullhead and generally poor diversity had an effect in the overall site classification.

Brown trout were counted at every site during every year of survey in moderate to high abundance. Both highest counts were at Barkisland in 2021 and 2023 with 154 individuals counted, whilst the lowest count of 27 was at Freudenberg, however the survey employed a single-catch methodology compared to the catch-depletion utilised during the highest count surveys.

Bullhead were captured every survey year, with the exception of 2022, and were never counted at Barkisland or Penny Hill (WR). Abundance ranged from low to high, with a highest log abundance of 999 at Freudenberg in 2023, the same site having the lowest count of 14 in 2019. Stone loach were occasionally counted in low abundance at Freudenberg, and at DS/ Holywell Brook Confluence and U/S Holywell Brook Confluence. **Table B2-7** details species presence by year across all sites within the Black Brook 1 reach. 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 B2-6: Black Brook 1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
8299	Freudenberg	SE0842420695	Electric Fishing (AC, PDC and DC)	9	2010	2023
11821	Barkisland	SE0660519803		4	2015	2023
11837	Gate Head Lane	SE0770220594		2	2015	2021
11958	Penny Hill (WR)	SE0636318410		1	2010	2010
80005	d/s Holywell Brook Confluence	SE0908020841		1	2024	2024
80006	u/s Holywell Brook confluence	SE0907120803		1	2024	2024

Table B2-7: Black Brook 1 Fish Survey Results

Tolerance Category[4]	Species Name	2010	2011	2012	2013	2015	2017	2019	2021	2022	2023	2024
Medium tolerance	Stone loach				X	X		X	X			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	X

B2.1.4.3 WFD waterbody status

Table B2-8 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-8** 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 B2-8: WFD classifications

Waterbody ID & Name	GB104027062570 Black Brook from Source to River Calder		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	

B2.1.5 Invasive non-native species (INNS)

Table B2-9 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 B2-9**).

Table B2-9: 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)*
INNS – Macroinvertebrates Northern Crangonyctid (*Crangonyx pseudogracilis*)	Major	The implementation of this drought permit is not anticipated to increase the spread of invasive non-native species.	Not sensitive	No

[4] UKTAG Rivers Assessment Methods: Fish Fauna (Fisheries Classification Scheme 2 – FCS2) By WFD-UKTAG, December 2008.

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)*
New Zealand mud snail (*Potamopyrgus antipodarum*) Caspian mud shrimp *(Chelicorophium curvispinum)* Brown Planarian*(Dugesia tigrine)*				
INNS – Terrestrial and Aquatic plants Himalayan balsam (*Impatiens glandulifera)*	Major	The implementation of this drought permit is not anticipated to increase the spread of invasive non-native species.	Not sensitive	No

B2.1.6 Landscape, navigation, recreation and heritage

Table B2-10 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 B2-10**).

Table B2-10 :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)*
Bradley Hall Golf Club	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Calderdale Way – National Trail	Major	The route of the trail runs alongside Black Brook. The river forms part the landscape setting of the trail.	Not sensitive	No
Angling on Black Brook	Major	Casual angling only	Low	No
Bradley Hall Golf Club	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No

B2.2 COLNE 1

B2.2.1 Statutory designated sites

Table B2-11 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 B2-11**).

Table B2-11: 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 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 Phase 2 SPA	Major		Not sensitive	No
South Pennine Moors SSSI	Major		Not sensitive	No

B2.2.2 NERC and local wildlife sites

Table B2-12 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 B2-12**).

Table B2-12: 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)*
Huddersfield Narrow Canal LWS	Major	A canal just under 20 miles in length. Site runs adjacent to the River Colne; unlikely to be in connectivity with the impacted reach.	Not sensitive	No
NERC Priority Habitat – Deciduous woodland -205198, 205253, 204810, 205126, 204450, 205709, 206498	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)	Not sensitive	No
NERC Priority Habitat – Blanket bog	Major	Primarily composed of saturated peat, sphagnum mosses, cotton grass (*Eriophorum angustifolium*), heather (*Calluna vulgaris),* and purple moor	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)*
-12971, 12832		grass (*Molinia caerulea*). Unlikely to be in connectivity with impacted reach.		
NERC Priority Habitat – Lowland heath -546036, 546064	Major	Characterised by a mix of dwarf shrubs including heather (*Calluna vulgaris*), bell heather (*Erica cinerea*), and gorse (*Ulex sp*). Unlikely to be in connectivity with impacted each or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Good quality semi-improved grassland -475218	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Lowland dry acid grassland -513132	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Upland heath 784179, 784094, 784557	Major	Characterised by boggy pools and saturated peat, composed of heather (*Calluna vulgaris)*, bilberry (*Vaccinium myrtillus*), crowberry (*Empetrum nigrum*), and bell heather (*Erica cinerea).* Unlikely to be in connectivity with impacted reach.	Not sensitive	No

B2.2.3 NERC and other protected species

Table B2-13 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 no surveys or records have been recorded 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 these species are considered to be susceptible to drought order 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. The data showed no surveys or records have been recorded in the impacted reach. However, 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, YWSL 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 may be 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 water

vole likely to be present in the reach at the time of the implementation of a drought permit. Based on the limited available information water vole are considered to be susceptible to drought permit 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).

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 B2-13: 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 are not likely to be present in the impacted reach as identified by an assessment of habitat during an Environment Agency walkover survey.	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.	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.	High	Yes
NERC and Notable species – Birds	Major	The following bird species to varying extents rely on water dependent habitats. However they are not expected to be impacted severely	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)*
There are many bird species present across the region		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*)		

B2.2.4 WFD Receptors

B2.2.4.1 Macroinvertebrates

The WFD waterbody GB104027063250 River Colne from Source to Wessenden Brook classifies as 'High' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by one Environment Agency monitoring site, The Green (ID 1486). The Green had baseline survey data for two seasonal samples between 2010 and 2023.

The WFD status of the macroinvertebrate community in Colne 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.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-2.**

Data from the monitoring site shows variation in $WHPT_{ASPT}$ scores with them ranging between 6.03 and 7.26, averaging 6.7, with the lowest $WHPT_{ASPT}$ score of 6.03 at Site 1486 in Autumn 2020, and the highest score of 7.26 at Site 1486 in Spring 2023. The $WHPT_{ASPT}$ expected score for this site is 7.38, with one of the 11 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.86 and 1.01 (0.93) with the lowest $WHPT_{ASPT}$ EQR of 0.86 at Site 1486 in Autumn 2020, and the highest EQR of 1.01 at Site 1486 in Autumn 2014.

In Colne 1 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ ranging between 12 and 26, averaging 19.27, with the lowest $WHPT_{NTAXA}$ score of 12 at Site 1486 in Spring 2021, and the highest score of 26 at Site 1486 in Spring 2014. The $WHPT_{NTAXA}$ expected score for this site is 25.6, with 4 of the 11 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.47 and 1.02 (0.77) with the lowest $WHPT_{NTAXA}$ EQR of 0.47 at Site 1486 in Spring 2021, and the highest EQR of 1.02 at Site 1486 in Spring 2014.

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 Colne 1 is highly sensitive to reduced flows (**Figure B2-2**). See **Table B2-3** for guidance in interpreting raw LIFE scores.

$LIFE_{FAMILY}$ 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 7.47 - 8.69 (7.96) with the lowest $LIFE_{FAMILY}$ score of 7.47 at Site 1486 in Autumn 2023, and the highest score of 8.69 at Site 1486 in Autumn 2022. The $LIFE_{FAMILY}$ expected score for this site is7.854, with all samples above the 'Good/Moderate boundary'. $LIFE_{FAMILY}$ EQR scores ranged between 0.96 - 1.12 (1.02) with the lowest $LIFE_{FAMILY}$ EQR of 0.96 at Site 1486 in Autumn 2023, and the highest EQR of 1.12 at Site 1486 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 71.05 - 96.77 (83.07) with the lowest PSI_{FAMILY} score of 71.05 at Site 1486 in Spring 2010, and the highest score of 96.77 at Site 1486 in Autumn 2021. The PSI_{FAMILY} expected score for this site is74.591, with 1 of the 11 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.95 - 1.36 (1.14) with the lowest PSI_{FAMILY} EQR of 0.95 at Site 1486 in Spring 2010, and the highest EQR of 1.36 at Site 1486 in Autumn 2021.

A total of two INNS species, including *Potamopyrgus antipodarum* and *Crangonyx pseudogracilis/floridanus* were recorded as present at one site (1486) between 2014 to 2023. No designated species were recorded during the monitoring period.

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 B2-14: Macroinvertebrate Observed and EQR Summary

Site ID	Site NGR	Survey count	Survey Range	LIFE $_{Family}$ EQR Score	LIFE $_{Family}$ Score	PSI $_{Family}$ EQR Score	PSI $_{Family}$ Score	WHPT $_{ASPT}$ EQR Score	WHPT $_{ASPT}$ EQR Class	WHPT $_{ASPT}$ Score	WHPT $_{NTAXA}$ EQR Score	WHPT $_{NTAXA}$ EQR Class	WHPT $_{NTAXA}$ Score
1486	SE0469611681	11	2010 to 2023	0.96 - 1.12 (1.02)	7.47 - 8.69 (7.96)	0.95 - 1.36 (1.14)	71.05 - 96.77 (83.07)	0.86 - 1.01 (0.93)	M - H (G)	6.03 - 7.26 (6.7)	0.47 - 1.02 (0.77)	B - H (G)	12 - 26 (19)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High

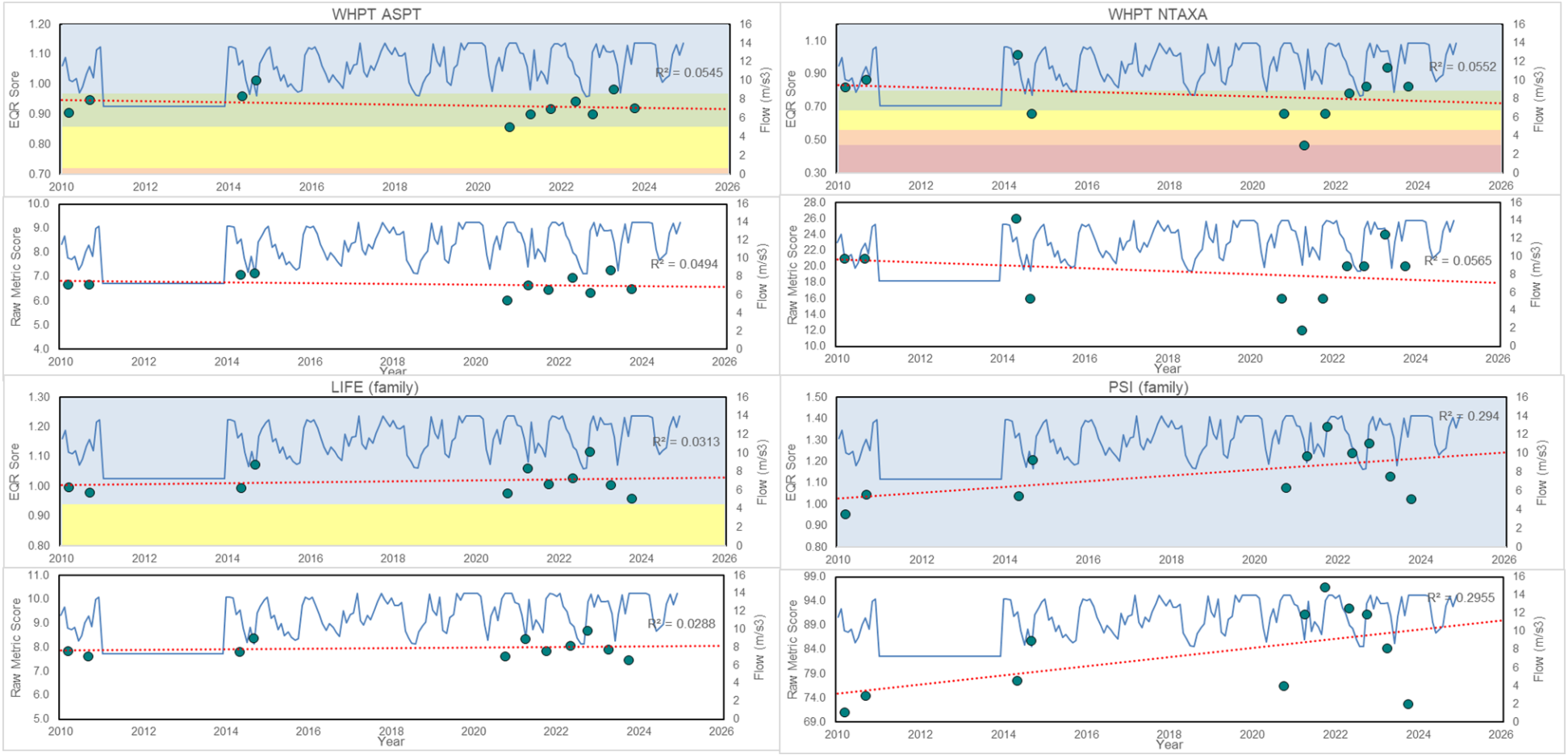


Figure B2-2: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.2.4.2 Fish

Waterbody GB104027063250 River Colne from Source to Wessenden Brook is classified under Cycle 3 (2022) as 'good'. The classification is informed by one site, Clough Lea (ID 29861).

Baseline fisheries data is available for one site, Clough Lea. The site was surveyed in 2015 and 2021.

YWSL commissioned additional surveys at three sites, U/S of Pond (ID YW131), Clough Lea and Church Lane (ID YW130). Church Lane, Clough Lane and U/S of pond were all surveyed in 2016 through to 2018, with additional surveys at U/S of pond in 2021 and 2024.

Table B2-15 details survey sites within the Colne 1 reach.

The WFD status of the fish community in Colne 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 Clough Lea is individually classified as 'good' with a site EQR of 0.453, based on the FCS2 EQR scores from the 2023 survey. The site has a relatively good diversity, with three species present from an expected three species, although stickleback were not expected to be present. Trout had a poot EQR score of 0.285, with a significantly lower observed density than expected. Bullhead and stickleback are present at a level that meets/exceeds expectations, with an EQR score of 1. Stone loach were expected to be present at the site but were not observed.

Brown trout were counted at every survey site during every survey year in low to moderate numbers, with a highest count of 60 at Clough Lea in 2018 and lowest count of 4 at U/S of Pond in 2016. Bullhead were present in low to high abundance with a high degree of variance between years. The highest count of 134 was at U/S of pond and lowest count of one at Church Lane in 2016 and Clough Lea in 2015. No bullhead were counted at Church Lane in 2017. One 3-spined stickleback was counted at Clough Lea in 2018 and 2021, whilst one was counted at U/S of Pond in 2018, increasing to 33 in 2021. Although stone loach are expected to be present based on FCS2 scores at Clough Lea, none have been counted.

Table B2-16 details species presence by year across all sites within the Colne 1 reach. 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 B2-15: Colne 1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
130	Church Lane	SE0478711662	Electric Fishing (AC, PDC and DC)	3	2016	2018
131	u/s of pond	SE0409311873	Electric Fishing (AC, PDC and DC)	5	2016	2024
29861	Clough Lea	SE0474311667	Electric Fishing (AC, PDC and DC)	5	2015	2021

Table B2-16: Colne 1 Fish Survey Results

Tolerance Category Tolerance Category[4]	Species Name	2015	2016	2017	2018	2021	2024
High tolerance	3-spined stickleback				X	X	
Low tolerance	Bullhead	X	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X	X

B2.2.4.3 WFD waterbody status

Table B2-17 summarises the WFD classification of waterbody which contain the impacted reach.

Table B2-17: WFD classifications 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 B2-17: WFD classifications

Waterbody ID & Name		**GB104027063250 Colne from Source to Wessenden Brook**	**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	High	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.2.5 Invasive non-native species (INNS)

Table B2-18 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 B2-18**).

Table B2-18: 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)*
INNS – Macroinvertebrates New Zealand mud snail *(Potamopyrgus antipodarum)* Freshwater Shrimp *(Crangonyx pseudogracilis)*	Major	The implementation of this drought permit is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Himalayan balsam *(Impatiens glandulifera)* -Japanese knotweed *(Fallopia japonica)*	Major	The implementation of this drought permit is not expected to increase the distribution of this INNS.	Not sensitive	No

B2.2.6 Landscape, navigation, recreation and heritage

Table B2-19 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 B2-19**).

Table B2-19: 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)*
Kirklees Way – National Trail	Major	The route of the trail runs alongside the River Colne. The river forms part the landscape setting of the trail.	Not sensitive	No
Angling on River Colne	Major	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 COLNE 2

B2.3.1 Statutory designated sites

Table B2-20 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 B2-20**).

Table B2-20: 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 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 Phase 2 SPA	Major		Not sensitive	No
South Pennine Moors SSSI	Major		Not sensitive	No

B2.3.2 NERC and local wildlife sites

Table B2-21 Table B2-21: 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 B2-21**).

Table B2-21: 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)*
Huddersfield Narrow Canal LWS	Major	A canal just under 20 miles in length. Site runs adjacent to the River Colne; unlikely to be in connectivity with the impacted reach.	Not sensitive	No
NERC Priority Habitat – Deciduous woodland -212985, 212302, 211813, 211469, 212329, 212552, 212648, 212931, 212274, 210961, 210780, 210901, 211088, 210890, 211345, 210857, 210253, 210168, 210073, 210444, 210326. 210363,	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)	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)*
209978, 209700, 209205, 209385, 208723, 208339, 208430, 206768, 206334, 206498				
NERC Priority Habitat – Lowland heath 546257, 546128	Major	Characterised by a mix of dwarf shrubs including heather (*Calluna vulgaris*), bell heather (*Erica cinerea*), and gorse (*Ulex sp*). Unlikely to be in connectivity with impacted each or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Lowland dry acid grassland -513226	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Upland heath -784907, 784561, 784557	Major	Characterised by boggy pools and saturated peat, composed of heather (*Calluna vulgaris)*, bilberry (*Vaccinium myrtillus*), crowberry (*Empetrum nigrum*), and bell heather (*Erica cinerea).* Unlikely to be in connectivity with impacted reach.	Not sensitive	No

B2.3.3 NERC and other protected species

Table B2-22 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 historical records of the Receptor in the impacted reach. Additionally, the data identifies that suitable habitat is present in the impacted reach. However, the distribution of information and survey data for the species was considered to be limited. Based on the available information these species are considered to be susceptible to drought order 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. The data showed no surveys or records have been recorded in the impacted reach. However, 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, YWSL and a review of available data from NBN gateway was used inform the assessment of water vole in the impacted reach. The data showed historical records of the Receptor in the impacted reach. Additionally, the data identifies that suitable habitat is present in the impacted reach. However, the distribution of information and survey data for the species was considered to be limited. Based on the available information these species are considered to be susceptible to drought order impacts and have a **medium** 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 two notable fish species (grayling and bullhead).

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 B2-22: 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 are not likely to be present in the impacted reach as identified by an assessment of habitat during an Environment Agency walkover survey.	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.	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, predation, inter and intra-species competition 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, predation, inter and intra-species competition etc.	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)*
NERC and Notable species – Birds There are many bird 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

B2.3.4 WFD Receptors

B2.3.4.1 Macroinvertebrates

The WFD waterbody GB104027063330 River Colne from Wessenden Brook to River Holme classifies as 'moderate' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by five Environment Agency monitoring sites, Lingards Wood (ID 1412), D/S Slaithwaite Footbridge (ID 152875), Further D/S SWD - Just U/S Grosvenor Building (ID 152877), D/S Pennine Chemicals (ID 150370) and site 213251. WFD classification for these sites are based on the worst classification between $WHPT_{ASPT}$ and NTAXA, these ranged between 'Bad' on four occurrences to 'High' on two occurrences.

The WFD status of the macroinvertebrate community in Colne 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. No physical environmental data was able for the Sites 150370, 152877 and 213251, therefore no site specific EQR value could be calculated in RICT3. 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.

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 Colne 2 has medium to high sensitivity to reduced flows (**Figure B2-3**). See **Table B2-3** for guidance in interpreting raw LIFE scores.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer.

Data from the monitoring site shows variation in $WHPT_{ASPT}$ scores over the period 2010 to 2023, with the standard to achieve poor or high WFD status over the monitoring period. $WHPT_{ASPT}$ scores from the site identifies macroinvertebrate communities which are composed of a proportion of taxa which have a medium sensitivity to pressures including water quality. $WHPT_{ASPT}$ scores ranged between 4.48 and 7.21, averaging 5.74, with the lowest $WHPT_{ASPT}$ score of 4.48 at Site 150370 in Autumn 2010, and the highest score of 7.21 at Site 152875 in Spring 2021. The $WHPT_{ASPT}$ expected scores for ranged between 6.63 to 7.13 across the sites, with 17 of the 29 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.65 - 1.01 (0.83) with the lowest $WHPT_{ASPT}$ EQR of 0.65 at Site 150370 in Autumn 2010, and the highest EQR of 1.01 at Site 152875 in Autumn 2016.

In Colne 2 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ scores ranging between 10 and 30, averaging 17.45, with the lowest $WHPT_{NTAXA}$ score of 10 at Site 150370 in Spring 2010, and the highest score of 30 at Site 213251 in Autumn 2023. The $WHPT_{NTAXA}$ expected scores ranged between 23.61 to 26.12 across the sites, with 14 of the 29 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.4 - 1.19 (0.69) with the lowest

$WHPT_{NTAXA}$ EQR of 0.4 at Site 150370 in Spring 2010, and the highest EQR of 1.19 at Site 213251 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. $LIFE_{FAMILY}$ scores ranged between 6.82 and 8.33, averaging 7.51, with the lowest $LIFE_{FAMILY}$ score of 6.82 at Site 150370 in Autumn 2010, and the highest score of 8.33 at Site 152875 in Autumn 2022. The $LIFE_{FAMILY}$ expected scores ranged between 7.62 to 7.77 across the sites, with 8 of the 29 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.88 and 1.09 (0.97) with the lowest $LIFE_{FAMILY}$ EQR of 0.88 at Site 150370 in Autumn 2010, and the highest EQR of 1.09 at Site 152875 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 40.63 - 92.86 (67.33) with the lowest PSI_{FAMILY} score of 40.63 at Site 150370 in Autumn 2010, and the highest score of 92.86 at Site 150370 in Spring 2022. The PSI_{FAMILY} expected scores ranged between 66.97 to 71.95 across the sites, with 17 of the 29 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.58 and 1.33 (0.97) with the lowest PSI_{FAMILY} EQR of 0.58 at Site 150370 in Autumn 2010, and the highest EQR of 1.33 at Site 150370 in Spring 2022.

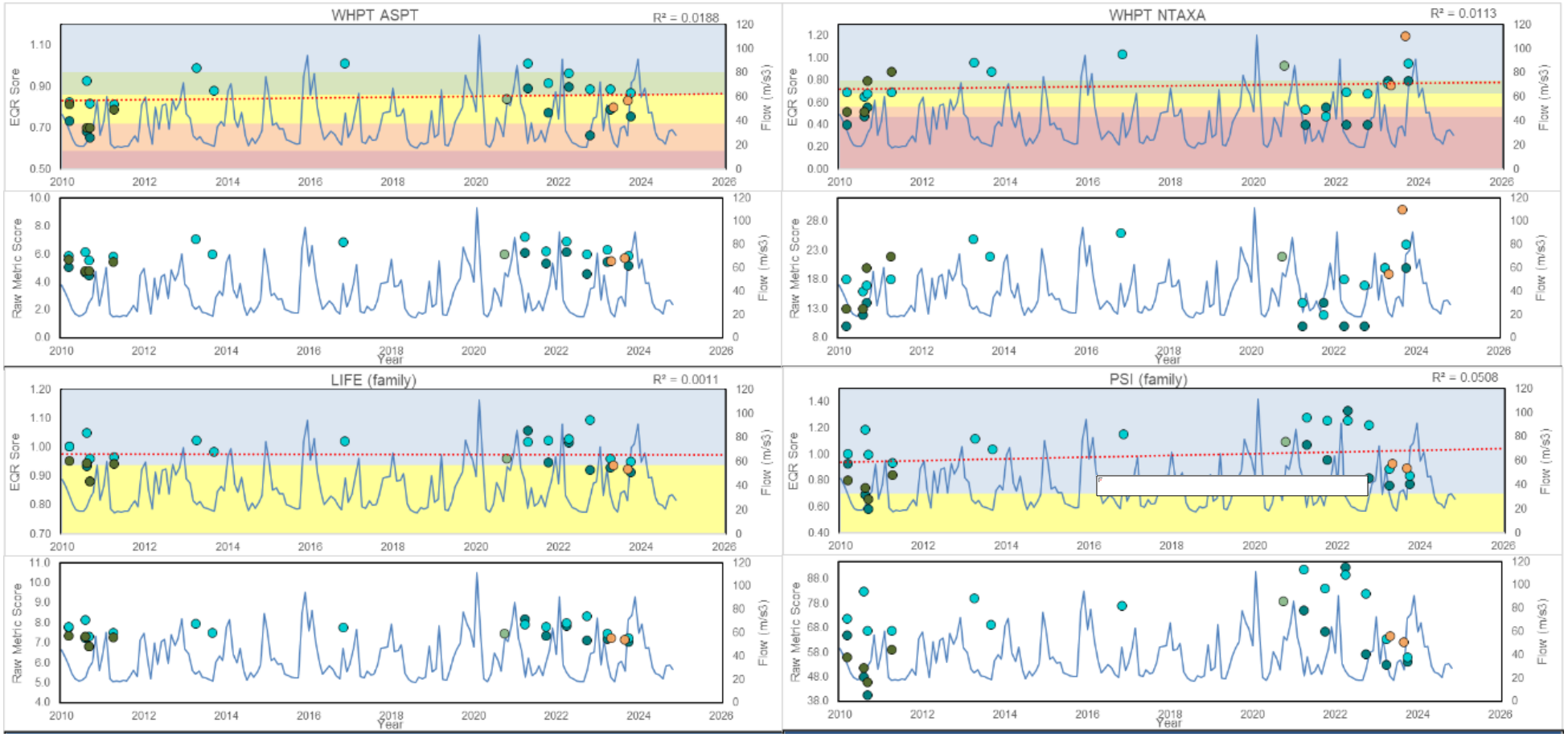
A total of two INNS species, including *Potamopyrgus antipodarum* and *Crangonyx pseudogracilis* were recorded as present at five sites between 2010 to 2023, with no designated species being recorded during the monitoring period.

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 B2-23: Macroinvertebrate Observed and EQR Summary table

Site ID	Site NGR	Survey count	Survey Range	LIFE Family EQR Score	LIFE Family Score	PSI Family EQR Score	PSI Family Score	WHPT ASPT EQR Score	WHPT ASPT EQR Class	WHPT ASPT Score	WHPT NTAXA EQR Score	WHPT NTAXA EQR Class	WHPT NTAXA Score
150370	SE0897214368	9	2010 to 2023	0.88 - 1.06 (0.96)	6.82 - 8.17 (7.39)	0.58 - 1.33 (0.88)	40.63 - 92.86 (61.41)	0.65 - 0.9 (0.76)	P - G (M)	4.48 - 6.16 (5.22)	0.4 - 0.8 (0.53)	B - G (P)	10 - 20 (13)
152875	SE0841114074	13	2010 to 2023	0.95 - 1.09 (1.01)	7.24 - 8.33 (7.75)	0.84 - 1.28 (1.09)	56.1 - 91.67 (75.48)	0.81 - 1.01 (0.91)	M - H (G)	5.53 - 7.21 (6.28)	0.48 - 1.03 (0.74)	P - H (G)	12 - 26 (19)
152877	SE0875314226	4	2010 to 2011	0.88 - 0.95 (0.93)	6.83 - 7.36 (7.19)	0.66 - 0.84 (0.76)	45.95 - 58.97 (53.19)	0.7 - 0.81 (0.75)	P - M (M)	4.8 - 5.59 (5.15)	0.52 - 0.88 (0.68)	P - H (M)	13 - 22 (17)
213251	SE0902814155	2	2023	0.93 - 0.94 (0.93)	7.15 - 7.25 (7.2)	0.89 - 0.93 (0.91)	62.26 - 64.71 (63.49)	0.8 - 0.83 (0.81)	M - M (M)	5.48 - 5.71 (5.6)	0.76 - 1.19 (0.98)	G - H (H)	19 - 30 (25)
1412	SE0653213136	1	2020	0.96	7.47	1.1	78.95	0.84	M	5.95	0.93	H	22

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High



Site Key				
150370	152875	152877	213251	1412

Figure B2-3: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.3.4.2 Fish

Waterbody GB104027063330 River Colne from Wessenden Brook to River Holme is classified under Cycle 3 (2022) as 'moderate'. The classification is informed by three sites, all three were last classified in 2019. Lees Mill Lane (ID 11851), Holme Mills (ID 29858) and Stafford Mills (ID 35969) were all classified as 'moderate'.

Baseline fisheries data is available for five sites, DS Slaithewaite Park (ID 44167), Holme Mills, Lees Mill Lane, Slaithwaite Park Footbridge (ID 44168) and Titanic Mill (ID 44166). DS Slaithewaite Park, Slaithewaite Park Footbridge and Titanic Mill were all surveyed in 2010 and 2012. Home Mills was surveyed in 2013 and 2015. Lees Mill Lane was surveyed in 2010 through to 2013, 2015, 2017, 2019, 2021 and 2023.

YWSL commissioned additional surveys at two sites, Holme Mills and Titanic Mill, Titanic Mill surveyed in 2016 through to 2018 and Holme Mills surveyed in 2020 through to 2023.

Table B2-24 details survey sites within the Colne 2 reach.

The WFD status of the fish community in Colne 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 Lees Mill Lane is individually classified as moderate with a site EQR of 0.3784, based on the FCS2 EQR scores from the 2017 survey. The site has a high diversity, with all four species present from an expected four species. Trout had a slightly higher observed density than expected, with an good EQR score of 0.6587. Sone loach are present at a level that meets/exceeds expectations, with an EQR score of 1. The EQR score for grayling was high at 0.9313, due to the higher than expected density and low expected prevalence score of 0.262. Bullhead were expected to be present at the site but were not observed.

The site Holme Mills is individually classified as moderate with a site EQR of 0.3764, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively high diversity, with three species present from an expected four species. Trout had a slightly higher observed density than expected, with an good EQR score of 0.626. The EQR score for stone loach was higher than expected at 1. As with the site above, bullhead were expected to be present at the site but were not observed.

Brown trout were counted at all sites and for every survey year, with the exception of Titanic Mill in 2010. Brown trout abundance ranged from low to high, with a lowest count of one at Lees Mill Lane in 2010 and highest count of 218 at Lees Mill Lane in 2013, although this is significantly higher than all other counts, with the average count being 41. Stone loach were counted at all sites during every survey year in low to moderate abundance, with a highest count of 102 at Lees Mill Lane in 2010 and lowest count of 1 at Titanic Mill in 2010. Bullhead were present in moderate to high abundance for every survey at Holme Mills, and in 2021 and 2023 for Lees Mill Lane. Grayling were counted in low abundance, primarily at Lee Mill Lane with a highest count of 23 in 2013. Minnow and 3-spiked stickleback were sporadically present in low abundance.

Table B2-25 details species presence by year across all sites within the Colne 2 reach. 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 B2-24: Colne 2 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
11851	Lees Mill lane	SE0896914294	Electric Fishing (AC, PDC and DC)	11	2010	2023
29858	Holme Mills	SE0642913052	Electric Fishing (AC, PDC and DC)	5	2013	2022
44166	Titanic Mill	SE0961614543	Electric Fishing (AC, PDC and DC)	5	2010	2018
44167	DS Slaithewaite Park	SE0863414211	Electric Fishing (AC, PDC and DC)	2	2010	2012

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
44168	Slaithewaite park footbridge	SE0846314105	Electric Fishing (AC, PDC and DC)	2	2010	2012

Table B2-25:Colne 2 Fish Survey Site Information

Tolerance Category[4]	Species Name	2010	2011	2012	2013	2015	2016	2017	2018	2019	2020	2021	2022	2023
High tolerance	3-spined stickleback	X	X					X	X	X		X	X	X
Medium tolerance	Minnow	X	X	X	X	X			X			X		
Medium tolerance	Stone loach	X	X	X	X	X	X	X	X	X	X	X	X	X
Low tolerance	Bullhead										X	X	X	X
Low tolerance	Brown trout	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

B2.3.4.3 WFD waterbody status

Table B2-26 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-26** 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 B2-26: 1 WFD classifications

Waterbody ID & Name		GB104027063330 River Colne from Wessenden Brook to River Holme	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	Good	
	Fish	Moderate	
	Macroinvertebrates	Moderate	
Waterbody Measures		None	

B2.3.5 Invasive non-native species (INNS)

Table B2-27 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 B2-27**).

Table B2-27: 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)*
INNS – Macroinvertebrates -New Zealand mud snail *(Potamopyrgus antipodarum)* -Freshwater Shrimp *(Crangonyx pseudogracilis)*	Major	The implementation of this drought permit is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Himalayan balsam *(Impatiens glandulifera)* -Japanese knotweed *(Fallopia japonica)*	Major	The implementation of this drought permit is not expected to increase the distribution of this INNS.	Not sensitive	No

B2.3.6 Landscape, navigation, recreation and heritage

Table B2-28 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 B2-28**).

Table B2-28: 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)*
Kirklees Way – National Trail	Major	The route of the trail runs alongside the River Colne. The river forms part the landscape setting of the trail.	Not sensitive	No
Angling on River Colne	Major	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 COLNE 3

B2.4.1 Statutory designated sites

Table B2-29 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 B2-29**Table B2-29: 2Table B2-29: 2).

Table B2-29: 2Statutory 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)*
Gledholt Woods – Local Nature Reserve	Major	The mature woodland and rough meadow support a wide range of fungi and white clawed crayfish have been found within the pond. While the pond drains via a tributary of the River Colne, this tributary does not lie within the impacted reaches, and hydrological connectivity with the main river is likely to be limited, particularly during dry conditions.	Not sensitive	No

B2.4.2 NERC and local wildlife sites

Table B2-30 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 B2-30**).

Table B2-30: 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)*
Huddersfield Narrow Canal LWS	Major	A canal just under 20 miles in length. Site runs adjacent to the River Colne; unlikely to be in connectivity with the impacted reach.	Not sensitive	No
Gledholt Woods LWS	Major	The mature woodland and rough meadow support a wide range of fungi and white clawed crayfish have been found within the pond. While the pond drains via a tributary of the River Colne, this tributary does not lie within the impacted reaches, and hydrological connectivity with the main river is likely to be limited, particularly during dry conditions.	Not sensitive	No
Lowestwood Mill Pond LWS	Major	A rich species diversity for standing water. The pond supports the European Protected Species floating water plantain (*Luroium natans*). The site is unlikely to be in connectivity with impacted reach.	Low	No
NERC Priority Habitat –	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus*	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)*
Deciduous woodland - 212467, 212552, 212648, 212931, 212329, 212985, 213853, 213303, 212948, 212770, 212754, 213719, 213769, 214189, 213954, 214626, 214524, 214730, 214979, 215006, 215509, 215380, 215745, 215984, 215848, 216006, 216307, 216657, 216505, 216491, 216082, 216883, 217117, 217427, 218613, 218743, 220828, 220287, 219980, 219503, 219736		*excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)		
NERC Habitat – Traditional orchard - 737635, 737637	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No

B2.4.3 NERC and other protected species

Table B2-31 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 a historical survey within the impacted reach, though no white-clawed crayfish were observed. Additionally, the data identifies that suitable habitat is present in the impacted reach. However, the distribution of information and survey data for the species was considered to be limited. Based on the available information these species are considered to be susceptible to drought order 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. The data showed no surveys or records have been recorded in the impacted reach. However, 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, YWSL 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. Based on an assessment of habitat, during an Environment Agency walkover survey, no suitable habitat was observed. Based on the absence of suitable habitat in the impacted

reach, the receptor is not considered at risk from the drought permit. 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.**

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 two notable fish species (grayling and bullhead).

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 B2-31: 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	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 voles are not likely to be present in the impacted reach as identified by an assessment of habitat during an Environment Agency walkover survey.	Not sensitive	No
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, predation, inter and intra-species competition etc.	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, predation, inter and intra-species competition etc.	Medium	Yes
NERC and Notable species – Birds There are many bird 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: - Curlew (*Numenius arqauta)* - Grey Wagtail (*Motacilla cinerea)*	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)*
		- House Martin (*Delichon urbica)* - Swallow (*Hirundo rustica)* - Little Ringed Plover Bird (*Charadrius dutius)* - Redshank (*Tringa tetanus)* - Reed Bunting (*Emberiza schoeniclus)*		
Aquatic Plants – Floating water-plantain *L. natans*	Major	European Protected Species floating water plantain (*Luroium natans).* Recorded location is unlikely to be in connectivity with impacted reach.	Low	N0

B2.4.4 WFD Receptors

B2.4.4.1 Macroinvertebrates

The WFD waterbody GB104027063330 River Colne from Wessenden Brook to River Holme classifies as 'moderate for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by two Environment Agency monitoring sites, D/S Titanic Spa Hotel (ID 153344) and Milnsbridge (ID 153345). WFD classification for these sites are based on the worst classification between $WHPT_{ASPT}$ and NTAXA, these ranged between 'Bad' on 11 occurrences to 'Good' on two occurrences.

The WFD status of the macroinvertebrate community in Colne 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.

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 Colne 3 is showed significant variation in sensitive to reduced flows, from low to high sensitivity (**Table B2-41**:). See **Table B2-3** for guidance in interpreting raw LIFE scores.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-4**.

Data from the monitoring site shows variation in $WHPT_{ASPT}$ scores over the period 2009 to 2019 and was consistent with the standard to achieve poor to high WFD status over the monitoring period. $WHPT_{ASPT}$ scores ranged between 4.13 and 6.72, averaging 5.34, with the lowest $WHPT_{ASP}$ score of 4.13 at Site 153345 in Autumn 2010, and the highest score of 6.72 at Site 153344 in Spring 2018. The $WHPT_{ASPT}$ expected scores for ranged between 6.65 to 7.19 across the sites, with 18 of the 23 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.6 and 0.95 (0.77) with the lowest $WHPT_{ASPT}$ EQR of 0.6 at Site 153345 in Spring 2010, and the highest EQR of 0.95 at Site 153344 in Autumn 2018.

In Colne 3 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ scores ranging between 7 and 23, averaging 13.13, with the lowest $WHPT_{NTAXA}$ score of 7 at Site 153345 in Spring 2021, and the highest score of 23 at Site 153344 in Autumn 2018. The $WHPT_{NTAXA}$ expected scores ranged between 24.48 to 26.29 across the sites, with 19 of the 23 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.27 - 0.91 (0.51) with the lowest $WHPT_{NTAXA}$ EQR of 0.27 at Site 153345 in Spring 2021, and the highest EQR of 0.91 at Site 153344 in Autumn 2018. Impaired $WHPT_{NTAXA}$ can be indicative of pressures including denuded habitat quality, siltation or reduced water quality, this data suggests that these pressure may have been present in the past.

$LIFE_{FAMILY}$ 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 6.4 and 8.4,

averaging 7.47, with the lowest $LIFE_{FAMILY}$ score of 6.4 at Site 153345 in Autumn 2010, and the highest score of 8.4 at Site 153345 in Spring 2021. The $LIFE_{FAMILY}$ expected scores ranged between 7.64 to 7.79 across the sites, with 9 of the 23 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.83 and 1.08 (0.97) with the lowest $LIFE_{FAMILY}$ EQR of 0.83 at Site 153345 in Autumn 2010, and the highest EQR of 1.08 at Site 153345 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 34.62 and 92.31, averaging 64.55, with the lowest PSI_{FAMILY} score of 34.62 at Site 153345 in Autumn 2010, and the highest score of 92.31 at Site 153345 in Spring 2022. The PSI_{FAMILY} expected scores ranged between 67.42 to 72.36 across the sites, with 13 of the 23 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.51 and 1.33 (0.92) with the lowest PSI_{FAMILY} EQR of 0.51 at Site 153345 in Autumn 2010, and the highest EQR of 1.33 at Site 153344 in Autumn 2021.

A total of two INNS species, including *Potamopyrgus antipodarum* and *Crangonyx pseudogracilis* were recorded as present at 2 sites between 2010 to 2023, with no designated species being recorded during the monitoring period.

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 B2-32: Macroinvertebrate Observed and EQR Summary

Site ID	Site NGR	Survey count	Survey Range	LIFE Family EQR Score	LIFE Family Score	PSI Family EQR Score	PSI Family Score	WHPT ASPT EQR Score	WHPT ASPT EQR Class	WHPT ASPT Score	WHPT NTAXA EQR Score	WHPT NTAXA EQR Class	WHPT NTAXA Score
153344	SE0988314764	14	2010 to 2018	0.87 - 1.05 (0.97)	6.62 - 8.11 (7.46)	0.56 - 1.33 (0.95)	37.5 - 91.67 (65.78)	0.63 - 0.95 (0.8)	P - G (M)	4.33 - 6.72 (5.54)	0.38 - 0.91 (0.57)	B - H (M)	10 - 23 (15)
153345	SE1136215892	9	2010 to 2023	0.83 - 1.08 (0.97)	6.4 - 8.4 (7.49)	0.51 - 1.3 (0.89)	34.62 - 92.31 (62.63)	0.6 - 0.86 (0.72)	P - G (M)	4.13 - 6.2 (5.04)	0.27 - 0.72 (0.43)	B - G (B)	7 - 18 (11)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High

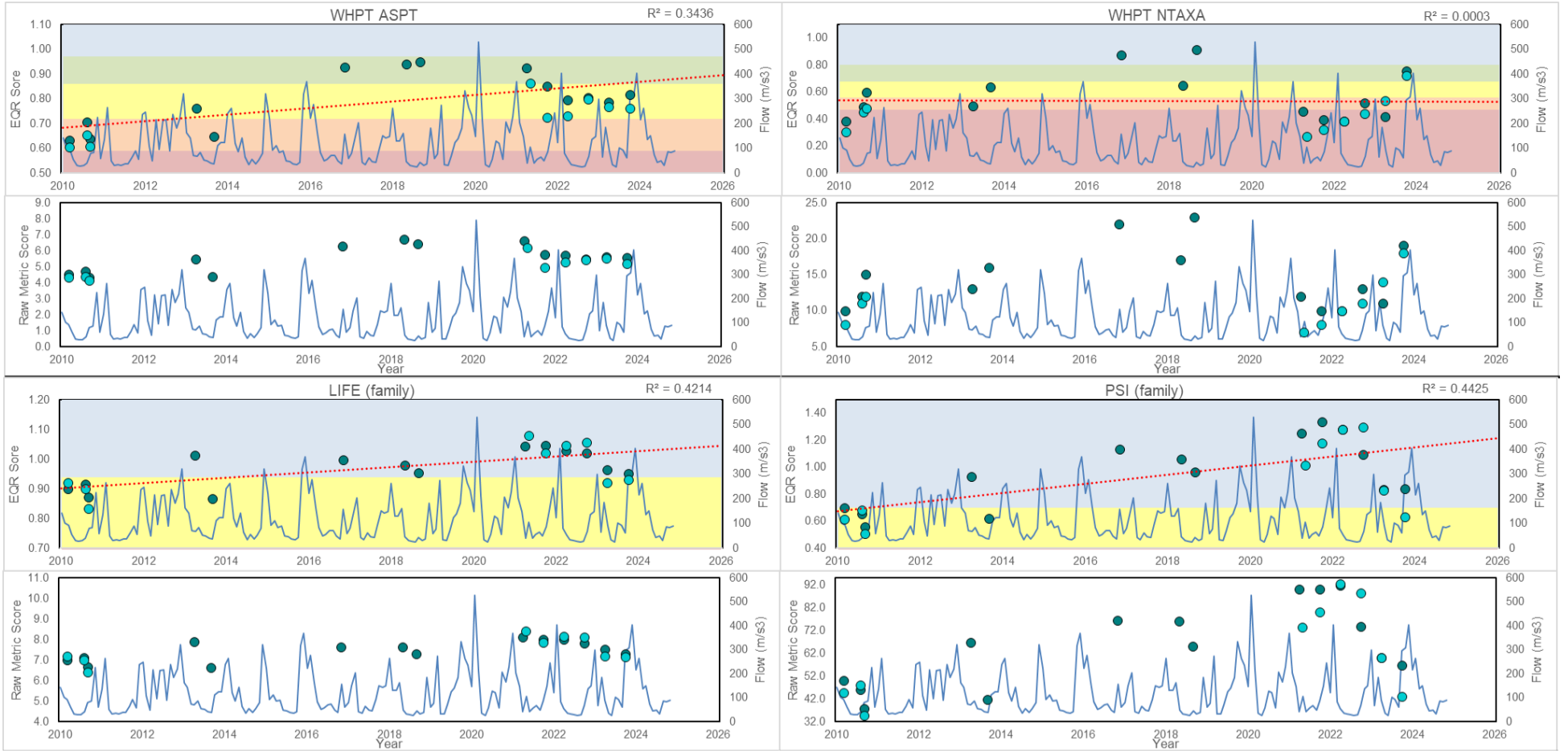


Figure B2-4: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.4.4.2 Fish

Waterbody GB104027063330 River Colne from Wessenden Brook to River Holme is classified under Cycle 3 (2022) as 'moderate'. The classification is informed by three sites, all three were last classified in 2019. Lees Mill Lane (ID 11851), Holme Mills (ID 29858) and Stafford Mills (ID 35969) were all classified as 'moderate'.

Baseline fisheries data is available for two sites, Stafford Mills and Stoney Battery Lane (ID 44165). Stafford Mills received surveys in 201. 2015 and 2016. Stoney Battery Lane received surveys in 2010, 2012 and 2013. YWSL commissioned additional surveys at Stafford Mills and Stoney Battery Lane in 2016, 2017, 2018 and 2021. **Table B2-33**:

Table B2-33 details survey sites within the Colne 3 reach.

The WFD status of the fish community in Colne 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 Stafford Mills is individually classified as moderate with a site EQR of 0.2702, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively good diversity, with four species present from an expected five species. Trout had a slightly higher observed density than expected, with agood EQR score of 0.6483. Stone loach and 3-spined-stickleback are both present at a level that meets/exceeds expectations, with an EQR score of 1. The EQR score for grayling was high at 0.7817, due to the higher than expected density and low expected prevalence score of 0.361. Bullhead were expected to be present at the site but were not observed.

Brown trout were present in low to moderate abundance at all sites and for every survey year, with the exception of 2010 at Stafford Mills. The highest count was 79 at Stoney Battery Lane and lowest count of 2 was at Stafford Mills in 2021 and Stoney Battery Lane In 2017. Grayling were counted at Stafford Mills in low abundance, whilst Stoney Battery Lane counted low numbers in 2013 and 2016, increasing to moderate abundance in 2018 and 2021, with a highest count of 52 in 2021. Stone loach were counted at every site during every survey year in varying abundance with a highest count of 124 at Stoney Battery Lane in 2021 and lowest count of at the same site in 2012. 3-spined stickleback and roach were rarely counted and in very low abundance. Bullhead were observed for the first time since 2010 surveys in 2021 at Stoney Battery Lane with five individuals. **Table B2-34**: **Table B2-34** details species presence by year across all sites within the Colne 3 reach. 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 B2-33: Colne 3 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
35969	Stafford Mills	SE1204216013	Electric Fishing (AC, PDC and DC)	6	2010	2021
44165	Stoney Battery Lane	SE1277416010	Electric Fishing (AC, PDC and DC)	7	2010	2021

Table B2-34: Colne 3 Fish Survey Results

Tolerance Category[4]	Species Name	2010	2012	2013	2015	2016	2017	2018	2021
High tolerance	3-spined stickleback	X			X			X	
High tolerance	Roach								X
Medium tolerance	Minnow							X	X
Medium tolerance	Stone loach	X	X	X	X	X	X	X	X
Low tolerance	Bullhead								X
Low tolerance	Brown trout		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 B2-35 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-35** 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 B2-35: WFD classifications

Waterbody ID & Name		**GB104027063330 River Colne from Wessenden Brook to River Holme**	**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	Good	
	Fish	Moderate	
	Macroinvertebrates	Moderate	
Waterbody Measures		None	

B2.4.5 Invasive non-native species (INNS)

Table B2-36 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 B2-36**).

Table B2-36: 3INNS 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)*
INNS – Macroinvertebrates -New Zealand mud snail *(Potamopyrgus antipodarum)* -Freshwater Shrimp *(Crangonyx pseudogracilis)*	Major	The implementation of this drought permit is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Himalayan balsam *(Impatiens glandulifera)* -Japanese knotweed	Major	The implementation of this drought permit is not expected to increase the distribution of this 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)*
(Fallopia japonica)				

B2.4.6 Landscape, navigation, recreation and heritage

Table B2-37 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 B2-37**).

Table B2-37: 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)*
Kirklees Way – National Trail	Major	The route of the trail runs alongside the River Colne. The river forms part the landscape setting of the trail.	Not sensitive	No
Angling on River Colne	Major	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 COLNE 4

B2.5.1 Statutory designated sites

Table B2-38 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 B2-38**).

Table B2-38: 4Statutory 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)*
Dalton Bank – Local Nature Reserve	Major	No water dependent Receptors	Not sensitive	No

B2.5.2 NERC and local wildlife sites

Table B2-39 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 B2-39**).

Table B2-39: 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)*
Huddersfield Narrow Canal LWS	Major	A canal just under 20 miles in length. Site runs adjacent to the River Colne; unlikely to be in connectivity with the impacted reach.	Not sensitive	No
Dalton Bank LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Deciduous woodland - 220828, 221041, 220486, 220698, 219980, 219883, 219619. 220981, 221367, 221315, 220910, 220852, 220879, 221556, 222045, 22194. 222713, 222045, 221098, 220949, 221250, 223362, 223073, 223820, 224437, 224187, 224130, 224506, 224929, 225340, 225894, 224737	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)	Not sensitive	No

B2.5.3 NERC and other protected species

Table B2-40 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

The nationally scarce species of Caddisfly, *Potamophylax rotundipennis*, have been identified as being present in Colne 4. The species was identified in routine sampling carried out by the Environment Agency at the site Ashgrove Road (ID 82), in 2016. Based on the available information these receptors are considered to be susceptible to drought option impacts and has a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

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 Colne. 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.

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. The data showed historical records have been recorded in the impacted reach. Additionally, 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, YWSL 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. Based on an assessment of habitat, during an Environment Agency walkover survey, no suitable habitat was observed. Based on the absence of suitable habitat in the impacted reach, the Receptor is not considered at risk from the drought permit. 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.**

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 two notable fish species (grayling and bullhead).

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 B2-40: 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)*
Notable Species – Macroinvertebrates Large Cinnamon Sedge *(Potamophylax rotundipennis)*	Major	*Potamophylax rotundipennis*, from family *Limnephilidae* have a tolerance for moderate flow conditions. Found in a variety of substrates, with clean, well-oxygenated water.	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)*
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. Water vole are not likely to be present in the impacted reach as identified by an assessment of habitat during an Environment Agency walkover survey.	Not sensitive	No
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, predation, inter and intra-species competition etc.	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, predation, inter and intra-species competition etc.	Medium	Yes
NERC and Notable species – Birds There are many bird 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: - Curlew (*Numenius arqauta)* - Grey Wagtail (*Motacilla cinerea)* - House Martin (*Delichon urbica)* - Swallow (*Hirundo rustica)* - Little Ringed Plover Bird (*Charadrius dutius)* - Redshank (*Tringa tetanus)* - Reed Bunting (*Emberiza schoeniclus)*	Not sensitive	No

B2.5.4 WFD Receptors

B2.5.4.1 Macroinvertebrates

The WFD waterbody GB104027062550 Colne from River Holme to River Calder classifies as ‘moderate’ for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by two Environment Agency monitoring sites, Ashgrove Road (ID 82), Colnebridge (ID 83). The indicative WFD classification for these sites are based on the worst classification between $WHPT_{ASPT}$ and NTAXA, these ranged between 'Bad' on nine occurrences to 'Good' on two occurrences.

The WFD status of the macroinvertebrate community in Colne 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.

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 Colne 4 has a medium to high sensitivity to reduced flows (Table B2-41:). See **Table B2-3** for guidance in interpreting raw LIFE scores.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency’s online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR’s are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-5.**

Data from the monitoring sites shows variation in $WHPT_{ASPT}$ scores over the period 2012 to 2023. $WHPT_{ASPT}$ scores ranged between 2.97 and 6.07, averaging 5.11, with the lowest $WHPT_{ASPT}$ score of 2.97 at Site 83 in Autumn 2022, and the highest score of 6.07 at Site 83 in Spring 2021. The $WHPT_{ASPT}$ expected scores for ranged between 6.48 to 6.96 across the sites, with 19 of the 22 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.45 and 0.89 (0.76) with the lowest $WHPT_{ASPT}$ EQR of 0.45 at Site 83 in Autumn 2022, and the highest EQR of 0.89 at Site 82 in Autumn 2016.

In Colne 4 data from the site identifies macroinvertebrate communities with a moderate level of diversity, with $WHPT_{NTAXA}$ scores ranging between 3 and 20, averaging 13.45, with the lowest $WHPT_{NTAXA}$ score of 3 at Site 83 in Autumn 2022, and the highest score of 20 at Site 82 in Autumn 2023. The $WHPT_{NTAXA}$ expected scores ranged between 24.07 to 26.36 across the sites, with 18 of the 22 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.12 and 0.83 (0.54) with the lowest $WHPT_{NTAXA}$ EQR of 0.12 at Site 83 in Autumn 2022, and the highest EQR of 0.83 at Site 82 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. $LIFE_{FAMILY}$ scores ranged between 5.71 and 8.67, averaging 7.33, with the lowest $LIFE_{FAMILY}$ score of 5.71 at Site 83 in Autumn 2018, and the highest score of 8.67 at Site 83 in Spring 2021. The $LIFE_{FAMILY}$ expected scores ranged between 7.51 to 7.73 across the sites, with 8 of the 22 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.76 and 1.13 (0.96) with the lowest $LIFE_{FAMILY}$ EQR of 0.76 at Site 83 in Autumn 2018, and the highest EQR of 1.13 at Site 83 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 18.18 and 91.67, averaging 61.19, with the lowest PSI_{FAMILY} score of 18.18 at Site 83 in Autumn 2018, and the highest score of 91.67 at Site 82 in Spring 2022. The PSI_{FAMILY} expected scores ranged between 64.51 to 69.62 across the sites, with 12 of the 22 above the expected PSI(family) score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.28 and 1.32 (0.91) with the lowest PSI_{FAMILY} EQR of 0.28 at Site 83 in Autumn 2018, and the highest EQR of 1.32 at Site 82 in Spring 2022.

A total of two INNS species, including *Potamopyrgus antipodarum* and *Crangonyx pseudogracilis* were recorded as present at the reach between 2012 to 2023. A single designated species, *Potamophylax rotundipennis,* was recorded at Site 82 in 2016.

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**.

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Table B2-41: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{Family}$ EQR Score	$LIFE_{Family}$ Score	PSI_{Family} EQR Score	PSI_{Family} Score	$WHPT_{ASPT}$ EQR Score	$WHPT_{ASPT}$ EQR Class	$WHPT_{ASPT}$ Score	$WHPT_{NTAXA}$ EQR Score	$WHPT_{NTAXA}$ EQR Class	$WHPT_{NTAXA}$ Score
82	SE1693218713	10	2013 to 2023	0.94 - 1.05 (1.01)	7.06 - 8.13 (7.68)	0.9 - 1.32 (1.07)	58.06 - 91.67 (71.68)	0.66 - 0.89 (0.8)	P - G (M)	4.54 - 5.81 (5.37)	0.37 - 0.83 (0.62)	B - H (M)	9 - 20 (15)
83	SE1773020161	12	2012 to 2018	0.76 - 1.13 (0.92)	5.71 - 8.67 (7.03)	0.28 - 1.21 (0.77)	18.18 - 78.57 (51.65)	0.45 - 0.87 (0.72)	B - G (M)	2.97 - 6.07 (4.9)	0.12 - 0.68 (0.47)	B - G (P)	3 - 18 (12)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High

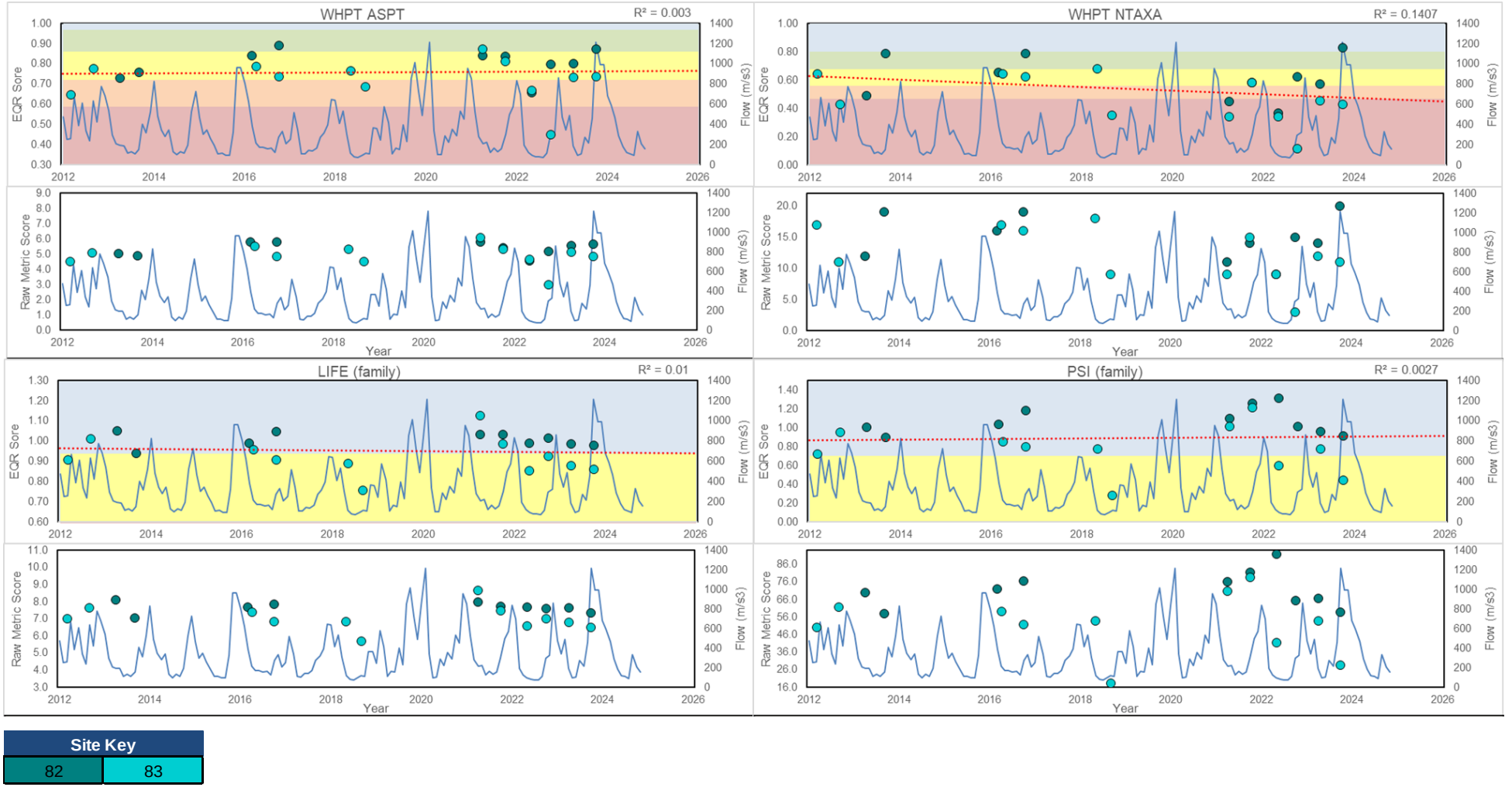


Figure B2-5: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.5.4.2 Fish

Waterbody GB104027062550 Colne from River Holme to River Calder is classified under Cycle 3 (2022) as 'moderate' for ecological elements. No fish classification is available.

Baseline fisheries data is available for one site, Galpham Stadium (ID 63383) in 2015. YWSL commissioned additional surveys at Galpham Stadium in 2020 through to 2022. Table B2-42: details survey sites within the Colne 4 reach.

Baseline data within the impacted reach was limited to one site, Galpham Stadium therefore baseline data from Stafford Mills (ID 35969) (Colne 3) was included. No FCS2 data was available for the Environment Agency monitoring site within the impacted reach, FCS2 data was provided by Stafford Mills (ID 35969), located upstream of the impacted reach (Colne 3). **Table B2-42** sets out the available fish survey data from these sites.

The WFD status of the fish community in Colne 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 Stafford Mills is individually classified as moderate with a site EQR of 0.2702, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively good diversity, with four species present from an expected five species. Trout had a slightly higher observed density than expected, with a good EQR score of 0.6483. The EQR scores for stone loach and 3-spined-stickleback were higher than expected at 1. The EQR score for grayling was high at 0.7817, due to the higher than expected density and low expected prevalence score of 0.361. Bullhead were expected to be present at the site but were not observed.

Brown trout and grayling were present in low abundance for every year of survey, with numbers remaining similar throughout each year of survey. Bullhead were absent in 2015 but counted in high abundance the following surveys. The highest count of bullhead was 219 in 2022 and lowest was 151 in 2020. Minnow, stone loach and 3-spined stickleback were also counted after 2015. One roach was counted in 2020.

Table B2-43 details species presence by year across all sites within the Colne 4 reach. 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 B2-42: Colne 4 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
63383	Galpham Stadium	SE1515717441	Electric Fishing (AC, PDC and DC)	4	2015	2022

Table B2-43: Colne 4 Fish Survey Results

Tolerance Category[4]	Species Name	2015	2020	2021	2022
High tolerance	3-spined stickleback		X	X	X
High tolerance	Roach		X		
Medium tolerance	Minnow		X	X	X
Medium tolerance	Stone loach		X	X	X
Low tolerance	Bullhead		X	X	X
Low tolerance	Brown trout	X	X	X	X
Low tolerance	Grayling	X	X	X	X

B2.5.4.3 WFD waterbody status

Table B2-44 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-44** 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 B2-44: WFD classifications

Waterbody ID & Name		**GB104027062550 Colne from River Holme to River Calder**	**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	-	Medium
	Macroinvertebrates	Moderate	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Good	
	Fish	-	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.5.5 Invasive non-native species (INNS)

Table B2-45 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 B2-45**).

Table B2-45: 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)*
INNS – mammals -American mink (*Neovision vision*)	Minor	The implementation of this drought order is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – Macroinvertebrates -Signal Crayfish *(Pacifastacus leniusculus)* -New Zealand mud snail *(Potamopyrgus antipodarum)* -Freshwater Shrimp *(Crangonyx pseudogracilis)*	Major	The implementation of this drought permit is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Himalayan balsam	Major	The implementation of this drought permit is not	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)*
(Impatiens glandulifera) -Japanese knotweed *(Fallopia japonica)*		expected to increase the distribution of this INNS.		

B2.5.6 Landscape, navigation, recreation and heritage

Table B2-46 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 B2-46**).

Table B2-46: 5Landscape, 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)*
Kirklees Way – National Trail	Major	The route of the trail runs alongside the River Colne. The river forms part the landscape setting of the trail.	Not sensitive	No
Angling on River Colne	Major	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

B2.6 COLNE T1

B2.6.1 Statutory designated sites

Table B2-47 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 B2-47**).

Table B2-47: 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 site is 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 Phase 1 and 2	Major		Not sensitive	No
South Pennine Moors SSSI	Major		Not sensitive	No
Dark Peak - SSSI	Major	None. The site is upstream of the impacted reach. The gradients between the site and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the site, particularly during dry conditions.	Not sensitive	No

B2.6.2 NERC and local wildlife sites

Table B2-48 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 B2-48**).

Table B2-48: 6NERC 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)*
Butterly Cutting LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Huddersfield Narrow Canal LWS	Major	A canal just under 20 miles in length. Site runs adjacent to the River Colne.	Not sensitive	No
NERC Priority Habitat - Lowland heathland -414434,414277, 546131, 546043	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat –	Major	Characterised by boggy pools and saturated peat, composed of heather	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)*
Upland heath -786548, 784635, 784628, 784447, 784560, 546205, 784463, 786649		(*Calluna vulgaris)*, bilberry (*Vaccinium myrtillus*), crowberry (*Empetrum nigru*m), and bell heather (*Erica cinerea).* Unlikely to be in connectivity with impacted reach.		
NERC Priority Habitat – Grass moorland -461025, 461047, 461044, 461058	Major	Characterised by shallow peat soils dominated by bristle bent (*Agrostis curtisii*), sheep's fescue (*Festuca ovina*), and mat grass (*Nardus stricta*). Unlikely to be in connectivity with impacted reach.	Not sensitive	No
NERC Priority Habitat – Deciduous woodland - 205430, 205252, 205253, 205205, 205198, 205313, 205203, 205210, 205362, 205570, 205686	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)	Not sensitive	No

B2.6.3 NERC and other protected species

Table B2-49 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 no surveys or records have been recorded in the impacted. However, the distribution of information and survey data for the species was considered to be limited. Based on the available information these species are considered to be susceptible to drought order 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. The data showed no surveys or records have been recorded 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, YWSL and a review of available data from NBN gateway was used inform the assessment of water vole in the impacted reach. The data showed historical records have been recorded in the impacted reach. Based on the available information these species are considered to be susceptible to drought order impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

One NERC act section 41 species (brown trout) has 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 B2-49: 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	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 voles are not likely to be present in the impacted reach as identified by an assessment of habitat during an Environment Agency walkover survey.	Not sensitive	No
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, predation, inter and intra-species competition etc.	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: - Curlew (*Numenius arqauta)* - Grey Wagtail (*Motacilla cinerea)* - House Martin (*Delichon urbica)* - Swallow (*Hirundo rustica)* - Little Ringed Plover Bird (*Charadrius dutius)* - Redshank (*Tringa tetanus*) - Reed Bunting (*Emberiza schoeniclus)*	Not sensitive	No

B2.6.4 WFD Receptors

B2.6.4.1 Macroinvertebrates

The WFD waterbody GB104027063190 Wessenden Bk from Butterly Resr to River Colne classifies as 'moderate' for macroinvertebrates in 2019, Cycle 3. Baseline macroinvertebrate data is provided by two Environment Agency monitoring sites, Site ID 1487 and Marsden (ID 1179). The indicative WFD classification for these sites are based on the worst classification between $WHPT_{ASPT}$ and NTAXA, these ranged between 'Bad' on one occurrence to 'Good' on three occurrences.

The WFD status of the macroinvertebrate community in Colne T1 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 Colne T1 has a medium to high sensitivity to reduced flows (see **Figure B2-6**). See **Table B2-3** for guidance in interpreting raw LIFE scores.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-6**.

Data from the monitoring site shows variation in $WHPT_{ASPT}$ scores over the period 2010 to 2023. $WHPT_{ASPT}$ scores ranged between 5.15 and 6.8, averaging 6.19, with the lowest $WHPT_{ASPT}$ score of 5.15 at Site 1179 in Autumn 2021, and the highest score of 6.8 at Site 1487 in Spring 2010. The $WHPT_{ASPT}$ expected scores for ranged between 7.13 to 7.38 across the sites, with 8 of the 13 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.72 and 0.95 (0.85) with the lowest $WHPT_{ASPT}$ EQR of 0.72 at Site 1179 in Autumn 2021, and the highest EQR of 0.95 at Site 1487 in Spring 2010.

In Colne T1 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ ranging between 10 and 23, averaging 16.15, with the lowest $WHPT_{NTAXA}$ score of 10 at Site 1179 in Spring 2021, and the highest score of 23 at Site 1179 in Autumn 2023. The $WHPT_{NTAXA}$ expected scores ranged between 21.22 to 22.39 across the sites, with 4 of the 13 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.45 and 1.08 (0.75) with the lowest $WHPT_{NTAXA}$ EQR of 0.45 at Site 1179 in Spring 2021, and the highest EQR of 1.08 at Site 1179 in Autumn 2023. Impaired $WHPT_{NTAXA}$ can be indicative of pressures including denuded habitat quality, siltation or reduced water quality, this data suggests that there pressure may have been present in the past.

$LIFE_{FAMILY}$ 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 6.86 and 8, averaging 7.43 with the lowest $LIFE_{FAMILY}$ score of 6.86 at Site 1179 in Autumn 2021, and the highest score of 8 at Site 1179 in Spring 2022. The $LIFE_{FAMILY}$ expected scores ranged between 7.75 to 7.79 across the sites, with 4 of the 13 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.88 and 1.03 (0.96) with the lowest $LIFE_{FAMILY}$ EQR of 0.88 at Site 1179 in Autumn 2021, and the highest EQR of 1.03 at Site 1179 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 56.52 and 77.8, averaging 67.33, with the lowest PSI_{FAMILY} score of 56.52 at Site 1179 in Autumn 2020, and the highest score of 77.8 at Site 1179 in Spring 2022. The PSI_{FAMILY} expected scores ranged between 74.32 to 75.08 across the sites, with 11 of the 13 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.76 - 1.04 (0.9) with the lowest PSI_{FAMILY} EQR of 0.76 at Site 1179 in Autumn 2020, and the highest EQR of 1.04 at Site 1179 in Spring 2022.

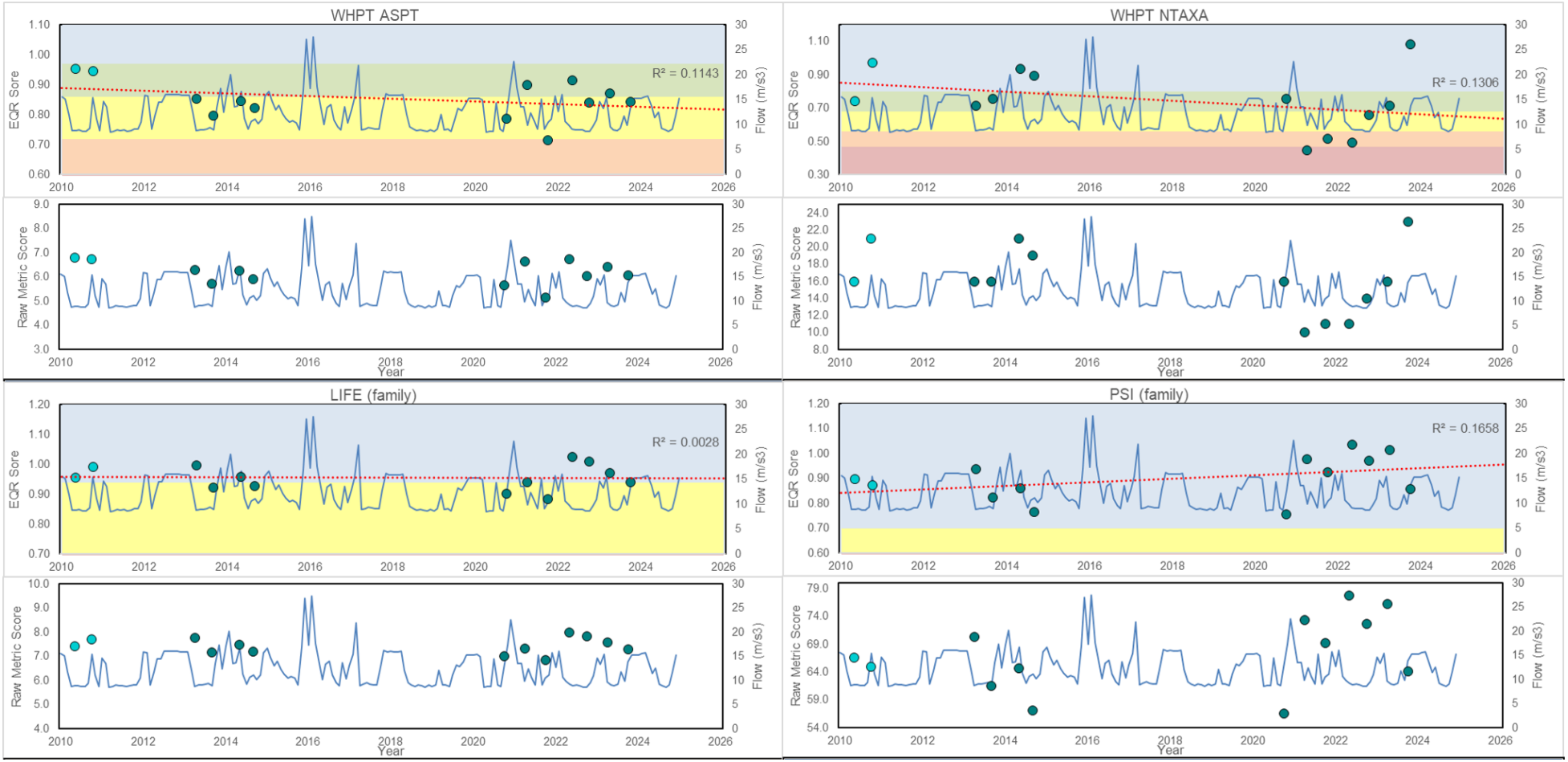
A total of two INNS species, *including Potamopyrgus antipodaru and Crangonyx pseudogracilis*, were recorded as present between 2010 to 2023. No designated species were recorded during the monitoring period.

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 B2-50: Macroinvertebrate Observed and EQR Summary

Site ID	Site NGR	Survey count	Survey Range	LIFE Family EQR Score	LIFE Family Score	PSI Family EQR Score	PSI Family Score	WHPT ASPT EQR Score	WHPT ASPT EQR Class	WHPT ASPT Score	WHPT NTAXA EQR Score	WHPT NTAXA EQR Class	WHPT NTAXA Score
1179	SE0478311544	11	2013 to 2023	0.88 - 1.03 (0.95)	6.86 - 8 (7.41)	0.76 - 1.04 (0.9)	56.52 - 77.8 (67.6)	0.72 - 0.91 (0.84)	P - G (M)	5.15 - 6.75 (6.08)	0.45 - 1.08 (0.72)	B - H (G)	10 - 23 (16)
1487	SE0471410903	2	2010	0.96 - 0.99 (0.97)	7.42 - 7.71 (7.57)	0.87 - 0.9 (0.89)	65 - 66.67 (65.84)	0.95 - 0.95 (0.95)	G - G (G)	6.75 - 6.8 (6.78)	0.74 - 0.97 (0.86)	G - H (H)	16 - 21 (19)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High



Site Key	
1179	1487

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

B2.6.4.2 Fish

Waterbody GB104027063190 Wessenden Brook from Butterly Reservoir to River Colne is not classified under Cycle 3 (2022) for fish.

Limited Baseline data within the impacted reach was limited to one site, Wessenden Brook (ID 29862) which was surveyed in 2015.

YWSL commissioned additional surveys at Wessenden Brook and Weir Side (ID YW133) in 2016 through to 2018. Wessenden Brook received further surveys in 2021 and 2024.

Table B2-51 details survey sites within the Colne T1 reach.

No FSC2 data was available for the Environment Agency monitoring site within the impacted reach.

The WFD status of the fish community in Colne T1 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.

Brown trout were initially counted in 2018 at both sites, with counts at Wessenden Brook increasing in the 2021 and 2024 surveys. The highest count of brown trout was 48 in 2024 and lowest was 2 in 2018 at Wessenden Brook. Four perch were counted in the Wessenden Brook 2024 survey. 3-spined stickleback were counted in low abundance at Wessenden Brook and moderate abundance at Weir Side, however counts decreased over time.

Table B2-52 details species presence by year across all sites within the Colne T1 reach. 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 considered to have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-51: Colne T1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
133	Weir Side	SE0481411560	Electric Fishing (AC, PDC and DC)	3	2016	2018
29862	Wessenden Brook	SE0475411522	Electric Fishing (AC, PDC and DC)	6	2015	2024

Table B2-52: Colne T1 Fish Survey Results

Tolerance Category[4]	Species Name	2015	2016	2017	2018	2021	2024
High tolerance	3-spined stickleback	X	X	X	X		
High tolerance	Perch						X
Low tolerance	Brown trout				X	X	X

B2.6.4.3 WFD waterbody status

Table B2-53 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-53** 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 B2-53: WFD classifications

Waterbody ID & Name		**GB104027063190 Wessenden Bk from Butterly Resr to River Colne**	**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
	Macroinvertebrates	Moderate	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	-	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.6.5 Invasive non-native species (INNS)

Table B2-54 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 B2-54**:).

Table B2-54: 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)*
INNS – Macroinvertebrates -New Zealand mud snail *(Potamopyrgus antipodarum)* -Freshwater Shrimp *(Crangonyx pseudogracilis)*	Major	The implementation of this drought permit is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Himalayan balsam *(Impatiens glandulifera)* -Japanese knotweed *(Fallopia japonica)*	Major	The implementation of this drought permit is not expected to increase the distribution of this INNS.	Not sensitive	No

B2.6.6 Landscape, navigation, recreation and heritage

Table B2-55 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 B2-55**).

Table B2-55: 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)*
Angling on Wesseden brook	Major	Angling unlikely on Wesseden brook	Not sensitive	No

B2.8 COLNE T3

B2.8.1 Statutory designated sites

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

B2.8.2 NERC and local wildlife sites

Table B2-56 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 B2-56**).

Table B2-56: 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)*
Blackmoor Foot Reservoir LWS	Major	Blackmoorfoot Reservoir is a haven for wildlife and migrating birds. The site hosts rich grassland, standing water and regionally rare fern *Asplenium adiantum nigrum.* Also present are uncommon wintering bird species and nationally notable insect species. However, 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	No
NERC Priority Habitat – Deciduous woodland -212329, 212552, 212985, 212648, 212274, 212931, 212507, 625251, 212611, 212617, 212421, 213432, 213536, 213597	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)	Not sensitive	No
NERC Priority Habitat – Traditional orchard -737597	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Lowland dry acid grassland -513304, 513310, 513307, 513315, 513338	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No

B2.8.3 NERC and other protected species

Table B2-57 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

The nationally scarce species of Caddisfly *Wormaldia subnigra* have been identified as being present in Colne T3. The species was identified in routine sampling carried out by the Environment Agency at the site Nr. Daisy Green (ID 1182) in October 2020, with an abundance of one. Based on the available information this receptor is considered to be susceptible to drought option impacts and has 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 white-clawed crayfish in the impacted reach. The data showed no surveys or records have been recorded in the impacted reach, although suitable habitat may be 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** 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 did not indicate the presence of otter within the impacted reach, however information obtained from the West Yorkshire Biological Records Centre identified their presence within the zone of influence of the drought option. 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, YWSL 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 in the impacted reach, however water vole have been recorded in the surrounding and receiving reaches. Based on the available information these species are considered to be susceptible to drought order impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

One NERC act section 41 fish species (brown trout) 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 B2-57: 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)*
Notable Species – Macroinvertebrates Fingernet Caddisfly *(Wormaldia subnigra)*	Major	The family Philopotamidae (Finger-net Caddisflies) have a strong preference for fast-flowing, well-oxygenated streams, reflecting their adaptation to such environments.	Medium	Yes
NERC Species – Crustacea White-clawed Crayfish (*Austropotamobius pallipes)*	Major	Limited data are available for the impacted reach. However, River Habitat Survey data indicate that the impacted reach does not provide suitable habitat for white-clawed crayfish. As a result, white-clawed crayfish are considered unlikely to occur within the reach, and no further assessment has been undertaken.	Medium/High	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 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 are not likely to be present in the impacted reach as identified by an assessment of habitat during an Environment Agency walkover survey.	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, predation, inter and intra-species competition etc.	High	Yes
NERC and Notable species – Birds There are many bird 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: - *Eurasian* Curlew (*Numenius arqauta)* - Reed Bunting (*Emberiza schoeniclus)* - Grey Wagtail (*Motacilla cinerea)* - House Martin (*Delichon urbica)* - Swallow (*Hirundo rustica)* - Little Ringed Plover Bird (*Charadrius dutius)* - Redshank (*Tringa tetanus)* - Snipe (*Gallinago gallinago)* - Mute Swan (*Cygnus olor)* - Common Tern (*Sterna hirundo)*	Not sensitive	No

B2.8.4 WFD Receptors

B2.8.4.1 Macroinvertebrates

The WFD waterbody GB104027063330 River Colne from Wessenden Brook to River Holme classifies as ‘moderate’ for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by one Environment Agency monitoring site, Nr. Daisy Green (ID 1182). The indicative WFD classification for this site is based on the worst classification between $WHPT_{ASPT}$ and NTAXA, these ranged between 'Moderate' on two occurrences to 'Good' on nine occurrences.

The WFD status of the macroinvertebrate community in Colne T3 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.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-7**.

$WHPT_{ASPT}$ scores from the site identifies macroinvertebrate communities which are composed of a good proportion of taxa which are sensitive to pressures including water quality, $WHPT_{ASPT}$ scores ranging between 5.95 and 7.14, averaging 6.58, with the lowest $WHPT_{ASPT}$ score of 5.95 at Site 1182 in Autumn 2022, and the highest score of 7.14 at Site 1182 in Spring 2021. The $WHPT_{ASPT}$ expected score for this site is7.46, with 2 of the 11 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.81 and 0.96 (0.89) with the lowest $WHPT_{ASPT}$ EQR of 0.81 at Site 1182 in Spring 2023, and the highest EQR of 0.96 at Site 1182 in Autumn 2010.

In Colne T3 data from the site identifies a macroinvertebrate community with good diversity, with $WHPT_{NTAXA}$ ranging between 23 and 32 (26.18) with the lowest $WHPT_{NTAXA}$ score of 23 at Site 1182 in Spring 2023, and the highest score of 32 at Site 1182 in Spring 2021. The $WHPT_{NTAXA}$ expected score for this site is21.755, with all samples above the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 1.06 and 1.47 (1.22) with the lowest $WHPT_{NTAXA}$ EQR of 1.06 at Site 1182 in Spring 2023, and the highest EQR of 1.47 at Site 1182 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 7.25 and 8.05, scoring 7.52 on average, with the lowest $LIFE_{FAMILY}$ score of 7.25 at Site 1182 in Spring 2023, and the highest score of 8.05 at Site 1182 in Autumn 2022. The $LIFE_{FAMILY}$ expected score for this site is 7.885, with 6 of the 11 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.92 and 1.02 (0.95) with the lowest $LIFE_{FAMILY}$ EQR of 0.92 at Site 1182 in Spring 2023, and the highest EQR of 1.02 at Site 1182 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 57.6 and 78.72, averaging 70.6, with the lowest PSI_{FAMILY} score of 57.6 at Site 1182 in Spring 2023, and the highest score of 78.72 at Site 1182 in Autumn 2020. The PSI_{FAMILY} expected score for this site is 76.9, with 10 of the 11 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.75 and 1.03 (0.92) with the lowest PSI_{FAMILY} EQR of 0.75 at Site 1182 in Spring 2023, and the highest EQR of 1.03 at Site 1182 in Autumn 2020.

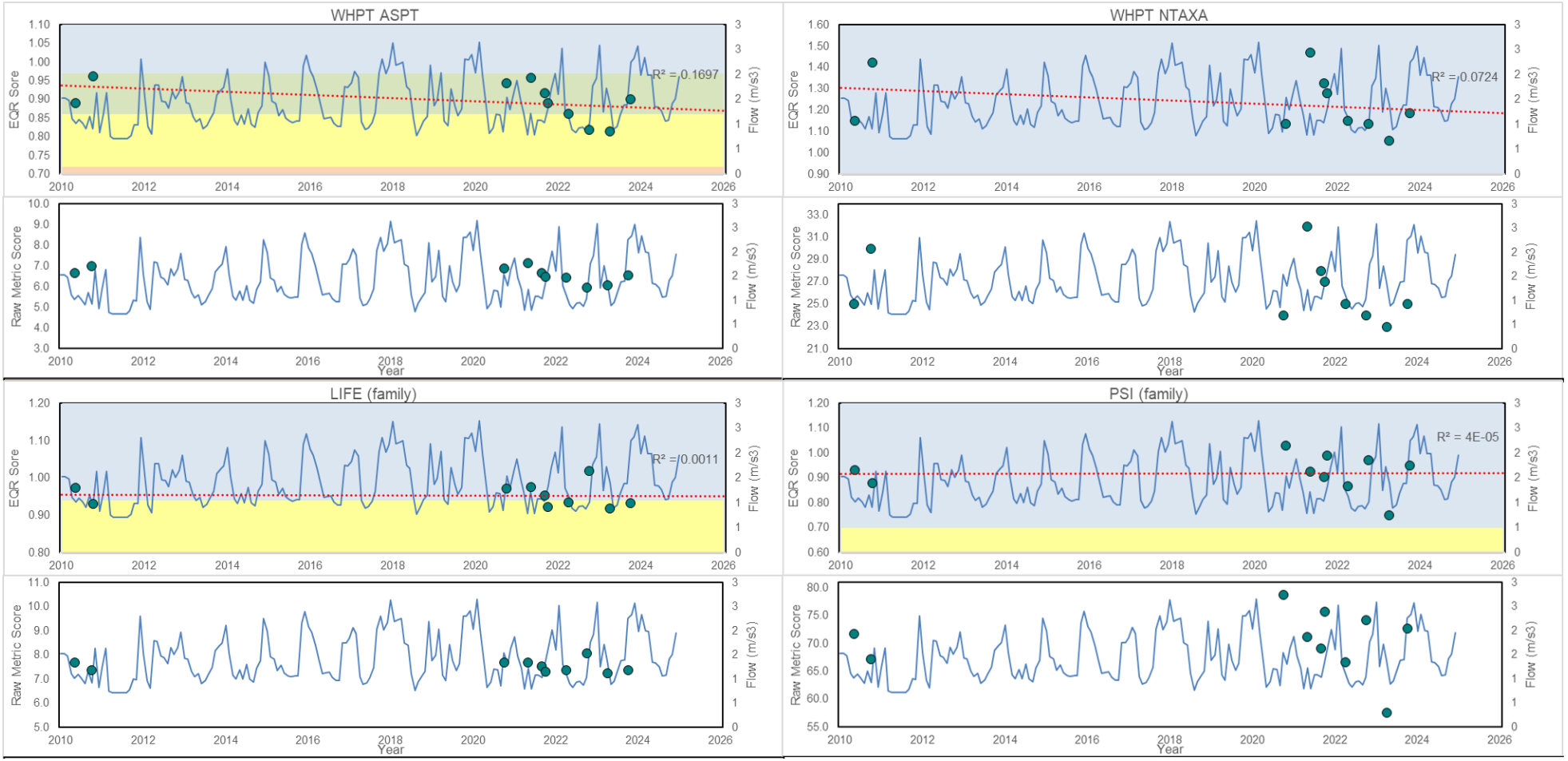
A total of three INNS species, including *Potamopyrgus antipodarum*, *Crangonyx pseudogracilis* and *Dugesia tigrina* were recorded as present within the reach between 2010 to 2023. A single designated species, *Wormaldia subnigra* was recorded as present at Site 1182 in 2020

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 B2-58: Macroinvertebrate Observed and EQR Summary table

Site ID	Site NGR	Survey count	Survey Range	LIFE Family EQR Score	LIFE Family Score	PSI Family EQR Score	PSI Family Score	WHPT ASPT EQR Score	WHPT ASPT EQR Class	WHPT ASPT Score	WHPT NTAXA EQR Score	WHPT NTAXA EQR Class	WHPT NTAXA Score
1182	SE0967713289	11	2010 to 2023	0.92 - 1.02 (0.95)	7.25 - 8.05 (7.52)	0.75 - 1.03 (0.92)	57.6 - 78.72 (70.6)	0.81 - 0.96 (0.89)	M - G (G)	5.95 - 7.14 (6.58)	1.06 - 1.47 (1.22)	H - H (H)	23 - 32 (26)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High



Site Key
1182

Figure B2-7: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.8.4.2 Fish

Waterbody GB104027063330 River Colne from Wessenden Brook to River Holme is classified under Cycle 3 (2022) as 'moderate'. The classification is informed by three sites, all three were last classified in 2019. Lees Mill Lane (ID 11851), Holme Mills (ID 29858) and Stafford Mills (ID 35969) were all classified as 'moderate'.

Baseline fisheries data is informed by three YWSL monitoring sites, Blackmoorfoot (ID YW 48), Nr Daisy Green (ID YW 47) and Upper Clough (ID YW 49). All YWSL monitoring sites in the impacted reach were surveyed in 2015. Barber Row received an additional survey in 2020 and Nr Daisy Green in 2021. No FCS2 data was available for the Environment Agency monitoring site within the impacted reach, FCS2 data was provided by Lees Mill Lane (ID 11851), located downstream of the impacted reach (Colne 2).

Table B2-59 details survey sites within the Colne T3 reach. The WFD status of the fish community in Colne T3 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 Lees Mill Lane is individually classified as moderate with a site EQR of 0.3784, based on the FCS2 EQR scores from the 2017 survey. The site has a high diversity, with all four species present from an expected four species. Trout had a slightly higher observed density than expected, with an good EQR score of 0.6587. The EQR score for stone loach is higher than expected at 1. The EQR score for grayling was high at 0.9313, due to the higher than expected density and low expected prevalence score of 0.262. Bullhead were expected to be present at the site but were not observed.

From the data identified in the FCS2, a medium population of brown trout is likely to be present in the receiving reach (Colne 2). With Lees Mill Lane being located downstream of the impacted reach in Colne T3, the fish community at Lees Mill Lane is significantly different to that of the sites surveyed in the impacted reach, and therefore not representative of sensitivity of the fish community in the impacted reach.

Additional baseline fish data for the impacted reach from YWSL sites, Blackmoorfoot, Nr Daisy Green and Upper Clough recorded no fish across all sites. Due to the lack of fisheries information for sites in the Hoyle House Clough within the extent of influence from the Blackmoorfoot Reservoir (Hoyle House Clough) option, it is assumed that a low abundance of brown trout are present in the reach.

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 B2-59: Colne T3 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
49	Barber Row	SE0950014300	Electric Fishing (AC, PDC and DC)	2	2015	2020
YW10041	Nr Daisy Green	SE0967713289	Electric Fishing (AC, PDC and DC)	2	2015	2021
YW10042	Blackmoorfoot	SE097132	Electric Fishing (AC, PDC and DC)	1	2015	2015

B2.8.4.3 WFD waterbody status

Table B2-60 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-60** 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 B2-60: WFD classifications

Waterbody ID & Name		**GB104027063330 River Colne from Wessenden Brook to River Holme**	**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	Good	
	Fish	Moderate	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.8.5 Invasive non-native species (INNS)

Table B2-61 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 B2-61**).

Table B2-61: 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)*
INNS – Macroinvertebrates -New Zealand mud snail *(Potamopyrgus antipodarum)* -Freshwater Shrimp *(Crangonyx pseudogracilis)* -Brown planarian flatworm *(Dugesia tigrina)*	Major	The implementation of this drought permit is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Himalayan balsam *(Impatiens glandulifera)* -Japanese knotweed *(Fallopia japonica)*	Major	The implementation of this drought permit is not expected to increase the distribution of this INNS.	Not sensitive	No

B2.8.6 Landscape, navigation, recreation and heritage

No receptors that are sensitive or susceptible to drought permit impacts have been identified.

B2.9 COLNE T4

B2.9.1 Statutory designated sites

Table B2-62 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 B2-62**).

Table B2-62: 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 site is 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 Phase 1 and 2	Major		Not sensitive	No
South Pennine Moors SSSI	Major		Not sensitive	No

B2.9.2 NERC and local wildlife sites

Table B2-63 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 B2-63**).

Table B2-63: 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)*
NERC Priority Habitats - Lowland meadows -425235 -425234	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitats - Purple moor grass and rush pasture -466868	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Lowland heath -546259, 546232	Major	Characterised by a mix of dwarf shrubs including heather (*Calluna vulgaris*), bell heather (*Erica cinerea*), and gorse (*Ulex sp*). Unlikely to be in connectivity with impacted each 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)*
NERC Priority Habitat – Deciduous woodland -208829, 208656, 208476, 208337, 206810, 208277	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)	Not sensitive	No
NERC Priority Habitat – Good quality semi-improved grassland - 475641, 475632, 475635,	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Ancient woodland -Scout Wood	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No

B2.9.3 NERC and other protected species

Table B2-64 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 no surveys or records have been recorded in the impacted reach, although suitable habitat may be 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** 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. The data showed no surveys or records have been recorded in the impacted reach. However, 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, YWSL 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 in the impacted reach, however water vole have been recorded in the surrounding and receiving reaches, although suitable habitat may be 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 water vole likely to be present in the reach at the time of the implementation of a drought permit. 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.**

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 B2-64: 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 are not likely to be present in the impacted reach as identified by an assessment of habitat during an Environment Agency walkover survey.	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. 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.	medium	Yes
NERC and Notable species – Birds There are many bird 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: - Eurasian Curlew (*Numenius arqauta*)	Not sensitive	No

B2.9.4 WFD Receptors

B2.9.4.1 Macroinvertebrates

The WFD waterbody GB104027063330 River Colne from Wessenden Brook to River Holme classifies as ‘moderate’ for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by one Environment Agency monitoring site, Scout Wood (ID 152669). The indicative WFD classification for this site is based on the worst classification between $WHPT_{ASPT}$ and NTAXA, these ranged between 'Moderate' on two occurrences to 'High' on two occurrences.

The WFD status of the macroinvertebrate community in Colne T4 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. Flow series data was unavailable for the impacted reach. Baseline data indicates that under present conditions, the macroinvertebrate community in Colne T4 is highly sensitive to reduced flows (**Figure B2-8**). See **Table B2-3** for guidance in interpreting raw LIFE scores.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-8**.

Data from the monitoring site was limited and shows $WHPT_{ASPT}$ scores consistent with the standard to achieve high WFD status. $WHPT_{ASPT}$ scores from the site identifies macroinvertebrate communities which are composed of a good proportion of taxa which are sensitive to pressures including water quality, $WHPT_{ASPT}$ scores ranging between 5.56 and 7.45, averaging 6.59, with the lowest $WHPT_{ASPT}$ score of 5.56 at Site 152669 in Autumn 2021, and the highest score of 7.45 at Site 152669 in Spring 2023. The $WHPT_{ASPT}$ expected score for this site is 7.11, with two of the 7 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.78 and 1 (0.91) with the lowest $WHPT_{ASPT}$ EQR of 0.78 at Site 152669 in Autumn 2021, and the highest EQR of 1 at Site 152669 in Spring 2023.

In Colne T4 data from the site identifies a macroinvertebrate community with a good diversity, with $WHPT_{NTAXA}$ ranging between 15 - 25 (20.86) with the lowest $WHPT_{NTAXA}$ score of 15 at Site 152669 in Autumn 2022, and the highest score of 25 at Site 152669 in Autumn 2023. The $WHPT_{NTAXA}$ expected score for this site is 22.3, with one of the seven samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.67 and 1.12 (0.92) with the lowest $WHPT_{NTAXA}$ EQR of 0.67 at Site 152669 in Autumn 2022, and the highest EQR of 1.12 at Site 152669 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. $LIFE_{FAMILY}$ scores ranged between 7.15 - 8.19 (7.64) with the lowest $LIFE_{FAMILY}$ score of 7.15 at Site 152669 in Autumn 2021, and the highest score of 8.19 at Site 152669 in Spring 2021. The $LIFE_{FAMILY}$ expected score for this site is 7.79, with one of the seven samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.92 - 1.04 (0.98) with the lowest $LIFE_{FAMILY}$ EQR of 0.92 at Site 152669 in Autumn 2021, and the highest EQR of 1.04 at Site 152669 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 53.6 and 94.59, scoring an average of 77.87, with the lowest PSI_{FAMILY} score of 53.6 at Site 152669 in Autumn 2022, and the highest score of 94.59 at Site 152669 in Spring 2021. The PSI_{FAMILY} expected score for this site is 72.97, with three of the seven above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.73 and 1.25 (1.05) with the lowest PSI_{FAMILY} EQR of 0.73 at Site 152669 in Autumn 2022, and the highest EQR of 1.25 at Site 152669 in Spring 2021.

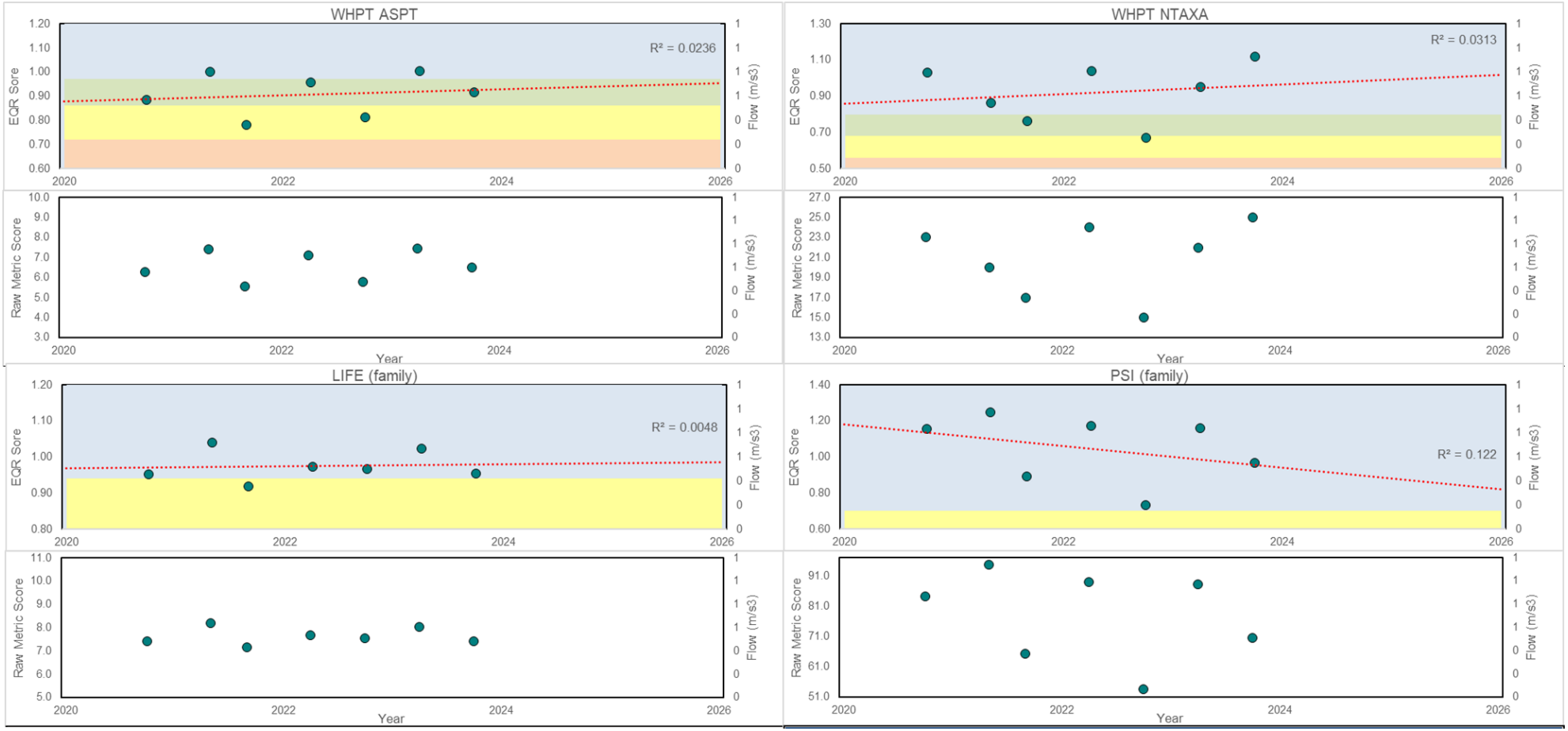
A total of two INNS species, including *Crangonyx pseudogracilis* and *Dugesia tigrina* were recorded as present within the reach between 2020 to 2023. No designated species were recorded during the monitoring period.

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 B2-65: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{Family}$ EQR Score	$LIFE_{Family}$ Score	PSI_{Family} EQR Score	PSI_{Family} Score	$WHPT_{ASPT}$ EQR Score	$WHPT_{ASPT}$ EQR Class	$WHPT_{ASPT}$ Score	$WHPT_{NTAXA}$ EQR Score	$WHPT_{NTAXA}$ EQR Class	$WHPT_{NTAXA}$ Score
152669	SE0569514302	7	2020 to 2023	0.92 - 1.04 (0.98)	7.15 - 8.19 (7.64)	0.73 - 1.25 (1.05)	53.6 - 94.59 (77.87)	0.78 - 1 (0.91)	M - H (G)	5.56 - 7.45 (6.59)	0.67 - 1.12 (0.92)	M - H (H)	15 - 25 (21)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High



Site Key
152669

Figure B2-8: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.9.4.2 Fish

Waterbody GB104027063330 River Colne from Wessenden Brook to River Holme is classified under Cycle 3 (2022) as 'moderate'. The classification is informed by three sites, all three were last classified in 2019. Lees Mill Lane (ID 11851), Holme Mills (ID 29858) and Stafford Mills (ID 35969) were all classified as 'moderate'.

Baseline fisheries data is informed by one Environment Agency site, Merry Dale Clough (ID 34396) which was surveyed in 2009. YWSL commissioned additional surveys at two sites, Merry Dale Clough and Claridge House Bridge (ID YW10037). Both sites were surveyed in 2015, with Claridge House Bridge receiving additional surveys in 2020 through to 2022. **Table B2-66** details survey sites within the Colne T4 reach.

The WFD status of the fish community in Colne T4 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 fish were recorded during the Environment Agency monitoring survey at Merry Dale Clough in 2009 or the YWSL survey in 2015. At Claridge House Bridge, 3-spined stickleback were recorded in 2022 with 26 individuals counted, no other fish were recorded during other survey years.

Table B2-67 details species presence by year across all sites within the Colne T4 reach. 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 be **not sensitive** to the physical environment impacts identified in **Appendix A**.

Table B2-66: Colne T4 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
YW10035	Merry Dale Clough	SE0582714278	Electric Fishing (AC, PDC and DC)	1	2015	2015
YW10037	Claridge House Bridge	SE066143	Electric Fishing (AC, PDC and DC)	4	2015	2022

Table B2-67: Colne T4 Fish Survey Results

Tolerance Category[4]	Species Name	2009	2015	2020	2021	2022
High tolerance	3-spined stickleback					X

B2.9.4.3 WFD waterbody status

Table B2-68 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-68** 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 B2-68: WFD classifications

Waterbody ID & Name	GB104027063330 River Colne from Wessenden Brook to River Holme	Sensitivity (Uncertain, High, Medium, Low, Not Sensitive)
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)	Major	

Waterbody ID & Name		GB104027063330 River Colne from Wessenden Brook to River Holme	Sensitivity (Uncertain, High, Medium, Low, Not Sensitive)
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	Not sensitive
	Macroinvertebrates	Moderate	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Good	
	Fish	Moderate	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.9.5 Invasive non-native species (INNS)

Table B2-69 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 B2-69**).

Table B2-69: 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)*
INNS – Macroinvertebrates -Freshwater Shrimp *(Crangonyx pseudogracilis)* -Brown planarian flatworm *(Dugesia tigrina)*	Major	The implementation of this drought permit is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Japanese knotweed *(Fallopia japonica)* -Himalayan balsam *(Impatiens glandulifera)*	Major	The implementation of this drought permit is not expected to increase the distribution of this INNS.	Not sensitive	No

B2.9.6 Landscape, navigation, recreation and heritage

Table B2-70 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 B2-70**).

Table B2-70: 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)*
Other abstractions	Major	There is a non-public water supply abstraction from the impacted reach that could potentially be derogated by the drought option	Uncertain	Yes

B2.10 HOLME 1

B2.10.1 Statutory designated sites

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

B2.10.2 NERC and local wildlife sites

Table B2-71 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 B2-71**).

Table B2-71: 7NERC 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)*
Digley Reservoir/Marsden Clough LWS	Major	Digley Reservoir/Marsden Clough supports a mosaic of the semi-natural habitats. The site contains reservoirs, upstream valleys, coniferous and plantation woodland, and heathland. Digley Reservoir is home to 138 species of birds. However, 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	No
Yateholme Reservoirs and Plantations LWS	Major	A large site encompassing a wide mixture of habitats including woodland, heathland, acid grassland, mire, standing water and running water. However, 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	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 Priority Habitats - Deciduous woodland - 326183 - 326184 - 326186 - 326187 - 326188 - 326191 - 326192 - 326193 - 326194 - 326196	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitats - Lowland dry acid grassland - 404189 - 404190 - 404235 - 404236 - 404237 - 404238 - 404239 - 404240 - 404241 - 404242 - 404243 - 404273	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitats - Lowland heathland -414362	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No

B2.10.3 NERC and other protected species

Table B2-72 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

The nationally scarce species of Caddisflies, *Wormaldia subnigra and Potamophylax rotundipennis* have been identified as being present in Holme 1. The species *Wormaldia subnigra* was identified in routine sampling carried out by the Environment Agency at the site D/S Brownhill Reservoir (ID 1584) in September 2015, with an abundance of six, and *Potamophylax rotundipennis* recorded at the same site in April 2014 with an abundance of two. Based on the available information these receptors are considered to be susceptible to drought option impacts and has 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 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** 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. The data showed no surveys or records have been recorded in the impacted reach. However, 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, YWSL and a review of available data from NBN gateway was used inform the assessment of water vole in the impacted reach. Review of EA records did not indicate the presence of water vole within the impacted reach, though 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 water vole 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 one NERC Act Section 41 fish species (brown trout) and one notable fish species (bullhead).

Table B2-72: 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)*
Notable Species – Macroinvertebrates Fingernet Caddisfly *(Wormaldia subnigra)* Large Cinnamon Sedge *(Potamophylax rotundipennis)* *Tinodes unicolor* Black-legged Alderfly *(Sialis nigripes)*	Major	The family Philopotamidae (Finger-net Caddisflies) have a strong preference for fast-flowing, well-oxygenated streams, reflecting their adaptation to such environments. *Potamophylax rotundipennis*, from family Limnephilidae have a tolerance for moderate flow conditions. Found in a variety of substrates, with clean, well-oxygenated water. The family Psychomyiidae have a strong preference for cool, well-oxygenated waters with moderate to fast flow, reflecting their adaptation to such environments. The family Sialidae (Alderfly) often favour slow-flowing or standing freshwater habitats, with an assigned score of 6, and a WHIPT score of 4 such water quality pressures are unlikely to impact the species.	Medium	Yes
NERC Species – Crustacea	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	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)*
White-clawed Crayfish (*Austropotamobius pallipes)*		determine to what extent or how they may be impacted by reduced flows caused by the drought option.		
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 are not likely to be present in the impacted reach as identified by an assessment of habitat during an Environment Agency walkover survey.	Not sensitive	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, predation, inter and intra-species competition etc.	High	Yes
Notable Species – Fish Bullhead (*Cottus gobio)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, provision of cover, predation, inter and intra-species competition etc.	Medium	Yes

B2.10.4 WFD Receptors

B2.10.4.1 Macroinvertebrates

The WFD waterbody GB104027057600 Holme from Source to New Mill Dike classifies as ‘moderate’ for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by one Environment Agency monitoring site, D/S Brownhill Reservoir (ID 1584). The indicative WFD classification for this site is based on the worst classification between $WHPT_{ASPT}$ and NTAXA, these ranged between 'Moderate' on four occurrences to 'High' on one occurrence.

The WFD status of the macroinvertebrate community in Holme 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.

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 Holme 1 has a medium to high sensitivity to reduced flows (**Figure B2-9**). See **Table B2-3** for guidance in interpreting raw LIFE scores.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency’s online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR’s are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-9**.

Data from the monitoring site shows variation in $WHPT_{ASPT}$ scores over the period 2010 to 2024, $WHPT_{ASPT}$ scores from the site identifies macroinvertebrate communities which are composed of a good proportion of taxa which are sensitive to pressures including water quality. $WHPT_{ASPT}$ scores ranged between 6.06 and 7.21, averaging 6.65, with the lowest $WHPT_{ASPT}$ score of 6.06 at Site 1584 in Autumn 2023, and the highest score of 7.21 at Site 1584 in Autumn 2015. The $WHPT_{ASPT}$ expected score for this site is 7.5, with four of the 24 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.84 and 1 (0.9) with the lowest $WHPT_{ASPT}$ EQR of 0.84 at Site 1584 in Autumn 2023, and the highest EQR of 1 at Site 1584 in Autumn 2015.

In Holme 1 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ ranging between 21 and 38 (29.63) with the lowest $WHPT_{NTAXA}$ score of 21 at Site 1584 in Spring 2019, and the highest score of 38 at Site 1584 in Spring 2012. The $WHPT_{NTAXA}$ expected score for this site is 22.7, with all samples above the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.93 and 1.74 (1.33) with the lowest $WHPT_{NTAXA}$ EQR of 0.93 at Site 1584 in Spring 2019, and the highest EQR of 1.74 at Site 1584 in Autumn 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 7.04 and 7.76, scoring 7.45 on average, with the lowest $LIFE_{FAMILY}$ score of 7.04 at Site 1584 in Autumn 2016, and the highest score of 7.76 at Site 1584 in Spring 2013. The $LIFE_{FAMILY}$ expected score for this site is 7.9, with 9 of the 24 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.89 and 0.98 (0.94) with the lowest $LIFE_{FAMILY}$ EQR of 0.89 at Site 1584 in Autumn 2016, and the highest EQR of 0.98 at Site 1584 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 54.05 and 76.92, averaging 65.87, with the lowest PSI_{FAMILY} score of 54.05 at Site 1584 in Spring 2019, and the highest score of 76.92 at Site 1584 in Autumn 2015. The PSI(family) expectedscore for this site is 76.6, with 23 of the 24 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.71 and 1.02 (0.87) with the lowest PSI_{FAMILY} EQR of 0.71 at Site 1584 in Spring 2019, and the highest EQR of 1.02 at Site 1584 in Autumn 2015.

A total of two INNS species, including *Potamopyrgus antipodarum* and *Crangonyx pseudogracilis/floridanus* recorded as present in the reach between 2010 to 2024.

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 B2-73: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{Family}$ EQR Score	$LIFE_{Family}$ Score	PSI_{Family} EQR Score	PSI_{Family} Score	$WHPT_{ASPT}$ EQR Score	$WHPT_{ASPT}$ EQR Class	$WHPT_{ASPT}$ Score	$WHPT_{NTAXA}$ EQR Score	$WHPT_{NTAXA}$ EQR Class	$WHPT_{NTAXA}$ Score
1584	SE1198506578	24	2010 to 2024	0.89 - 0.98 (0.94)	7.04 - 7.76 (7.45)	0.71 - 1.02 (0.87)	54.05 - 76.92 (65.87)	0.84 - 1 (0.9)	M - H (G)	6.06 - 7.21 (6.65)	0.93 - 1.74 (1.33)	H - H (H)	21 - 38 (30)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High

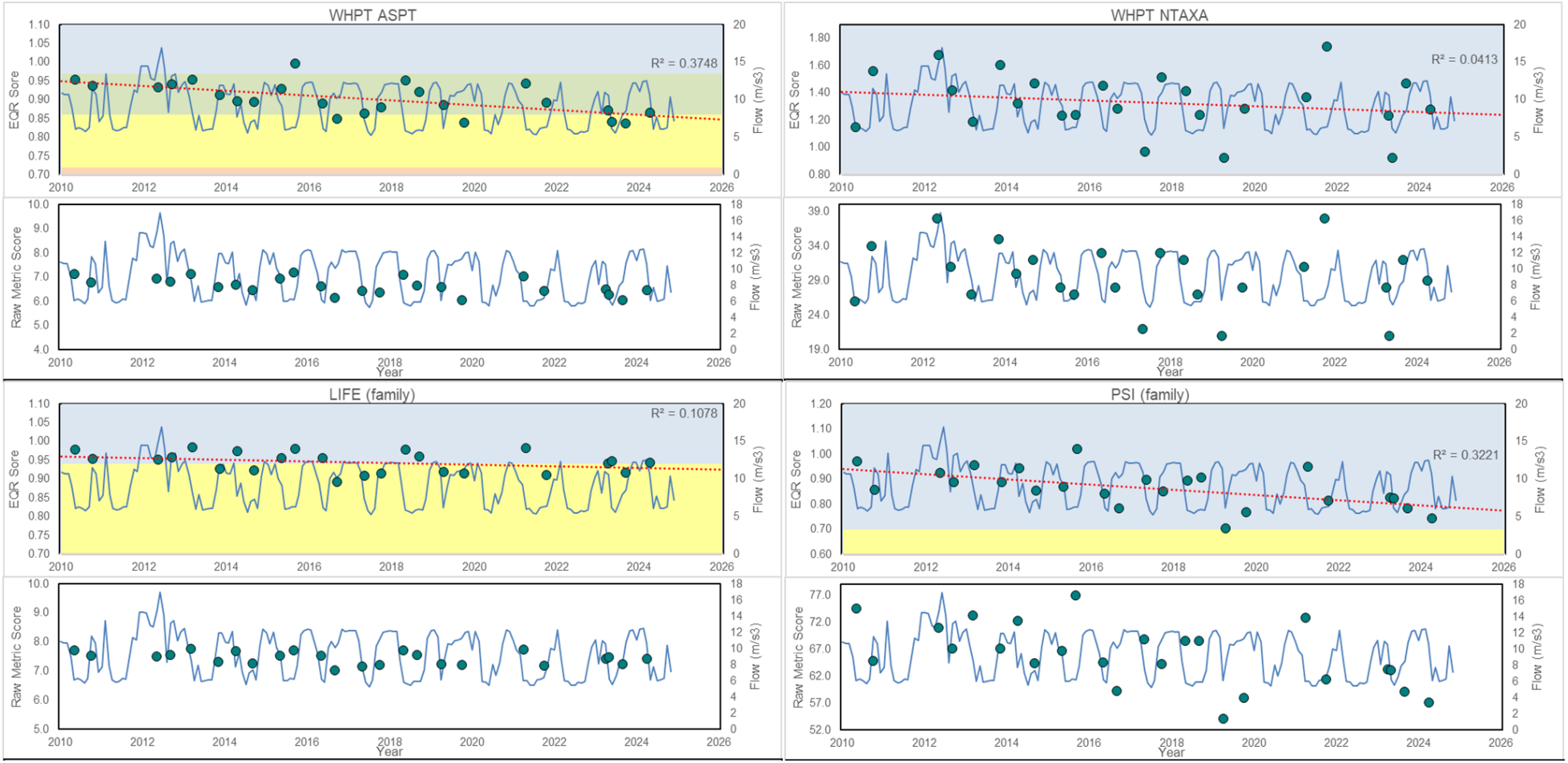


Figure B2-9: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.10.4.2Fish

Waterbody GB104027057600 Holme from Source to New Mill Dike is classified under Cycle 3 (2022) as 'poor', a deterioration from 'moderate' in 2019. The classification is informed by one site, Tennis Courts (ID 14180), classified as 'poor' in 2022, a deterioration from 'good' in 2019.

Baseline fisheries data is informed by one site, Brownhill Reservoir (WR) (ID 11966) which was surveyed 2015. and 2015. YWSL commissioned additional surveys at Brownhill Reservoir (WR) in 2020 through to 2023. **Table B2-74** details survey sites within the Holme 1 reach.

The WFD status of the fish community in Holme 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 Brownhill Reservoir (WR) is individually classified as 'good' with a site EQR of 0.42, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively good diversity, with two species present from an expected three species. Trout had a EQR score of 0.338, with a lower observed density than expected. The EQR score for bullhead was higher than expected at 1. Stone loach were expected at a low prevalence score of 0.3973, but were not recorded at the site.

Bullhead and brown trout were both present for every year of survey, with bullhead counted in moderate to high abundance and brown trout moderate abundance. Brown trout numbers were consistent, with a highest count of 39 in 2020 and lowest of 25 in 2022. Bullhead numbers were more variable but were typically found in high abundance, with a highest count of 199 in 2023 and lowest of 42 in 2020. Stone loach and perch were counted in very low numbers, both were absent in 2022 and 2023 surveys.

Table B2-75 details species presence by year across all sites within the Holme 1 reach. 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 B2-74: Holme 1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
11966	Brownhill Reservoir (WR)	SE1182906461	Electric Fishing (AC, PDC and DC)	5	2015	2023

Table B2-75: Holme 1 Fish Survey Results

Tolerance Category[4]	Species Name	2015	2020	2021	2022	2023
High tolerance	Perch		X			
Medium tolerance	Stone loach		X	X		
Low tolerance	Bullhead	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X

B2.10.4.3WFD waterbody status

Table B2-76 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-76** 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 B2-76: WFD classifications

Waterbody ID & Name		**GB104027057600 Holme from Source to New Mill Dike**	**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	Moderate	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Moderate	
	Macroinvertebrates	Moderate	
Waterbody Measures		None	

B2.10.5 Invasive non-native species (INNS)

Table B2-77 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 B2-77**).

Table B2-77: 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)*
INNS – Macroinvertebrates -Freshwater Shrimp *(Crangonyx pseudogracilis)* -New Zealand mudsnail *(Potamopyrgus antipodarum)*	Major	The implementation of this drought permit is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Japanese knotweed *(Fallopia japonica)* -Himalayan balsam *(Impatiens glandulifera)*	Major	The implementation of this drought permit is not expected to increase the distribution of this INNS.	Not sensitive	No

B2.10.6 Landscape, navigation, recreation and heritage

Table B2-78 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 B2-78**).

Table B2-78: 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)*
Angling on River Holme	Major	Casual angling only	Low	No

B2.11 HOLME 2

B2.11.1 Statutory designated sites

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

B2.11.2 NERC and local wildlife sites

summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 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 B2-79**).

Table B2-79: 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)*
Digley Reservoir/Marsden Clough LWS	Major	Digley Reservoir/Marsden Clough supports a mosaic of the semi-natural habitats. The site contains reservoirs, upstream valleys, coniferous and plantation woodland, and heathland. Digley Reservoir is home to 138 species of birds. However, 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	No
Yateholme Reservoirs and Plantations LWS	Major	A large site encompassing a wide mixture of habitats including woodland, heathland, acid grassland, mire, standing water and running water. However, 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	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)*
		detract from the quality of the supporting environment.		
Malking House Wood LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitats - Lowland dry acid grassland -404190, 513424	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Deciduous woodland -216644, 216403, 217113, 216922, 216809, 218047, 217418, 218666, 218944, 219145, 219473, 219646, 219432, 219866, 219835, 219496,	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)	Not sensitive	No
NERC Priority Habitat – Good quality semi-improved grassland - 476179	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Ancient woodland -Malkin House Wood	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 B2-80 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

The nationally scarce species of Caddisfly, *Potamophylax rotundipennis and* mayfly *Ameletus inopinatus* have been identified as being present in Holme 2. The species *Potamophylax rotundipennis* was identified in routine sampling carried out by the Environment Agency at the site Bottoms Mill (1413) during October 2013 and April 2015 surveys as well as at site Hinchcliffe Mill (1608) during April 2015. The mayfly *Ameletus inopinatus was recorded at* Hinchcliffe Mill (1608) during May and September 2012. Based on the available information these receptors are considered to be susceptible to drought option impacts and has a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

Data obtained from the Environment Agency, YWSL, and a review of records from the NBN Gateway were used to inform the assessment of white-clawed crayfish within the impacted reach. No surveys or records of the species were identified within the reach. Furthermore, River Habitat Survey data indicated that suitable habitat for white-clawed crayfish is not present within the impacted reach. Given the absence of records and the lack of suitable habitat, white-clawed crayfish have been excluded from further assessment.

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. The data showed no surveys or records have been recorded in the impacted reach. However, 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, YWSL and a review of available data from NBN gateway was used inform the assessment of water vole in the impacted reach. Review of EA records did not indicate the presence of water vole within the impacted reach, however information obtained from the West Yorkshire Biological Records Centre identified their presence. However, this information did not include quantitative data on populations of this species in the reach. 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 water vole 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 one NERC Act Section 41 fish species (brown trout) and one notable fish species (bullhead).

Table B2-80: 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)*
Notable Species – Macroinvertebrates Large Cinnamon Sedge *(Potamophylax rotundipennis)* Upland Summer Mayfly *(Ameletus inopinatus)*	Major	Potamophylax rotundipennis, from family Limnephilidae have a tolerance for moderate flow conditions. Found in a variety of substrates, with clean, well-oxygenated water. The family of mayfly Ameletidae this high score family have a strong preference for fast-flowing, well-oxygenated streams, often in headwaters.	Medium	Yes
NERC Species – Crustacea White-clawed Crayfish (*Austropotamobius pallipes)*	Major	Limited data are available for the impacted reach. However, River Habitat Survey data indicate that the impacted reach does not provide suitable habitat for white-clawed crayfish. As a result, white-clawed crayfish are considered unlikely to occur within the reach, and no further assessment has been undertaken.	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	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)*
		reduced flows caused by the drought option.		
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.	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, predation, inter and intra-species competition etc.	High	Yes
Notable Species – Fish Bullhead (*Cottus gobio)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, provision of cover, predation, inter and intra-species competition etc.	Medium	Yes

B2.11.4 WFD Receptors

B2.11.4.1 Macroinvertebrates

The WFD waterbody GB104027057600 Holme from Source to New Mill Dike classifies as ‘moderate’ for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by five Environment Agency monitoring sites, By Stone Dressers (1194), Bottoms Mill (1413), Hinchcliffe Mill (1608). Data was available for a single survey for sites ID 189733 and ID 189734 in 2017. The indicative WFD classification for these sites are based on the worst classification between $WHPT_{ASPT}$ and NTAXA, these ranged between 'Poor' on one occurrence to 'High' on five occurrences.

The WFD status of the macroinvertebrate community in Holme 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.

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 Holme 2 is highly sensitive to reduced flows (**Figure B2-10**). See **Table B2-3** for guidance in interpreting raw LIFE scores.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency’s online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR’s are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-10**.

Data from the monitoring site shows variation in $WHPT_{ASPT}$ scores over the period 2012 to 2023 but remain consistent with the standard to achieve moderate to high WFD status over the monitoring period. $WHPT_{ASPT}$ scores from the site identifies macroinvertebrate communities which are composed of a good proportion of

taxa which are sensitive to pressures including water quality, $WHPT_{ASPT}$ scores ranging between 5.09 and 7.8, averaging 6.61, with the lowest $WHPT_{ASPT}$ score of 5.09 at Site 1194 in Autumn 2013, and the highest score of 7.8 at Site 1413 in Spring 2022. The $WHPT_{ASPT}$ expected scores for ranged between 7.07 to 7.43 across the sites, with 7 of the 31 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.72 and 1.08 (0.91) with the lowest $WHPT_{ASPT}$ EQR of 0.72 at Site 1194 in Autumn 2013, and the highest EQR of 1.08 at Site 1608 in Autumn 2012. There are instances of deterioration to this standard during the monitoring period as such the community has possibly been impaired by water quality pressures historically.

In Holme 2 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ ranging between 12 and 29, scoring an average of 23, with the lowest $WHPT_{NTAXA}$ score of 12 at Site 1413 in Spring 2022, and the highest score of 29 at Site 1608 in Spring 2014. The $WHPT_{NTAXA}$ expected scores ranged between 23.52 to 25.51 across the sites, with 2 of the 31 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.48 and 1.19 (0.95) with the lowest $WHPT_{NTAXA}$ EQR of 0.48 at Site 1413 in Spring 2022, and the highest EQR of 1.19 at Site 1413 in Autumn 2012.

$LIFE_{FAMILY}$ 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 and 8.5, averaging 7.7, with the lowest $LIFE_{FAMILY}$ score of 7 at Site 1608 in Autumn 2015, and the highest score of 8.5 at Site 1413 in Spring 2022. The $LIFE_{FAMILY}$ expected scores ranged between 7.8 to 7.87 across the sites, with 5 of the 31 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.9 and 1.08 (0.98) with the lowest $LIFE_{FAMILY}$ EQR of 0.9 at Site 1608 in Autumn 2015, and the highest EQR of 1.08 at Site 1413 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 51.11 and 100, averaging 74.83, with the lowest PSI_{FAMILY} score of 51.11 at Site 1194 in Autumn 2013, and the highest score of 100 at Site 1413 in Spring 2022. The PSI_{FAMILY} expected scores ranged between 71.63 to 75.45 across the sites, with 14 of the 31 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.71 and 1.33 (1.02) with the lowest PSI_{FAMILY} EQR of 0.71 at Site 1194 in Autumn 2013, and the highest EQR of 1.33 at Site 1413 in Spring 2022.

A total of four INNS species, including Potamopyrgus antipodarum, Chelicorophium curvispinum, Dugesia tigrina and Crangonyx pseudogracilis were recorded as present at four sites between 2012 to 2023.

A total of two designated species, including *Potamophylax rotundipennis* and *Ameletus inopinatus* were recorded as present at two sites between 2012 to 2015.

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 B2-81: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{Family}$ EQR Score	$LIFE_{Family}$ Score	PSI_{Family} EQR Score	PSI_{Family} Score	$WHPT_{ASPT}$ EQR Score	$WHPT_{ASPT}$ EQR Class	$WHPT_{ASPT}$ Score	$WHPT_{NTAXA}$ EQR Score	$WHPT_{NTAXA}$ EQR Class	$WHPT_{NTAXA}$ Score
1194	SE1380607879	2	2013	0.9 - 0.95 (0.92)	7.05 - 7.43 (7.24)	0.71 - 0.84 (0.78)	51.11 - 63.04 (57.08)	0.72 - 0.78 (0.75)	M - M (M)	5.09 - 5.79 (5.44)	0.9 - 1.08 (0.99)	H - H (H)	23 - 26 (25)
1413	SE1311907368	17	2012 to 2023	0.93 - 1.08 (1)	7.29 - 8.5 (7.86)	0.85 - 1.33 (1.06)	61.54 - 100 (78.28)	0.79 - 1.05 (0.92)	M - H (G)	5.89 - 7.8 (6.69)	0.48 - 1.19 (0.93)	P - H (H)	12 - 28 (22)
1608	SE1247106960	10	2013 to 2020	0.9 - 1.01 (0.97)	7 - 7.88 (7.58)	0.83 - 1.1 (1.02)	59.26 - 81.63 (74.22)	0.8 - 1.08 (0.95)	M - H (G)	5.68 - 7.6 (6.82)	0.66 - 1.14 (0.95)	M - H (H)	16 - 29 (24)
189733	SE1347907649	1	2017	0.94	7.38	0.9	65.96	0.88	G	6.27	1.08	H	26
189734	SE1348107678	1	2017	0.94	7.35	0.91	66.67	0.82	M	5.86	0.87	H	21

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High

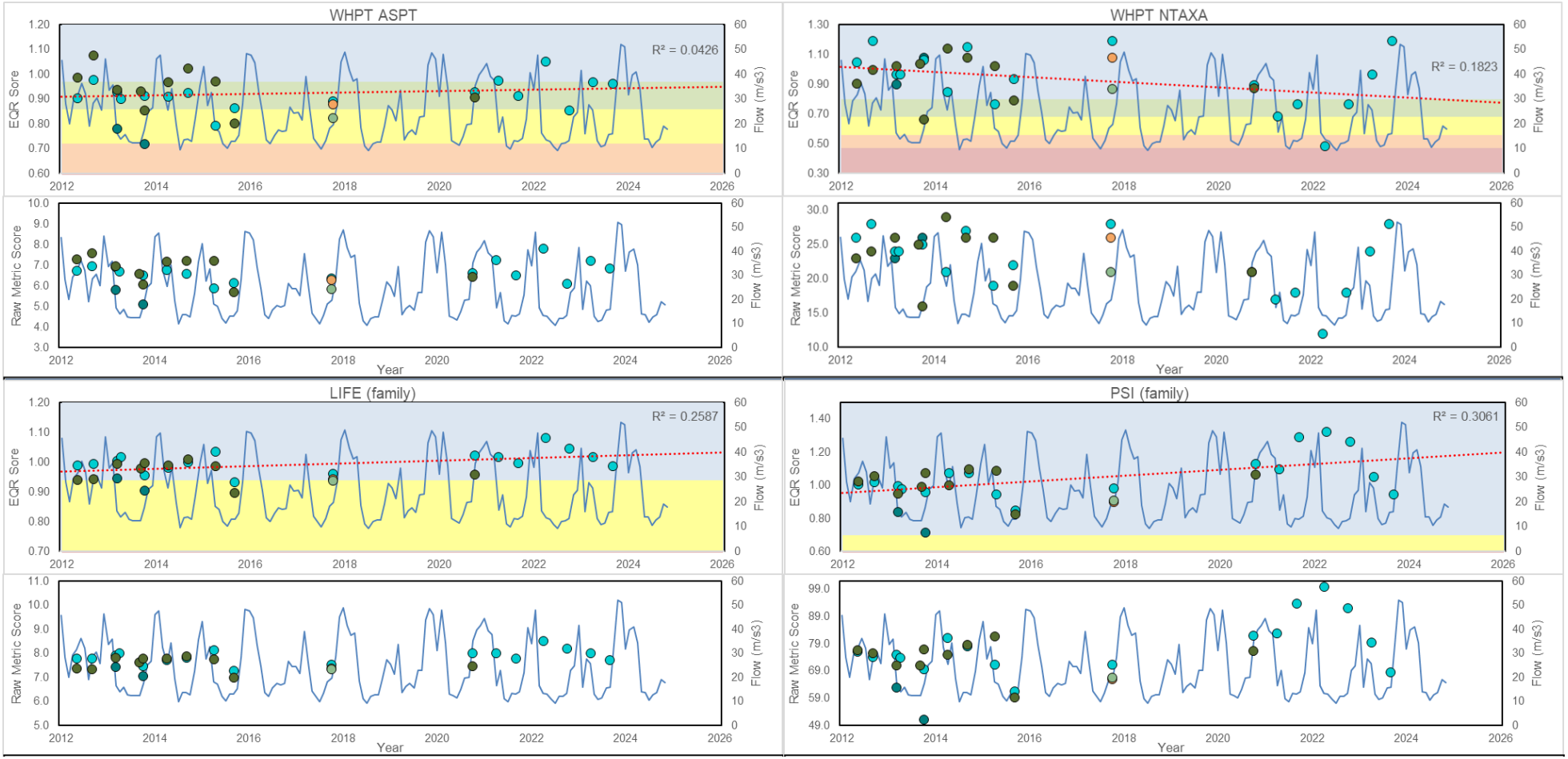


Figure B2-10: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.11.4.2Fish

Waterbody GB104027057600 Holme from Source to New Mill Dike is classified under Cycle 3 (2022) as 'poor', a deterioration from 'moderate' in 2019. The classification is informed by one site, Tennis Courts (ID 14180), classified as 'poor' in 2022, a deterioration from 'good' in 2019.

Baseline fisheries data is available for two sites, New Houses (ID 14128) and Co-op Lane (ID 14181). Both sites were surveyed in 2015, with Co-op Lane receiving an additional survey in 2019.

YWSL commissioned additional surveys at three sites, New Houses, Co-op Lane and Bottoms Dam (ID 14188). All three sites were surveyed in 2020 and 2021, with a further survey on Bottoms Dam in 2022.

Table B2-82 details survey sites within the Holme 2 reach.

Baseline fisheries data is informed by three sites, New Houses (ID 14128), Co-op Lane (ID 14181) and Bottoms Dam (ID 14188). No FCS2 data was available for the Environment Agency monitoring site within the impacted reach, FCS2 data was provided by Tennis Courts (ID 14180), located downstream of the impacted reach (Holme 3)

The WFD status of the fish community in Holme 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 Tennis Courts is individually classified as 'good' with a site EQR of 0.459, based on the FCS2 EQR scores from the 2023 survey. The site has moderate diversity, with only two species present from an expected four species. Trout had a moderate EQR score of 0.5753, with a slightly lower observed density than expected. The EQR score for bullhead was higher than expected at 1. Minnow and stone loach were expected to be present at the site in varied degrees of prevalence, however both species were not recorded.

Brown trout and bullhead were counted at every site during every survey year. Brown trout were present in moderate abundance, with a highest count of 67 in 2015 at Co-op Lane and lowest count of 18 at Bottoms Dam in 2022, although the Bottoms Dam survey utilised a single-catch methodology compared to the catch-depletion method utilised at Co-op Lane. Bullhead were present in moderate to high abundance, with a highest count of 132 in 2021 at Co-op Lane and lowest count of nine at Bottoms Dam in 2022. Three rainbow trout were recorded at Co-op Lane in 2021 and two perch in 2020 at Bottoms Dam.

With Tennis Courts being located downstream of the impacted reach in Holme 3, the site recorded an increased number of trout when compared to upstream. The fish community at Tennis Courts is significantly different to that of the sites surveyed in the impacted reach, and therefore not representative of sensitivity of the fish community in the impacted reach. The survey data from all three sites in the impacted reach indicated that a moderate abundance of brown trout and bullhead are likely to be present in the impacted reach.

Table B2-83 details species presence by year across all sites within the Holme 2 reach. 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 B2-82: Holme 2 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
14128	New Houses	SE1347907605	Electric Fishing (AC, PDC and DC)	4	2015	2021
14181	Co-op Lane	SE1256707013	Electric Fishing (AC, PDC and DC)	5	2015	2021
14188	Bottoms Dam	SE1310807362	Electric Fishing (AC, PDC and DC)	4	2020	2022

Table B2-83: Holme 2 Fish Survey Results

Tolerance Category[4]	Species Name	2015	2019	2020	2021	2022
High tolerance	Perch			X		
Low tolerance	Bullhead	X	X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X
Low tolerance	Rainbow trout				X	

B2.11.4.3WFD waterbody status

Table B2-84 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-84** 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 B2-84: WFD classifications

Waterbody ID & Name		GB104027057600 Holme from Source to New Mill Dike	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	Moderate	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Moderate	
	Macroinvertebrates	Moderate	
Waterbody Measures		None	

B2.11.5 Invasive non-native species (INNS)

Table B2-85 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 B2-85**).

Table B2-85: 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)*
INNS – Macroinvertebrates -Freshwater Shrimp *(Crangonyx pseudogracilis)* *-New Zealand mudsnail (Potamopyrgus antipodarum)* *-Caspian mud shrimp (Chelicorophium curvispinum)*	Major	The implementation of this drought permit 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)*
-Brown planarian flatworm (Dugesia tigrina)				
INNS – terrestrial plants -Japanese knotweed *(Fallopia japonica)* -Himalayan balsam *(Impatiens glandulifera)*	Major	The implementation of this drought permit is not expected to increase the distribution of this INNS.	Not sensitive	No

B2.11.6 Landscape, navigation, recreation and heritage

Table B2-86 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 B2-86**).

Table B2-86: 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)*
Angling on River Holme	Major	Casual angling only	Low	No
Other abstractions	Major	There is a non-public water supply abstraction that could potentially be derogated by the drought option	Uncertain	Yes

B2.12 HOLME 3

B2.12.1 Statutory designated sites

No statutory designated sites that are sensitive or susceptible to drought order impacts have been identified for detailed assessment.

B2.12.2 NERC and local wildlife sites

Table B2-87 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 order impacts have been identified for detailed assessment (see **Table B2-87**).

Table B2-87: 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)*
Hagg Wood LWS	Major	Plantation woodland predominantly of acidic oak/birch communities. Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Round Wood, Brockholes LWS	Major	Ancient & semi-natural woodland: species rich acid woodland. Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Cliff Wood LWS	Major	Species rich acid woodland, with native bluebell cover. Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitats - Lowland dry acid grassland -404190	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Deciduous woodland - 219507, 219351, 218570, 219667, 219502, 217708, 218761, 218797, 219314, 219237, 219325, 220011, 219458, 218379, 219596, 219918, 220411, 627075, 221292, 220087, 220235, 220346, 220614, 221156, 221055, 221702, 220398, 221526, 221416, 220620,	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)	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)*
219843, 220104, 219853, 220656, 220558, 219195, 219496, 219835, 219866, 218666, 219145, 218944, 219473				
NERC Priority Habitat – Traditional Orchard -738092, 738094, 738012, 738056,	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Ancient woodland -Hagg Wood	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No

B2.12.3 NERC and other protected species

Table B2-88 summarises 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 distribution of information and survey data for the species was considered to be limited. White-clawed crayfish have not been recorded within the impacted reach but were recorded downstream at Armitage Bridge as recently as 2025. Therefore, absence cannot be confirmed in Holme 3. 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 these species are considered to be susceptible to drought order impacts and have 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. The data showed no surveys or records have been recorded in the impacted reach. However, the data identifies that suitable habitat may be 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 order. Based on the limited available information otters considered to be susceptible to drought order 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. Review of EA records did not indicate the presence of water vole within the impacted reach, however information obtained from the West Yorkshire Biological Records Centre identified their presence. However, this information did not include quantitative data on populations of this species in the reach. 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 order. Based on the limited available information water vole considered to be susceptible to drought order 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 one NERC Act Section 41 fish species (brown trout) and one notable fish species (bullhead).

Table B2-88: 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 are not likely to be present in the impacted reach as signal crayfish are identified as present during a targeted survey.	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. 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 order 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, predation, inter and intra-species competition etc.	High	Yes
Notable Species – Fish Bullhead (*Cottus gobio)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, provision of cover, predation, inter and intra-species competition etc.	Medium	Yes

B2.12.4 WFD receptors

B2.12.4.1 Macroinvertebrates

The WFD waterbody GB104027057600 Holme from Source to New Mill Dike and GB104027063301 River Holme from Mag Brook to River Colne are both classified as 'moderate' for macroinvertebrates in 2022, Cycle 3. Limited baseline macroinvertebrate data is provided by two Environment Agency monitoring sites, Brockholes (ID 1415) and Site ID 188173. Site ID 1415 recorded one survey in 2017, with Site 188173 having had six surveys completed between 2021 and 2023.

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 recorded 'Bad' on one occurrence to 'Good' on three occurrences. See **Table B2-89** guidance in interpreting EQR scores for WHPT WFD classification.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores were available for these sites. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-11**.

Data from the monitoring site shows significant variation in $WHPT_{ASPT}$ scores over the period 2017 to 2023 with the standard to achieve poor to high WFD status over the monitoring period. $WHPT_{ASPT}$ scores from the site identifies macroinvertebrate communities which are composed of a poor to good proportion of taxa which are sensitive to pressures including water quality, $WHPT_{ASPT}$ scores ranged between 5.22 and 6.8, averaging 5.89, with the lowest $WHPT_{ASPT}$ score of 5.22 at Site 188173 in Autumn 2022, and the highest score of 6.8 at Site 188173 in Spring 2021. The $WHPT_{ASPT}$ expected scores for ranged between 6.44 to 7.17 across the sites, with three of the seven samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.81 and 1, averaging 0.88 with the lowest $WHPT_{ASPT}$ EQR of 0.81 at Site 188173 in Autumn 2022, and the highest EQR of 1 at the same site in Spring 2021.

Monitoring data shows variation in $WHPT_{NTAXA}$ scores, ranging between 12 and 24 (19.71) with the lowest $WHPT_{NTAXA}$ score of 12 at Site 188173 in Spring 2022, and the highest score of 24 at Site 188173 in Autumn 2023. The $WHPT_{NTAXA}$ expected scores ranged between 26.7 to 28.33 across the sites, with two of the seven samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.42 - 0.87 (0.71) with the lowest $WHPT_{NTAXA}$ EQR of 0.42 at Site 188173 in Spring 2022, and the highest EQR of 0.87 at the same site 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. $LIFE_{FAMILY}$ scores ranged between 7.14 - 8.44 (7.71) with the lowest $LIFE_{FAMILY}$ score of 7.14 at Site 188173 in Autumn 2023, and the highest score of 8.44 at Site 188173 in Spring 2022. The $LIFE_{FAMILY}$ expected scores ranged between 7.49 to 7.78 across the sites, with all samples above the 'Good/Moderate boundary'. $LIFE_{FAMILY}$ EQR scores ranged between 0.95 - 1.11 (1.02) with the lowest $LIFE_{FAMILY}$ EQR of 0.95 at Site 188173 in Autumn 2023, and the highest EQR of 1.11 at Site 188173 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 59 - 95.83 (71.72) with the lowest PSI_{FAMILY} score of 59 at Site 188173 in Autumn 2023, and the highest score of 95.83 at Site 188173 in Spring 2022. The PSI_{FAMILY} expected scores ranged between 62.6 to 71.95 across the sites, with 3 of the 7 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.94 - 1.43 (1.09) with the lowest PSI_{FAMILY} EQR of 0.94 at Site 1415 in Spring 2017, and the highest EQR of 1.43 at Site 188173 in Spring 2022.

A total of three INNS species, including *Pacifastacus leniusculus Potamopyrgus antipodarum*, and *Crangonyx pseudogracilis*were recorded as present at site 188173 between 2021 to 2023. No designated species were recorded during the monitoring period.

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**.

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

Baseline data indicates that under present conditions, the macroinvertebrate community in Holme 3 is moderately sensitivity to reduced flows (**Figure B2-11**).

A summary of the above data is presented within **Table B2-89.** Based on the available information the macroinvertebrate community is considered to be susceptible to drought order impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

Table B2-89: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	LIFE Family EQR Score	LIFE Family Score	PSI Family EQR Score	PSI Family Score	WHPT ASPT EQR Score	WHPT ASPT EQR Class	WHPT ASPT Score	WHPT NTAXA EQR Score
1415	SE1509310872	1	2017	0.97	7.53	0.94	67.5	6.21	0.79	G	21
188173	SE1399312183	6	2021 to 2023	0.95 - 1.11 (1.02)	7.14 - 8.44 (7.74)	0.94 - 1.43 (1.11)	59 - 95.83 (72.42)	5.22 - 6.8 (5.84)	0.42 - 0.87 (0.7)	B - H (G)	12 - 24 (20)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High

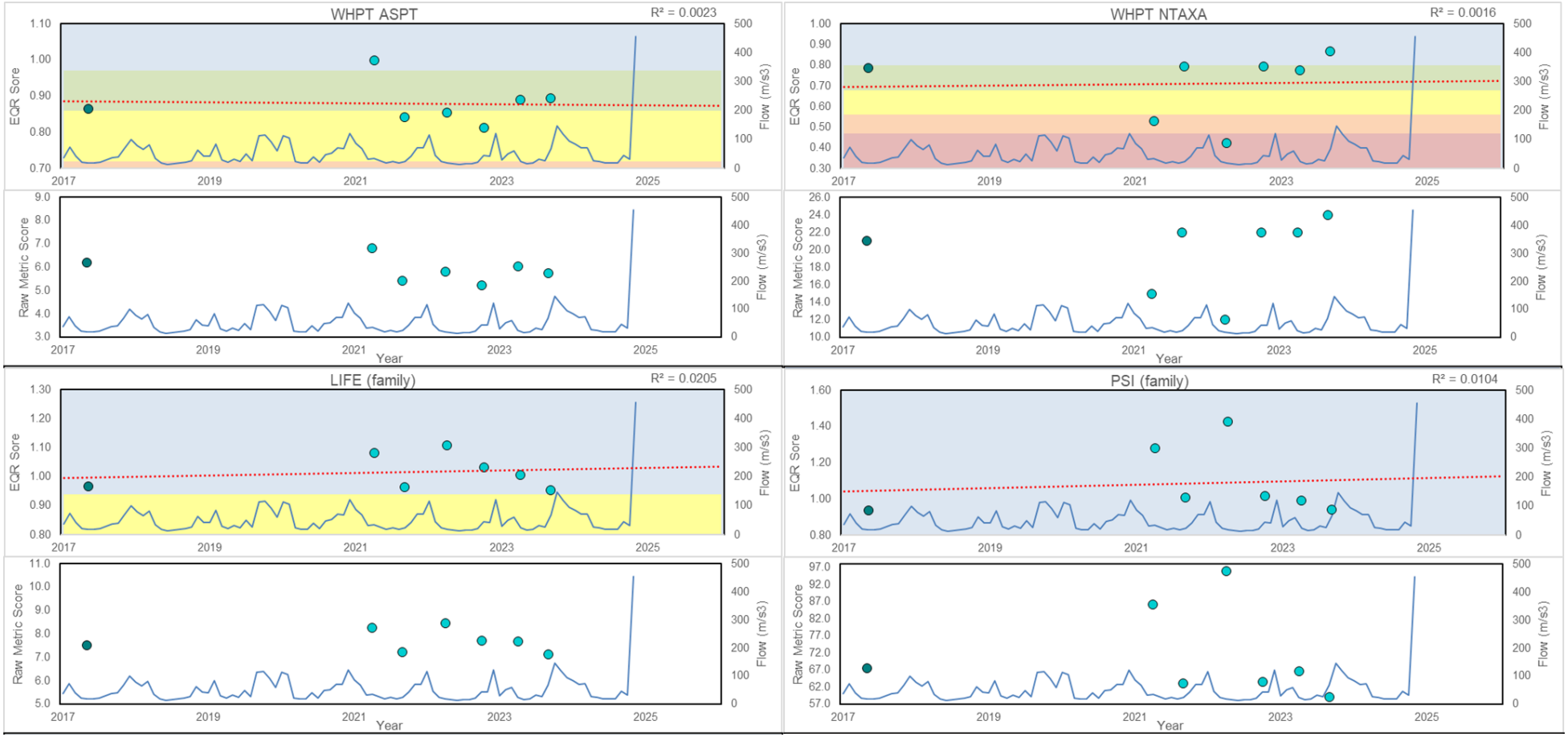


Figure B2-11: Macroinvertebrate EQR scores (Top) and observed scores (Bottom) for $WHPT_{NTAXA}$, $WHPT_{ASPT}$, $LIFE_{FAMILY}$ and PSI_{FAMILY} scores

B2.12.4.2Fish

Waterbody GB104027057600 Holme from Source to New Mill Dike is classified under Cycle 3 (2022) as 'poor', a deterioration from 'moderate' in 2019. The classification is informed by one site, Tennis Courts (ID 14180), classified as 'poor' in 2022, a deterioration from 'good' in 2019.

Waterbody GB104027063301 Holme from New Mill Dike to R Colne is classified under Cycle 3 (2022) as 'good' for fish. The waterbody is a merger of the previously impacted waterbody GB10402063300 River Holme from Mag Brook to River Colne which was classified as 'moderate' in Cycle 2 (2016) and GB10402763600 River Holme from New Mill Dike to Mag Brook. The classification of GB104027063301 is informed by one site, Berry Brow (ID 12006), last classified in 2019.

Baseline fisheries data is available for four sites, Tennis Courts, Brockholes (ID 45184), Sands Recreation Ground (ID 14129) and Co-op Car Park (ID 14187). Tennis courts was surveyed in 2010 through to 2012, 2017, 2019 and 2023. Sands Recreation Ground was surveyed in 2015 and 2019, Brockholes in 2012 and Co-op Car Park in 2019.

YWSL commissioned additional surveys at three sites, Co-op Car Park, Sands Recreation Ground and Tennis Courts. All three sites were surveyed in 2020 and 2021, with Tennis Courts and Co-op car park receiving a further survey in 2022. **Table B2-90** details survey sites within the Holme 3 reach.

FCS2 data was only available for the Environment Agency monitoring site, Tennis Courts (ID 14180).

The WFD status of the fish community in Holme 3 may be impacted by drought order implementation. However, low flow impacts of the drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only), and therefore impacts of drought order implementation must be considered in the context of environmental drought.

The site Tennis Courts is individually classified as 'good' with a site EQR of 0.459, based on the FCS2 EQR scores from the 2023 survey. The site has moderate diversity, with only two species present from an expected four species. Trout had a moderate EQR score of 0.5753, with a slightly lower observed density than expected. The EQR score for bullhead was higher than expected at 1. Minnow and stone loach were expected to be present at the site in varied degrees of prevalence, however both species were not recorded.

Brown trout and bullhead were present during every year of survey, with bullhead absent at Brockholes in 2012 and brown trout absent at Sands Recreation Ground in 2019. Brown trout abundance varies throughout the reach, but typically counts have decreased with survey recency. Bullhead abundance also varies throughout the reach but does not show the same general decline as brown trout, with a highest log-abundance estimate of 100-999 at Tennis Courts in 2010, whilst the lowest count was at the same site in 2019 with eight individuals. The 2010 survey at Tennis Courts noted log abundances of 1-9 for minnow and 100-999 for stone loach, neither were counted again at the same site, furthermore, the only additional record of stone loach was at Brockholes in 2012 with one individual.

Table B2-91 details species presence by year across all sites within the Holme 3 reach. 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 order impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-90: Holme 3 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
14129	Sands Recreation Ground	SE1460009200	Electric Fishing (AC, PDC and DC)	5	2015	2021
14180	Tennis Courts	SE1480909695		9	2010	2023
14187	Co-op car park	SE1431708330		4	2019	2022
45184	Brockholes	SE1507310995		1	2012	2012

Table B2-91: Holme 3 Fish Survey Results

Tolerance Category[4]	Species Name	2010	2011	2012	2015	2017	2019	2020	2021	2022	2023
Medium tolerance	Minnow	X									
Medium tolerance	Stone loach	X		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

B2.12.4.3WFD waterbody status

Table B2-92 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-92** 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 B2-92: WFD classifications

Waterbody ID & Name		GB104027057600Holme from Source to New Mill Dike	GB104027063301 Holme from New Mill Dike to R Colne	Sensitivity (Uncertain, High, Medium, Low, Not Sensitive)
Physical Environment Impact at Location *(Major, Moderate, Minor, Negligible)*		Major		
RBMP Cycle 3 Status/ Potential	Overall	Moderate	Moderate	
	Fish	Poor	Good	Medium
	Macroinvertebrates	Moderate	Moderate	Medium
Hydro-morph designation		Heavily modified	Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	Moderate	
	Fish	Moderate	Good	
	Macroinvertebrates	Moderate	Moderate	
Waterbody Measures		None	None	

B2.12.5 Invasive non-native species (INNS)

Table B2-93 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 order impacts have been identified, as per the UKTAG INNS Alarm List[5] (see **Table B2-93**).

Table B2-93: 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)*
INNS – mammals -American mink (*Neovision vision*)	Major	The implementation of this drought order is not expected to increase the	Not sensitive	No

[5] Water Framework Directive UK Technical Advisory Group (2015), UKTAG INNS Alarm List v1.2.pdf

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)*
		distribution of these INNS.		
INNS – macroinvertebrates -Freshwater Shrimp *(Crangonyx pseudogracilis)* -Signal crayfish *(Pacifastacus leniusculus)* -New Zealand mud snail *(Potamopyrgus antipodarum)*	Major	The implementation of this drought order is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Japanese knotweed *(Fallopia japonica)* -Himalayan balsam *(Impatiens glandulifera)*	Major	The implementation of this drought order is not expected to increase the distribution of this INNS.	Not sensitive	No

B2.12.6 Landscape, navigation, recreation and heritage

Table B2-94 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 order impacts have been identified (see **Table B2-94** .

Table B2-94: 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)*
Angling on River Holme	Major	Casual angling only	Low	No

B2.13 HOLME 4

B2.13.1 Statutory designated sites

Table B2-95 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 B2-95**).

Table B2-95: 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)*
Upper Park Wood – Local Nature Reserve	Major	No water dependent Receptors	Not sensitive	No

B2.13.2 NERC and local wildlife sites

Table B2-96 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 B2-96**).

Table B2-96: 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)*
NERC Priority Habitat – Ancient Woodland -Park Wood LWS	Major	A large strip of ancient woodland consisting predominantly of oak with occasional sycamore and beech, and a holly and birch underlayer. Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Deciduous woodland - 219113, 219596, 219458, 219502, 219325, 219237, 219314, 219667, 219062, 218761, 218797, 219507, 218570, 217708, 219523, 219939, 219437, 219351, 217824, 218183, 218896, 218040, 218266, 217984,	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)	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)*
218563, 218266, 217984, 217874, 217939, 218105, 217743, 218105, 218161, 217762, 218252, 218105, 217463, 218630, 217743, 219503, 219089, 219091, 219619, 219763, 219980				

B2.13.3 NERC and other protected species

Table B2-97 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

The nationally scarce species of *Atherix ibis* have been identified as being present in Holme 4. The species was identified in routine sampling carried out by the Environment Agency within the impacted reach. Based on the available information these receptors are considered to be susceptible to drought option impacts and has 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 white-clawed crayfish in the impacted reach. Anecdotal information provided by the Environment Agency suggest white-clawed crayfish are present on Dean Brook, adjacent to the impacted reach and therefore adopting a precautionary approach it is assumed they are present in this section, even if they are just individuals displaced downstream. Additionally, an individual was recorded during routine fisheries survey in 2022 at Huddersfield RUFC. 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.**

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. The data showed no surveys or records have been recorded in the impacted reach. However, 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, YWSL and a review of available data from NBN gateway was used inform the assessment of water vole in the impacted reach. Review of EA records did not indicate the presence of water vole within the impacted reach, however information obtained from the West Yorkshire Biological Records Centre identified their presence. However, this information did not include quantitative data on populations of this species in the reach. 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 water vole considered to be susceptible to drought permit impacts and have a **medium** 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 two notable fish species (bullhead and grayling).

Table B2-97: 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)*
Notable Species – Invertebrates *Atherix ibis*	Moderate/Minor	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.	Low	Yes
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. 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.	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, predation, inter and intra-species competition etc.	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, predation, inter and intra-species competition etc.	Medium	Yes

B2.13.4 WFD Receptors

B2.13.4.1 Macroinvertebrates

The WFD waterbody GB104027063301 Holme from New Mill Dike to R Colne classifies as 'moderate' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by three Environment Agency monitoring sites, Queensmill (181), U/S Dean Clough (98961) and D/S Mag Brook (1571). The indicative WFD classification for these sites are based on the worst classification between $WHPT_{ASPT}$ and NTAXA, these ranged between 'Bad' on one occurrence to 'Good' on four occurrences.

The WFD status of the macroinvertebrate community in Holme 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.

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 Holme 4 has a medium to high sensitivity to reduced flows (**Figure B2-12**). See **Table B2-3** for guidance in interpreting raw LIFE scores.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-12**.

Data from the monitoring site shows significant variation in $WHPT_{ASPT}$ scores over the period 2015 to 2023 with the standard to achieve moderate WFD status over the monitoring period. $WHPT_{ASPT}$ scores from the site identifies macroinvertebrate communities which are composed of a poor to good proportion of taxa which are sensitive to pressures including water quality, 4.54 and 6.43, averaging 5.63, with the lowest $WHPT_{ASPT}$ score of 4.54 at Site 98961 in Autumn 2015, and the highest score of 6.43 at Site 98961 in Spring 2023. The $WHPT_{ASPT}$ expected scores for ranged between 6.63 to 7.05 across the sites, with 13 of the 20 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.68 and 0.91 (0.83) with the lowest $WHPT_{ASPT}$ EQR of 0.68 at Site 98961 in Autumn 2015, and the highest EQR of 0.91 at Site 98961 in Spring 2023.

In Holme 4 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ ranging between $WHPT_{NTAXA}$ scores ranged between 9 and 23 (17.05) with the lowest $WHPT_{NTAXA}$ score of 9 at Site 98961 in Spring 2021, and the highest score of 23 at Site 181 in Autumn 2015. The $WHPT_{NTAXA}$ expected scores ranged between 24.88 to 26.76 across the sites, with 11 of the 20 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.34 and 0.92 (0.66) with the lowest $WHPT_{NTAXA}$ EQR of 0.34 at Site 98961 in Spring 2021, and the highest EQR of 0.92 at Site 181 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. $LIFE_{FAMILY}$ scores ranged between 6.69 and 8.1, averaging 7.71, with the lowest $LIFE_{FAMILY}$ score of 6.69 at Site 98961 in Autumn 2015, and the highest score of 8.1 at Site 98961 in Spring 2018. The $LIFE_{FAMILY}$ expected scores ranged between 7.58 to 7.76 across the sites, with 3 of the 20 samples below the 'Good/Moderate' boundary. LIFE(family) EQR scores ranged between 0.88 and 1.05 (1.01) with the lowest $LIFE_{FAMILY}$ EQR of 0.88 at Site 98961 in Autumn 2015, and the highest EQR of 1.05 at Site 98961 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 42.86 and 91.3, averaging 70.39, with the lowest PSI_{FAMILY} score of 42.86 at Site 98961 in Autumn 2015, and the highest score of 91.3 at Site 98961 in Spring 2022. The PSI_{FAMILY} expected scores ranged between 65.59 to 70.98 across the sites, with 8 of the 20 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.65 and 1.3 (1.03) with the lowest PSI_{FAMILY} EQR of 0.65 at Site 98961 in Autumn 2015, and the highest EQR of 1.3 at Site 98961 in Spring 2022.

A total of two INNS species, including *Potamopyrgus antipodarum* and *Crangonyx pseudogracilis*, were recorded as present at two sites between 2010 to 2023. A single designated species, *Atherix ibis,* was recorded at two sites in 2021.

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 B2-98: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{Family}$ EQR Score	$LIFE_{Family}$ Score	PSI_{Family} EQR Score	PSI_{Family} Score	$WHPT_{ASPT}$ EQR Score	$WHPT_{ASPT}$ EQR Class	$WHPT_{ASPT}$ Score	$WHPT_{NTAXA}$ EQR Score	$WHPT_{NTAXA}$ EQR Class	$WHPT_{NTAXA}$ Score
181	SE1425815787	9	2015 to 2023	0.91 - 1.04 (1)	6.89 - 8.1 (7.66)	0.83 - 1.22 (1.02)	56.76 - 86.4 (70.16)	0.75 - 0.91 (0.83)	M - G (M)	5.22 - 6.29 (5.69)	0.55 - 0.92 (0.7)	P - H (G)	14 - 23 (18)
1571	SE1412312701	1	2017	1.05	8.08	1.06	72.97	0.83	M	5.63	0.71	G	18
98961	SE1341413848	10	2015 to 2023	0.88 - 1.05 (1.01)	6.69 - 8.1 (7.71)	0.65 - 1.3 (1.03)	42.86 - 91.3 (70.35)	0.68 - 0.91 (0.82)	P - G (M)	4.54 - 6.43 (5.59)	0.34 - 0.81 (0.62)	B - H (M)	9 - 21 (16)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High

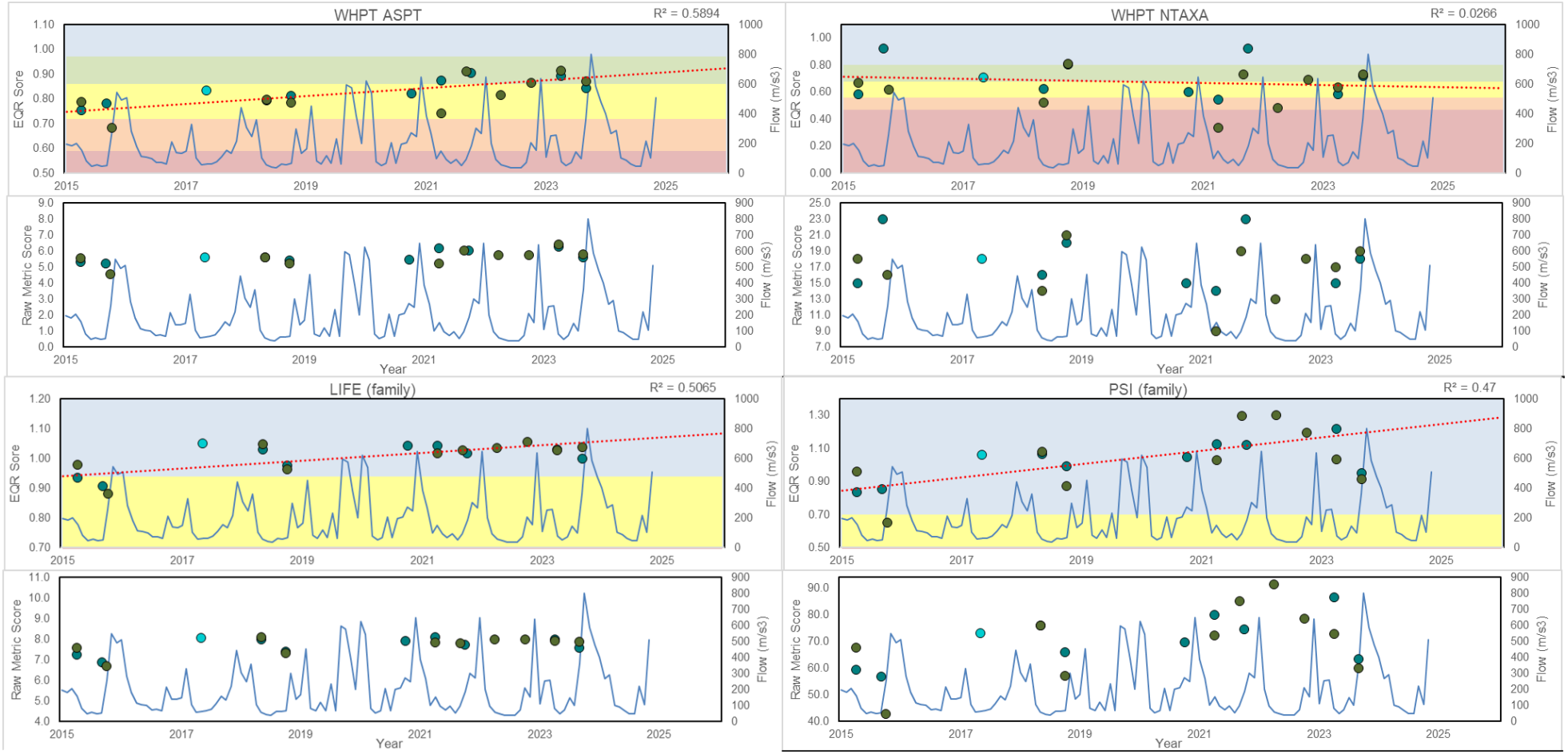


Figure B2-12: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.13.4.2Fish

Waterbody GB104027063301 Holme from New Mill Dike to R Colne is classified as 'Good' under Cycle 3 (2022). The classification is informed by one site, Berry Brow (12006), classified as 'good' in 2022.

Baseline fisheries data is available for four sites, Berry Brow (ID 12006), Lockwood (ID 45182), Honley (ID 45183) and Huddersfield RUFC (ID 11944). Lockwood and Honley were both surveyed in 2012. Berry Brow was surveyed in 2010, with both Berry Brow and Huddersfield RUFC were surveyed in 2015.

YWSL commissioned additional surveys at two sites, Huddersfield RUFC and Berry Brow. Both sites were surveyed in 2021 and 2022, with Huddersfield also surveyed in 2020 and Berry Brow in 2023. **Table B2-99** details survey sites within the Holme 4 reach.

The WFD status of the fish community in Holme 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 Berry Brow is individually classified as 'good' with a site EQR of 0.6788, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively high diversity, with five species present from an expected five species. Trout had a lower observed density than expected, with an EQR score of 0.4113. Bullhead, stone loach and minnow are present at a level that meets/exceeds expectations, with an EQR scores of 1. The EQR score for grayling was high at 0.783, due to the higher than expected density and low expected prevalence score of 0.356.

Baseline fish data for sites within the impacted reach showed similar species diversity with the classification site. Brown trout were counted at every site during every year of survey in low to moderate abundance, with a highest count of 56 in 2023 at Berry Brow and lowest count of 4 in 2012 at Berry Brow. Grayling were counted every year of survey in low to moderate abundance, with a highest count of 38 at Huddersfield RFC in 2022 and lowest count of one at Lockwood in 2012. Bullhead were only counted at Huddersfield RUFC and Berry Brow in low to moderate abundance, with a highest count of 81 in 2022 at Berry Brow and multiple records of just one individual. The minor species present included minnow, stone loach and 3-spined stickleback, which were in low abundance. Minnow were absent from 2021 to 2023 surveys, even at sites they had been captured at previously.

Table B2-100 details species presence by year across all sites within the Holme 4 reach. 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 B2-99: Holme 4 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
11844	Huddersfield RUFC	SE1318414634	Electric Fishing (AC, PDC and DC)	4	2015	2022
12006	Berry Brow	SE1349913643	Electric Fishing (AC, PDC and DC)	6	2010	2023
45182	Lockwood	SE1363315053	Electric Fishing (AC, PDC and DC)	1	2012	2012
45183	Honley	SE1409711986	Electric Fishing (AC, PDC and DC)	1	2012	2012

Table B2-100: Holme 4 Fish Survey Results

Tolerance Category[4]	Species Name	2010	2012	2015	2020	2021	2022	2023
High tolerance	3-spined stickleback	X	X			X	X	X
Medium tolerance	Minnow	X	X	X	X			
Medium tolerance	Stone loach			X	X	X	X	X
Low tolerance	Bullhead			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

B2.13.4.3WFD waterbody status

Table B2-101 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-101** 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 B2-101: WFD classifications

Waterbody ID & Name		**GB104027063301 Holme from New Mill Dike to R Colne**	**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	High
	Macroinvertebrates	Moderate	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Good	
	Macroinvertebrates	Moderate	
Waterbody Measures		None	

B2.13.5 Invasive non-native species (INNS)

Table B2-102 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 B2-102**).

Table B2-102: 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)*
INNS – Macroinvertebrates -Freshwater Shrimp *(Crangonyx pseudogracilis)* -New Zealand mud snail *(Potamopyrgus antipodarum)*	Major	The implementation of this drought permit is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Japanese knotweed *(Fallopia japonica)* -Himalayan balsam	Major	The implementation of this drought permit is not expected to increase the distribution of this 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)*
(Impatiens glandulifera)				

B2.13.6 Landscape, navigation, recreation and heritage

Table B2-103 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 B2-103**).

Table B2-103: 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)*
Angling on River Holme	Major	Casual angling only	Low	No

B2.14 HOLME T1

B2.14.1 Statutory designated sites

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

B2.14.2 NERC and local wildlife sites

Table B2-104 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 B2-104**).

Table B2-104: 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)*
Digley Reservoir/Marsden Clough LWS	Major	Digley Reservoir/Marsden Clough supports a mosaic of the semi-natural habitats. The site contains reservoirs, upstream valleys, coniferous and plantation woodland, and heathland. Digley Reservoir is home to 138 species of birds. However, 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	No
Yateholme Reservoirs and Plantations LWS	Major	A large site encompassing a wide mixture of habitats including woodland, heathland, acid grassland, mire, standing water and running water. However, 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	No
NERC Priority Habitats - Deciduous woodland -326184, 215947, 215051, 215507,	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitats - Lowland dry acid grassland -404190, 513424	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitat – Good quality semi-improved grassland - 476055	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)*
NERC Priority Habitat – Ancient woodland -Green Wood	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No

B2.14.3 NERC and other protected species

Table B2-105 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 records from the NBN Gateway were used to inform the assessment of white-clawed crayfish within the impacted reach. No surveys or records of the species were identified within the reach. Furthermore, River Habitat Survey data indicated that suitable habitat for white-clawed crayfish is not present within the impacted reach. Given the absence of records and the lack of suitable habitat, white-clawed crayfish have been excluded from further assessment.

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. The data showed no surveys or records have been recorded in the impacted reach. However, 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, YWSL 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. Based on an assessment of habitat, during an Environment Agency walkover survey, no suitable habitat was observed. Based on the absence of suitable habitat in the impacted reach, the Receptor is not considered at risk from the drought permit. 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.**

One NERC act section 41 and notable fish species (brown trout) has been identified as present in the impacted reach.

Table B2-105: 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 are available for the impacted reach. However, River Habitat Survey data indicate that the impacted reach does not provide suitable habitat for white-clawed crayfish. As a result, white-clawed crayfish are considered unlikely to occur within the reach, and no further assessment has been undertaken.	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 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 are not likely to be present in the impacted reach as identified by an assessment of habitat during an Environment Agency walkover survey.	Not sensitive	No
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, predation, inter and intra-species competition etc.	High	Yes

B2.14.4 WFD Receptors

B2.14.4.1 Macroinvertebrates

The WFD waterbody GB104027057600 Holme from Source to New Mill Dike classifies as 'moderate' for macroinvertebrates in 2022, Cycle 3. Baseline macroinvertebrate data is provided by three Environment Agency monitoring sites, Site ID 1192, Holmbridge (ID1193) and D/S Digley Reservoir (ID 1583). The indicative WFD classification for these sites are based on the worst classification between $WHPT_{ASPT}$ and NTAXA, these ranged between 'Bad' on two occurrences to 'High' on 10 occurrences.

The WFD status of the macroinvertebrate community in Holme T1 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 Holme T1 has a medium to high sensitivity to reduced flows (**Figure B2-13**). See **Table B2-3** for guidance in interpreting raw LIFE scores.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the sites. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **Figure B2-13**.

Data from the monitoring site shows variation in $WHPT_{ASPT}$ scores over the period 2010 to 2023 but remain consistent with the standard to achieve moderate or high WFD status. $WHPT_{ASPT}$ scores from the reach identifies macroinvertebrate communities which are composed of a moderate to high proportion of taxa which are sensitive to pressures including water quality, $WHPT_{ASPT}$ scores ranged between 5.8 and 8.07, averaging 6.94, with the lowest $WHPT_{ASPT}$ score of 5.8 at Site 1193 in Autumn 2013, and the highest score of 8.07 at Site 1193 in Spring 2021. The $WHPT_{ASPT}$ expected scores for ranged between 7.1 to 7.42 across the sites, with two of the 27 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.82 and 1.1 (0.97) with the lowest $WHPT_{ASPT}$ EQR of 0.82 at Site 1193 in Autumn 2013, and the highest EQR of 1.1 at Site 1192 in Spring 2012.

In Holme T1 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ ranging between 11 and 35, averaging 22.33 with the lowest $WHPT_{NTAXA}$ score of 11 at Site 1193 in Spring 2021, and the highest score of 35 at Site 1193 in Autumn 2014. The $WHPT_{NTAXA}$ expected scores ranged between 23.67 to 24.99 across the sites, with 7 of the 27 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.44 and 1.48 (0.92) with the lowest $WHPT_{NTAXA}$ EQR of 0.44 at Site 1193 in Spring 2021, and the highest EQR of 1.48 at Site 1193 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 7.18 and 8.67, averaging 7.66, with the lowest $LIFE_{FAMILY}$ score of 7.18 at Site 1583 in Autumn 2012, and the highest score of 8.67 at Site 1193 in Autumn 2022. The $LIFE_{FAMILY}$ expected scores ranged between 7.82 to 7.86 across the sites, with 3 of the 27 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.92 and 1.11 (0.98) with the lowest $LIFE_{FAMILY}$ EQR of 0.92 at Site 1583 in Autumn 2012, and the highest EQR of 1.11 at Site 1193 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 60 and 100, averaging 74.28, with the lowest PSI_{FAMILY} score of 60 at Site 1193 in Autumn 2013, and the highest score of 100 at Site 1193 in Autumn 2022. The PSI_{FAMILY} expected scores ranged between 72.37 to 75.3 across the sites, with 16 of the 27 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.83 and 1.38 (1.01) with the lowest PSI_{FAMILY} EQR of 0.83 at Site 1193 in Autumn 2013, and the highest EQR of 1.38 at Site 1193 in Autumn 2022.

A total of three INNS species, including *Potamopyrgus antipodarum, Dugesia tigrina* and *Crangonyx pseudogracilis/floridanus* were recorded as present in the reach between 2010 to 2023.

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 B2-106: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{Family}$ EQR Score	$LIFE_{Family}$ Score	PSI_{Family} EQR Score	PSI_{Family} Score	$WHPT_{ASPT}$ EQR Score	$WHPT_{ASPT}$ EQR Class	$WHPT_{ASPT}$ Score	$WHPT_{NTAXA}$ EQR Score	$WHPT_{NTAXA}$ EQR Class	$WHPT_{NTAXA}$ Score
1192	SE1209906699	6	2013 to 2014	0.94 - 1.01 (0.98)	7.36 - 7.9 (7.68)	0.86 - 1.08 (0.98)	63.16 - 79.55 (71.85)	0.92 - 1.1 (1.01)	G - H (H)	6.53 - 7.82 (7.2)	1 - 1.16 (1.08)	H - H (H)	24 - 28 (26)
1193	SE1181106716	13	2012 to 2023	0.94 - 1.11 (0.98)	7.31 - 8.67 (7.71)	0.83 - 1.38 (1.05)	60 - 100 (77.28)	0.82 - 1.09 (0.94)	M - H (G)	5.8 - 8.07 (6.79)	0.44 - 1.48 (0.83)	B - H (H)	11 - 35 (20)
1583	SE1173906782	8	2010 to 2014	0.92 - 1.01 (0.97)	7.18 - 7.88 (7.57)	0.87 - 1.1 (0.97)	63.64 - 80.56 (71.25)	0.92 - 1.05 (0.98)	G - H (H)	6.55 - 7.5 (6.98)	0.79 - 1.16 (0.96)	G - H (H)	19 - 28 (23)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High

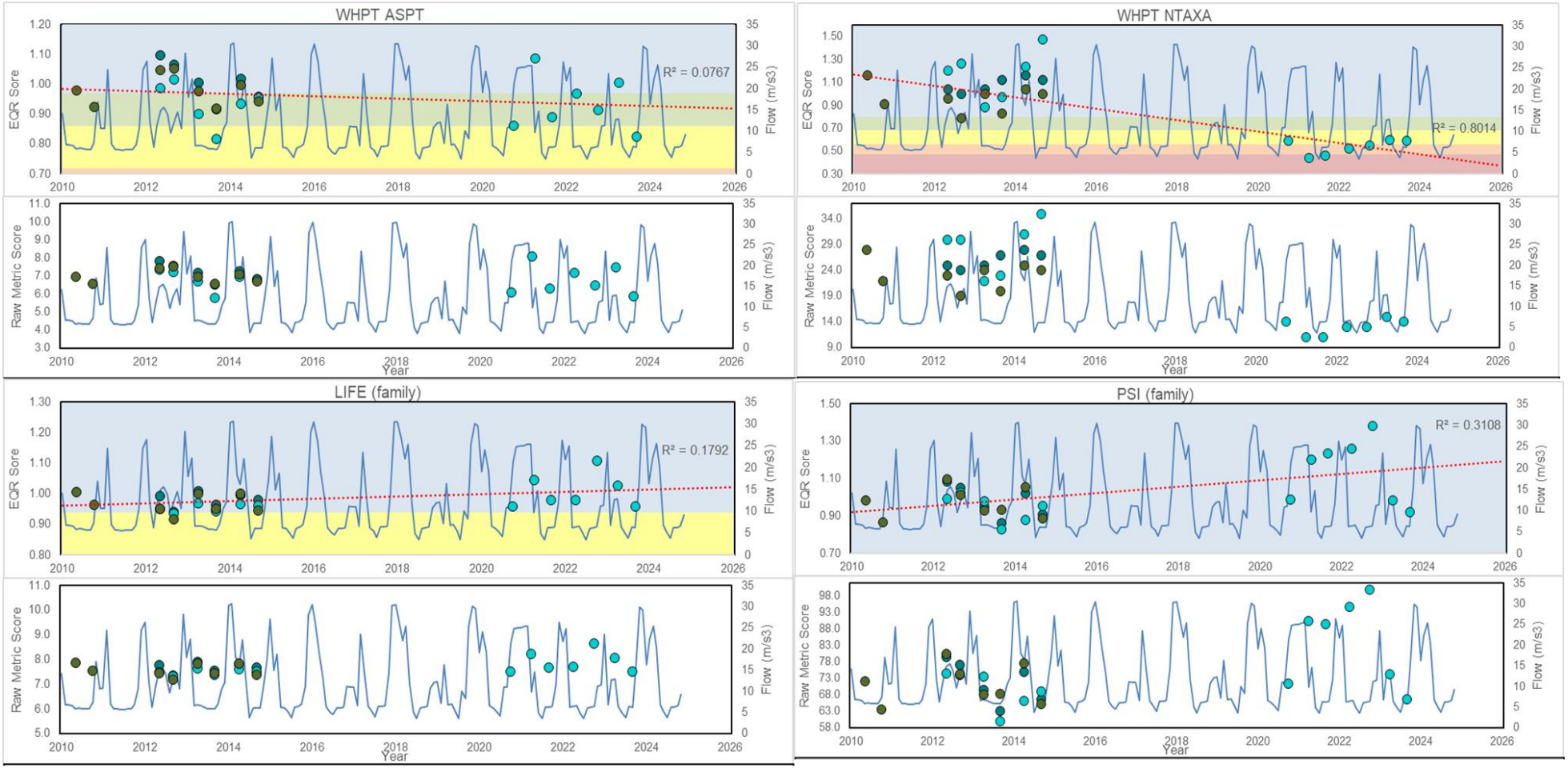


Figure B2-13: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.14.4.2Fish

Waterbody GB104027057600 Holme from Source to New Mill Dike is classified under Cycle 3 (2022) as 'poor', a deterioration from 'moderate' in 2019. The classification is informed by one site, Tennis Courts (ID 14180), classified as 'poor' in 2022, a deterioration from 'good' in 2019.

Baseline fisheries data is informed by one site, D/S Digley Reservoir (WR) (11993) which was surveyed in 2009. No FCS2 data was available for the Environment Agency monitoring site within the impacted reach, FCS2 data was provided by Brownhill Reservoir (WR) (ID 35969), located adjacent to the impacted reach (Holme 1).

YWSL commissioned additional surveys at D/S Digley Reservoir (WR) in 2020 through to 2023.

Table B2-107 details survey sites within the Holme T1 reach.

The WFD status of the fish community in Holme T1 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 Brownhill Reservoir (WR) is individually classified as 'good' with a site EQR of 0.42, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively good diversity, with two species present from an expected three species. Trout had an EQR score of 0.338, with a lower observed density than expected. Bullhead were observed at increased numbers, with an EQR score of 1. Stone loach were expected at a low prevalence score of 0.3973, but were not recorded at the site

With Brownhill Reservoir (WR) being located adjacent to the impacted reach in Holme 1, the site recorded an increased number of trout when compared to the impacted reach. The fish community at Brownhill Reservoir (WR) is significantly different to that of the sites surveyed in the impacted reach, and therefore not representative of sensitivity of the fish community in the impacted reach.

Brown trout were the only species captured during all fish surveys, in moderate abundance. Numbers counted remained consistent from 2020 to 2023.

Table B2-108 details species presence by year across all sites within the Holme T1 reach. 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 B2-107: Holme T1 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
11993	d/s Digley Res (WR)	SE1169906789	Electric Fishing (AC, PDC and DC)	4	2020	2023

Table B2-108: Holme T1 Fish Survey Results

Tolerance Category[4]	Species Name	2020	2021	2022	2023
Low tolerance	Brown trout	X	X	X	X

B2.14.4.3WFD waterbody status

Table B2-109 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-109** 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 B2-109: WFD classifications

Waterbody ID & Name		**GB104027057600 Holme from Source to New Mill Dike**	**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	Moderate	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Moderate	
	Macroinvertebrates	Moderate	
Waterbody Measures		None	

B2.14.5 Invasive non-native species (INNS)

Table B2-110 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 B2-110**).

Table B2-110: 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)*
INNS – Macroinvertebrates -Freshwater Shrimp *(Crangonyx pseudogracilis)* -New Zealand mudsnail *(Potamopyrgus antipodarum)* -Brown planarian flatworm *(Dugesia tigrina)*	Major	The implementation of this drought permit is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Japanese knotweed *(Fallopia japonica)* -Himalayan balsam *(Impatiens glandulifera)*	Major	The implementation of this drought permit is not expected to increase the distribution of this INNS.	Not sensitive	No

B2.14.6 Landscape, navigation, recreation and heritage

Table B2-111 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 B2-111**).

Table B2-111: 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)*
Angling on River Holme	Major	Casual angling only	low	No

B2.15 HOLME T3

B2.15.1 Statutory designated sites

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

B2.15.2 NERC and local wildlife sites

Table B2-112 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 B2-112**).

Table B2-112: 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)*
Blackmoor Foot Reservoir LWS	Major	Blackmoorfoot Reservoir is a haven for wildlife and migrating birds. The site hosts rich grassland, standing water and regionally rare fern *Asplenium adiantum nigrum.* Also present are uncommon wintering bird species and nationally notable insect species. However, 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	No
Honley Wood LWS	Major	Honley Woods is one of West Yorkshire's largest remaining ancient semi-natural woodland areas. Covering 60 hectares (150 acres), it is an important example of upland oak woodland and is a key part of the local forest habitat network. Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Banks Wood LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Hall Heys Wood LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Folly Dolly Falls LWS	Major	The site is a waterfall in a small valley shaded by trees. The face of the waterfall is a massive sandstone exposure of the Upper carboniferous Huddersfield White Rock with cross bedding. However, 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	No
NERC Priority Habitat – Ancient Woodland	Major	Honley Woods is one of West Yorkshire's largest remaining ancient semi-natural woodland areas. Covering 60 hectares (150 acres), it is an important example of upland	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)*
- Spring Wood, Honley LWS		oak woodland and is a key part of the local forest habitat network. Unlikely to be in connectivity with impacted reach or support aquatic receptors.		
NERC Priority Habitat – Deciduous woodland - 211669, 212142, 212499, 212456, 212588, 212499, 212456, 212588, 212787, 212856, 213848, 213831, 214450, 214238, 214122, 215900, 217724, 216493, 215780, 215908, 217274, 217708, 218570, 219351, 219113, 219062, 216493	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Species include English oak (*Quercus robur*), ash (*Fraxinus excelsior*), silver birch (*Betula pendula*), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), soft rush (*Juncus effusus*), common reedmace (*Typha latifolia*), and reed sweet grass (*Glyceria maxima*)	Not sensitive	No

B2.15.3 NERC and other protected species

Table B2-113 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 records from the NBN Gateway were used to inform the assessment of white-clawed crayfish within the impacted reach. No surveys or records of the species were identified within the reach. Furthermore, River Habitat Survey data indicated that suitable habitat for white-clawed crayfish is not present within the impacted reach. Given the absence of records and the lack of suitable habitat, white-clawed crayfish have been excluded from further assessment.

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. The data showed historical records have been recorded in the impacted reach. Additionally, 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, YWSL 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 in the impacted reach, however water vole have been recorded in the surrounding and receiving reaches, although suitable habitat may be 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 water vole likely to be present in the reach at the time of the implementation of a drought permit. 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.**

One NERC act section 41 and notable fish species (brown trout) has 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 B2-113: 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 are available for the impacted reach. However, River Habitat Survey data indicate that the impacted reach does not provide suitable habitat for white-clawed crayfish. As a result, white-clawed crayfish are considered unlikely to occur within the reach, and no further assessment has been undertaken.	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. 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.	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, predation, inter and intra-species competition etc.	High	Yes
NERC and Notable species – Birds There are many bird 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: - Eurasian Curlew (*Numenius arqauta*) - Swallow (*Hirundo rustica*) - Reed Bunting (*Emberiza schoeniclus*) - Grey Wagtail (*Motacilla cinerea)* - House Martin (*Delichon urbica)* - Swallow (*Hirundo rustica)* - Little Ringed Plover Bird (*Charadrius*	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)*
		dutius) - Redshank (*Tringa tetanus)* - Snipe (*Gallinago gallinago)* - Mute Swan (*Cygnus olor)* - Common Tern (*Sterna hirundo)*		

B2.15.4 WFD Receptors

B2.15.4.1 Macroinvertebrates

The WFD waterbody GB104027063590 Mag Brook from Source to River Holme classifies as 'moderate' for macroinvertebrates in 2016, Cycle 2. Baseline macroinvertebrate data is provided by four Environment Agency monitoring sites, By B6108 (ID 210), At Footbridge U/S Holme (ID 1417), (ID 1416), and (ID 74825). The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and NTAXA, these ranged between 'Bad' on 4 occurrences to 'High' on 1 occurrence.

The WFD status of the macroinvertebrate community in Holme T3 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 Holme T3 has a medium to high sensitivity to reduced flows (**Figure B2-14**). See **Table B2-3** for guidance in interpreting raw LIFE scores.

$WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see Figure B2-14. No physical environmental (River depth, width or sediment composition) data was able for the Site 74825. Therefore, no site specific EQR value could be calculated in RICT3. 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.

Data from the monitoring site shows variation in $WHPT_{ASPT}$ scores over the period 2010 to 2023 but remain consistent with the standard to achieve moderate to high WFD status over the monitoring period, with exception of Site 1417.

$WHPT_{ASPT}$ scores from the site identifies macroinvertebrate communities which are composed of a poor to good proportion of taxa which are sensitive to pressures including water quality, $WHPT_{ASPT}$ scores ranging between 4.3 and 7.29 (5.93) with the lowest $WHPT_{ASPT}$ score of 4.3 at Site 1417 in Autumn 2022, and the highest score of 7.29 at Site 74825 in Spring 2010. The $WHPT_{ASPT}$ expected scores for ranged between 6.9 to 7.38 across the sites, with 14 of the 26 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.62 and 1.04 (0.83) with the lowest $WHPT_{ASPT}$ EQR of 0.62 at Site 1417 in Autumn 2022, and the highest EQR of 1.04 at Site 74825 in Spring 2010.

In Holme T3 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ ranging between 8 and 32, averaging 19.73 with the lowest $WHPT_{NTAXA}$ score of 8 at Site 1417 in Autumn 2021, and the highest score of 32 at Site 74825 in Autumn 2010. The $WHPT_{NTAXA}$ expected scores ranged between 24 to 26.75 across the sites, with 10 of the 30 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.32 and 1.28 (0.8) with the lowest $WHPT_{NTAXA}$ EQR of 0.32 at Site 1417 in Autumn 2021, and the highest EQR of 1.28 at Site 74825 in Autumn 2010.

$LIFE_{FAMILY}$ 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 6.79 and 8.44, scoring 7.67 on average, with the lowest $LIFE_{FAMILY}$ score of 6.79 at Site 1417 in Spring 2015, and the highest score of 8.44 at Site 1416 in Autumn 2022. The $LIFE_{FAMILY}$ expected scores ranged between 7.73 to 7.86 across the sites, with 3 of the 26 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.87 and 1.09 (0.98) with the lowest $LIFE_{FAMILY}$ EQR of 0.87 at Site 1417 in Spring 2015, and the highest EQR of 1.09 at Site 1416 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} ranged between 41.38 and 86.49 (69.56) with the lowest PSI_{FAMILY} score of 41.38 at Site 1417 in Autumn 2015, and the highest score of 86.49 at Site 1416 in Spring 2022. The PSI_{FAMILY} expected scores ranged between 68.79 to 74.79 across the sites, with 15 of the 26 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.6 and 1.21 (0.96) with the lowest PSI_{FAMILY} EQR of 0.6 at Site 1417 in Autumn 2015, and the highest EQR of 1.21 at Site 1416 in Autumn 2022.

A total of three INNS species, including *Potamopyrgus antipodarum, Crangonyx pseudogracilis* and *Dugesia tigrina* were recorded as present within the reach between 2010 to 2023, with no designated species being recorded during the monitoring period.

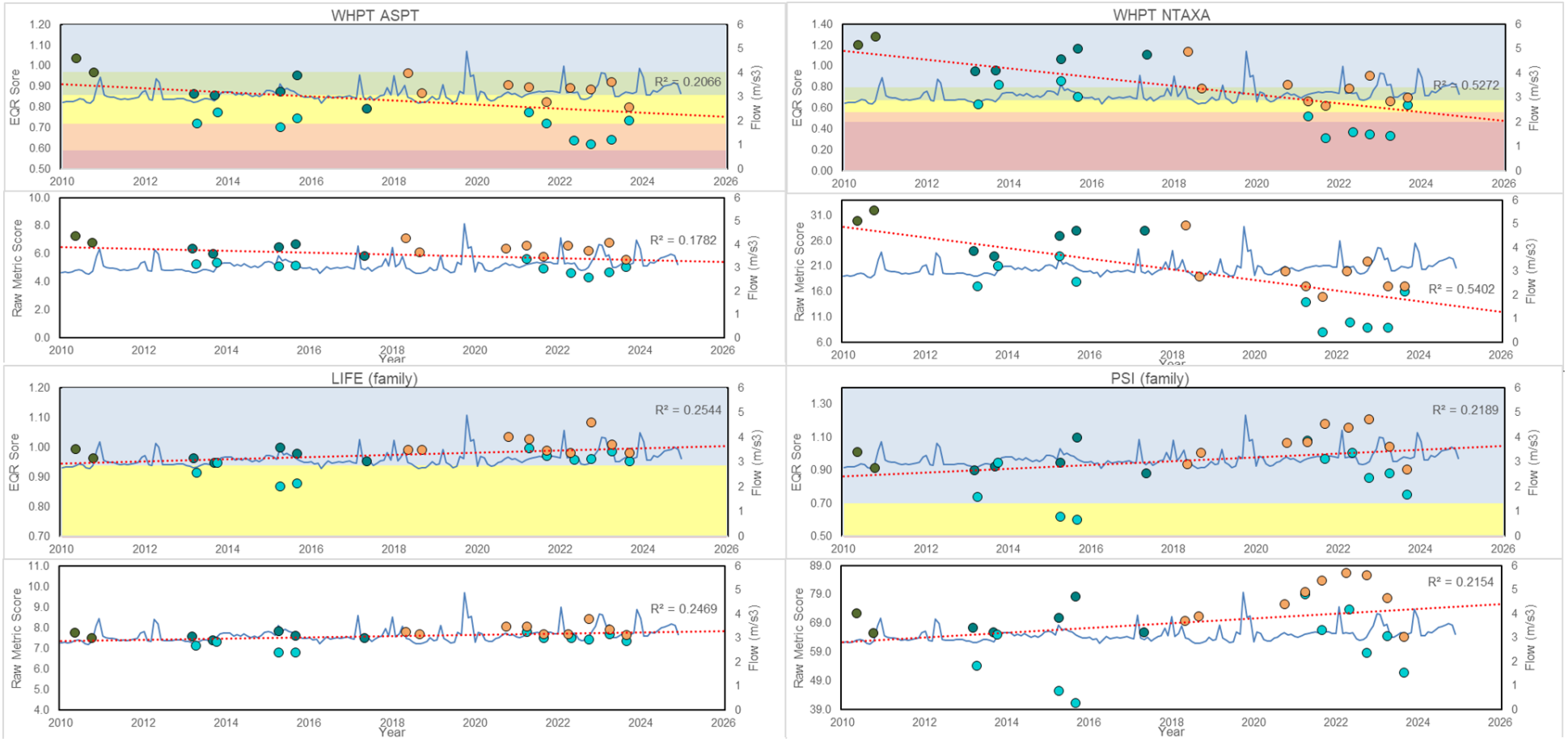
Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-114: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{Family}$ EQR Score	$LIFE_{Family}$ Score	PSI_{Family} EQR Score	PSI_{Family} Score	$WHPT_{ASPT}$ EQR Score	$WHPT_{ASPT}$ EQR Class	$WHPT_{ASPT}$ Score	$WHPT_{NTAXA}$ EQR Score	$WHPT_{NTAXA}$ EQR Class	$WHPT_{NTAXA}$ Score
210	SE1091611254	5	2013 to 2017	0.95 - 1 (0.97)	7.39 - 7.86 (7.59)	0.88 - 1.1 (0.95)	65.79 - 78.43 (69.7)	0.79 - 0.95 (0.87)	M - G (G)	5.85 - 6.71 (6.29)	H - H (H)	H - H (H)	23 - 28 (26)
1417	SE1396112554	10	2013 to 2023	0.87 - 1 (0.94)	6.79 - 7.8 (7.34)	0.6 - 1.08 (0.85)	41.38 - 79.17 (60.12)	0.62 - 0.78 (0.71)	P - M (P)	4.3 - 5.64 (5.02)	B - H (P)	B - H (P)	8 - 23 (15)
74825	SE0905710805	2	2010	0.96 - 1 (0.98)	7.52 - 7.76 (7.64)	0.91 - 1.01 (0.96)	65.63 - 72.58 (69.11)	0.97 - 1.04 (1)	G - H (H)	6.8 - 7.29 (7.05)	H - H (H)	H - H (H)	30 - 32 (31)
1416	SE1106511387	9	2020 to 2018	0.98 - 1.09 (1.01)	7.64 - 8.44 (7.89)	0.91 - 1.21 (1.06)	64.3 - 86.49 (77.27)	0.8 - 0.97 (0.89)	M - G (G)	5.61 - 7.12 (6.36)	M - H (G)	M - H (G)	15 - 29 (20)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High

Figure B2-14: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score



B2.15.4.2Fish

Waterbody GB104027063590 Mag Brook from Source to River Holme is classified under Cycle 3 (2022) as 'moderate'. The classification is informed by two sites, Meltham (WR) (ID 11963), last classified as 'moderate' in 2019 and Mag Brook At Honley (ID 36731), classified as 'poor' in 2019.

Baseline fisheries data are available from two sites, Meltham (WR) and Mag Brook at Honley — both surveyed in 2012 and 2015. YWSL commissioned additional surveys at three sites: Mag Brook at Honley, Lea Lane (ID YW137), and Wood Bottom Road (ID YW136), which were surveyed in 2016, 2017, and 2018. An additional survey was undertaken at Mag Brook at Honley in 2020, with further surveys at Lea Lane and Wood Bottom Road in 2021 and 2024. **Table B2-115** details survey sites within the Holme T3 reach.

The WFD status of the fish community in HolmeT3 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 Mag Brook at Honley is individually classified as 'poor' with a site EQR of 0.1252, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively poor diversity, with only one species present from an expected four species. Trout had a slightly lower observed density than expected, with an EQR score of 0.529. Bullhead and stone loach were not observed in this reach, although they are expected to be present. The poor diversity of species had a significant overall effect on the site EQR value.

The site Meltham is individually classified as 'moderate' with a site EQR of 0.3638, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively poor diversity, with only one species present from an expected three species. Trout had a higher observed density than expected, with an EQR score of 0. 7567. Bullhead were not observed in this reach, although were listed with an expected prevalence of greater than 50%, being more likely to occur at the site than not. Though the poor diversity of species had an effect on the site EQR value, the higher than expected density of trout contributed to the overall 'moderate' classification.

Brown trout were counted at every site during every survey year in a wide range of abundance, from low with a lowest count of 12 at Lea Lane in 2021, to high with a highest count of 192 at Lea Lane in 2024. 3-spined stickleback were counted in low abundance on three surveys, a single roach was counted at Mag Brook at Honley in 2016.

Additional baseline fish data for Holme T3 from YWSL sites showed no brown trout present, while 3-spined stickleback were present across all three sites.

Table B2-116 details species presence by year across all sites within the Holme T3 reach. 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 B2-115: Holme T3 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
YW136	Wood Bottom Road	SE1184812132	Electric Fishing (AC, PDC and DC)	5	2016	2024
YW137	Lea Lane	SE1256912382		5	2016	2024
11963	Meltham (WR)	SE0988310807		2	2012	2015
36731	Mag Brook at Honley	SE1360112335		6	2012	2020

Table B2-116: Holme T3 Fish Survey Results

Tolerance Category[4]	Species Name	2012	2015	2016	2017	2018	2020	2021	2024
High tolerance	3-spined stickleback					X	X		
High tolerance	Roach			X					

Low tolerance	Brown trout	X	X	X	X	X	X	X	X

B2.15.4.3WFD waterbody status

Table B2-117 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-117** 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 B2-117: WFD classifications

Waterbody ID & Name		**GB104027063590 Mag Brook from Source to River Holme**	**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	Good	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.15.5 Invasive non-native species (INNS)

Table B2-118 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 B2-118**).

Table B2-118: 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)**
INNS – Macroinvertebrates -Freshwater Shrimp *(Crangonyx pseudogracilis)* -New Zealand mudsnail *(Potamopyrgus antipodarum)* -Brown planarian flatworm *(Dugesia tigrina)*	Major	The implementation of this drought permit is not expected to increase the distribution of these INNS.	Not sensitive	No
INNS – terrestrial plants -Japanese knotweed *(Fallopia japonica)* -Himalayan balsam *(Impatiens glandulifera)*	Major	The implementation of this drought permit is not expected to increase the distribution of this INNS.	Not sensitive	No

B2.15.6 Landscape, navigation, recreation and heritage

Table B2-119 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 B2-119**).

Table B2-119: 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)*
Late Prehistoric enclosed settlement of Oldfield Hill, 340m west of Wentworth Farm – Scheduled Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Crosland Lower Hall moated site – Scheduled Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Low	No
Cairnfield in Honey Old Wood, 280m northwest of the woodland – Scheduled Monument	Major	Unlikely to be impacted over the duration of the drought options implementation.	Not sensitive	No
Angling on Brow Grains Dyke	Major	Casual angling only	Low	No

B2.16 CALDER 4

B2.16.1 Statutory designated sites

Table B2-120 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.

Three statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment

Table B2-120: 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)*
Cromwell Bottom – Local Nature Reserve	Moderate (Summer) Minor (Winter)	Site has water dependent receptors	Medium	Yes
Southern Washlands - Local Nature Reserve	Moderate (Summer) Minor (Winter)	One of several wetland sites in the Lower Calder Valley containing a variety of habitats such as open water, swamp, marshy grassland, willow and hawthorn scrub. The site is home to a variety of wildflowers, birds and amphibians.	Medium	Yes
Stanley Marsh - Local Nature Reserve	Moderate (Summer) Minor (Winter)	Small wetland area, created by mining subsidence, surrounded by woodland and a hay meadow. Good site for dragonflies, frogs and newts.	Medium	Yes
Sparrow Wood – Local nature Reserve	Moderate (Summer) Minor (Winter)	No water dependent Receptors	Not sensitive	No

B2.16.2 NERC and local wildlife sites

Table B2-121 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.

Six 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 B2-121**).

Table B2-121: 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)*
Calder and Hebble Canal / Navigation LWS	Moderate (Summer) Minor (Winter)	Site runs adjacent to the River Calder; unlikely to be in connectivity with the impacted reach.	Not sensitive	No
Cromwell Bottom LWS	Moderate (Summer) Minor (Winter)	Likely to be in connectivity with impacted reach or support aquatic receptors.	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)*
		Rich fen, grassland, ponds and wetlands with a number of rare species.		
Elland Park Wood LWS	Moderate (Summer) Minor (Winter)	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Strangstry Wood LWS	Moderate (Summer) Minor (Winter)	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Freeman's Wood LWS	Moderate (Summer) Minor (Winter)	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Cromwell Wood LWS	Moderate (Summer) Minor (Winter)	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Clifton Lagoon/Interchange LWS	Moderate (Summer) Minor (Winter)	Site supports neutral grassland and a diverse range of habitats. The site is valued for appreciation of nature and supports an fishery which sits on the banks of the river Calder next to Junction 25 of the M62.	Low	No
Briery Bank Wood LWS	Moderate (Summer) Minor (Winter)	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Whitley Wood LWS	Moderate (Summer) Minor (Winter)	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Sparrow Wood LWS	Moderate (Summer) Minor (Winter)	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
The Wyke LWS	Moderate (Summer) Minor (Winter)	The site is predominantly grasslands are interspersed with woodland, scrub and hedgerows, providing a valuable habitat corridor for many birds and mammals. Unlikely to be in connectivity with impacted reach.	Not sensitive	No
Horbury Lagoons LWS	Moderate (Summer) Minor (Winter)	The Horbury Lagoon is around 5 acres in size with an average depth of 7 metres. It was developed from an old gravel pit by Whitaker's Sand and Gravel Company in the early 1950s. Over the past few years the lagoon has been stocked regularly with good quality Carp. Pike, tench and bream have also been reported in the lagoon. The site may potentially be in connectivity with the impacted reach through alluvial deposits.	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)*
Soap Tip LWS	Moderate (Summer) Minor (Winter)	Grassland rich site, unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
Ashfields and the Half Moon LWS	Moderate (Summer) Minor (Winter)	The site was originally settlement lagoons for the pulverised fuel ash from Wakefield power station which have now transformed to woodland. The Half Moon is a cut-off meander of the Calder. Unlikely to be in connectivity with impacted reach.	Low	No
Southern Washlands LWS	Moderate (Summer) Minor (Winter)	Southern Washlands comprises open water, swamp, marshy grassland, neutral grassland scrub and woodland. Unlikely to be in connectivity with impacted reach.	Medium	Yes
Stanley Ferry Flash LWS	Moderate (Summer) Minor (Winter)	Stanley Ferry Flash is a mixture of open water, swamp, marshland and grassland, with areas of willow carr. The site is adjacent to the Aire and Calder navigation, and unlikely to be in connectivity with impacted reach.	Low	No
Stanley Marsh LWS	Moderate (Summer) Minor (Winter)	The site includes improved grassland and standing water. The is unlikely to be in connectivity with impacted reach.	Medium	Yes
Former Newmarket Colliery, Stanley LWS	Moderate (Summer) Minor (Winter)	Species rich colliery spoil; species rich standing water and mixed habitats. The is unlikely to be in connectivity with impacted reach.	Not sensitive	No
Altoft Ings LWS	Moderate (Summer) Minor (Winter)	Altoft Ings is situated in the meander. Artificial substrates, standing open water, mixed habitats.	Medium	Yes
Foxholes LWS	Moderate (Summer) Minor (Winter)	The site includes swamp and woodland type.	Medium	Yes
Junction Island and Oxbows, Rothwell LWS	Moderate (Summer) Minor (Winter)	The site includes species rich standing water, however the site is unlikely to be in connectivity with impacted reach.	Low	No
NERC Priority Habitats – Coastal and floodplain grazing marsh -60285 -43766 -43768 -60160	Moderate (Summer) Minor (Winter)	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitats – Good quality semi-improved grassland -356831	Moderate (Summer) Minor (Winter)	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)*
-56832 -357830				
NERC Priority Habitats – Deciduous woodland -326385 -326386 -325776 -325777 -325783 -326393 -352592 -352596	Moderate (Summer) Minor (Winter)	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitats – No main habitat but additional habitats present (Coastal and floodplain grazing marsh) -458508	Moderate (Summer) Minor (Winter)	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No
NERC Priority Habitats – Lowland fens -413501 -413500 -413503 -413502 -413497 -413504 -413429 -413428 -413427 -413436 -413437 -411488	Moderate (Summer) Minor (Winter)	Unlikely to be in connectivity with impacted reach or support aquatic receptors.	Not sensitive	No

B2.16.3 NERC and other protected species

Table B2-122 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

One nationally scarce macroinvertebrate species (*Atherix ibis)* was observed in Site 1409 in October 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, YWSL, and a review of records from the NBN Gateway were used to inform the assessment of white-clawed crayfish within the impacted reach. No surveys or records of the species were identified within the reach. Furthermore, River Habitat Survey data indicated that suitable

habitat for white-clawed crayfish is not present within the impacted reach. Given the absence of records and the lack of suitable habitat, white-clawed crayfish have been excluded from further assessment.

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 EA records did not indicate the presence of otter within impacted reach, however information obtained from the West Yorkshire Biological Records Centre and NBN atlas identified their presence within the impacted reach in the last ten years. 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, YWSL and a review of available data from NBN gateway was used inform the assessment of water vole in the impacted reach. Review of EA records did not indicate the presence of water vole within impacted reach, however information obtained from the West Yorkshire Biological Records Centre identified their presence within 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 water vole likely to be present in the reach at the time of the implementation of a drought permit. Based on the limited available information water vole are considered to be susceptible to drought permit impacts and have an **medium** 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 (brown trout, river lamprey 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 B2-122: 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)*
Notable Species – Invertebrates Yellow-legged water snipefly *(Atherix ibis)*	Moderate (Summer) Minor (Winter)	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 – Crustacea White-clawed Crayfish (*Austropotamobius pallipes)*	Moderate (Summer) Minor (Winter)	Limited data are available for the impacted reach. However, River Habitat Survey data indicate that the impacted reach does not provide suitable habitat for white-clawed crayfish. As a result, white-clawed crayfish are considered unlikely to occur within the reach, and no further assessment has been undertaken.	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 Species – Mammals Otter *(Lutra lutra)*	Moderate (Summer) Minor (Winter)	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)*	Moderate (Summer) Minor (Winter)	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.	Medium	Yes
NERC Species – Fish Brown trout *(Salmo trutta)* European eel *(Anguilla anguilla)* River lamprey (*Lampetra fluviatilis*)	Moderate (Summer) Minor (Winter)	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover, predation, inter and intra-species competition etc.	High	Yes
Notable Species – Fish Bullhead *(Cottus gobio)* Barbel (*Barbus barbus)* [6] Grayling (*Thymallus thymallus)* Brook lamprey (*Lampetra planeri*)	Moderate (Summer) Minor (Winter)	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover, predation, inter and intra-species competition etc.	Medium	Yes
NERC and Notable species – Birds There are many bird species present across the region	Moderate (Summer) Minor (Winter)	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: - Eurasian Curlew (*Numenius arqauta*) - Swallow (*Hirundo rustica*) - Reed Bunting (*Emberiza schoeniclus*) - Common Tern (*Sterna hirundo*)	Not sensitive	No

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

Site/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)*
		- House Martin (*Delichon urbica*)		

B2.16.4 WFD Receptors

B2.16.4.1 Macroinvertebrates

The WFD waterbody GB104027062642 Calder from Ryburn Confluence to River Colne, classified as 'good' for macroinvertebrates in 2022, Cycle 3 with GB104027062632 Calder from River Chald to River Aire classifying as 'moderate' in 2022, Cycle 3. Baseline macroinvertebrate data is provided by six Environment Agency monitoring sites, Cooper Bridge Below Weir (ID 1409), Site (ID 64), D/S Spen Beck by B6117 (ID 1211), Site (ID 1215), Bottom Boat (ID 164101) and Methley (ID 61). The indicative WFD classification for these sites are based on the worst classification between WHPT ASPT and NTAXA, these ranged between 'Bad' on 19 occurrences to 'Good' on three occurrences.

The WFD status of the macroinvertebrate community in Calder 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.

Assessment of the hydrological sensitivity of the macroinvertebrate community was undertaken by analysis of recorded LIFE scores. Baseline data indicates that under present conditions, the macroinvertebrate community in Calder 4 has a medium to high sensitivity to reduced flows **(Figure B2-15**). See **Table B2-3** for guidance in interpreting raw LIFE scores. $WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site. WHPT and PSI EQR scores are calculated based on available environmental parameters provided by the Environment Agency's online Ecology & Fish Data Explorer. Data which comprises of spring and autumn sampling occasions for a given year generate WFD classifications, these EQR's are displayed for $WHPT_{NTAXA}$ and $WHPT_{ASPT}$, see **(Figure B2-15**).

Data from the monitoring site shows variation in $WHPT_{ASPT}$ scores over the period 2010 to 2023 but with the standard fluctuating from those EQR scores indicative of achieving poor to high WFD status. $WHPT_{ASPT}$ scores from the site identifies macroinvertebrate communities which are composed of a poor to high proportion of taxa which are sensitive to pressures including water quality. $WHPT_{ASPT}$ scores ranged between 2.94 and 5.85, averaging 4.36, with the lowest $WHPT_{ASPT}$ score of 2.94 at Site 164101 in Autumn 2013, and the highest score of 5.85 at Site 1409 in Spring 2014. The $WHPT_{ASPT}$ expected scores for ranged between 4.41 to 6.72 across the sites, with 45 of the 53 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.57 and 1.02 (0.76) with the lowest $WHPT_{ASPT}$ EQR of 0.57 at Site 1215 in Spring 2021, and the highest EQR of 1.02 at Site 164101 in Spring 2022.

In Calder 4 data from the site identifies macroinvertebrate communities which significantly varies in terms of diversity, with $WHPT_{NTAXA}$ ranging between 5 and 25, scoring an average of 14.55, with the lowest $WHPT_{NTAXA}$ of 5 at Site 61 in Spring 2022, and the highest score of 25 at Site 164101 in Spring 2013. The $WHPT_{NTAXA}$ expected scores ranged between 24.79 to 31.51 across the sites, with 40 of the 53 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores showed significant variance between seasonal surveys, ranging between 0.18 and 0.91 (0.54) with the lowest $WHPT_{NTAXA}$ EQR of 0.18 at Site 61 in Spring 2022, and the highest EQR of 0.91 at Site 164101 in Spring 2013. This suggests that pressures which impair macroinvertebrate diversity such as habitat loss or/and low or high flows may influence the baseline community.

$LIFE_{FAMILY}$ 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 5.79 and 8, averaging 6.85, with the lowest $LIFE_{FAMILY}$ score of 5.79 at Site 61 in Autumn 2014, and the highest score of 8 at Site 1215 in Spring 2022. The $LIFE_{FAMILY}$ expected scores ranged between 6.04 to 7.66 across the sites, with 11 of the 53 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.8

and 1.14 (0.98) with the lowest $LIFE_{FAMILY}$ EQR of 0.8 at Site 1409 in Spring 2022, and the highest EQR of 1.14 at Site 164101 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 6.25 and 78.57, averaging 42.16, with the lowest PSI_{FAMILY} score of 6.25 at Site 61 in Autumn 2014, and the highest score of 78.57 at Site 1215 in Spring 2022. The PSI_{FAMILY} expected scores ranged between 16.29 to 67.41 across the sites, with 32 of the 53 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.18 and 1.83 (0.93) with the lowest PSI_{FAMILY} EQR of 0.18 at Site 1409 in Spring 2022, and the highest EQR of 1.83 at Site 61 in Spring 2021.

A total of seven INNS species, including *Crangonyx pseudogracilis, Physella acuta, Potamopyrgus antipodarum, Chelicorophium curvispinum, Pacifastacus leniusculus, Ferrissia californica, and Gammarus tigrinus,* were recorded as present at within the reach between 2010 to 2023.

A single designated species, *Atherix ibis*, was recorded at site 1409 in 2021.

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 B2-123: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{Family}$ EQR Score	$LIFE_{Family}$ Score	PSI_{Family} EQR Score	PSI_{Family} Score	$WHPT_{ASPT}$ EQR Score	$WHPT_{ASPT}$ EQR Class	$WHPT_{ASPT}$ Score	$WHPT_{NTAXA}$ EQR Score	$WHPT_{NTAXA}$ EQR Class	$WHPT_{NTAXA}$ Score
61	SE4100325860	10	2013 to 2023	0.96 - 1.13 (1.02)	5.79 - 7 (6.28)	0.36 - 1.83 (0.97)	6.25 - 37.5 (18.42)	0.71 - 0.98 (0.8)	P - H (M)	3.3 - 4.58 (3.63)	0.18 - 0.61 (0.43)	B - M (B)	5 - 17 (12)
64	SE1887020510	8	2012 to 2023	0.91 - 1.04 (0.95)	6.79 - 7.77 (7.16)	0.59 - 1.13 (0.87)	36.84 - 76.47 (56.58)	0.69 - 0.84 (0.76)	P - M (M)	4.37 - 5.28 (4.93)	0.52 - 0.85 (0.68)	P - H (M)	13 - 21 (17)
1211	SE2410120339	4	2012 to 2014	0.93 - 1.05 (0.99)	7.08 - 7.71 (7.39)	0.77 - 1.11 (0.96)	50 - 66.67 (59.73)	0.67 - 0.84 (0.76)	P - M (M)	4.43 - 5.24 (4.87)	0.58 - 0.89 (0.68)	M - H (G)	15 - 23 (18)
1215	SE2704219163	12	2012 to 2023	0.92 - 1.1 (0.99)	6.67 - 8 (7.1)	0.44 - 1.39 (0.94)	25 - 78.57 (52.08)	0.57 - 0.77 (0.66)	B - M (P)	3.46 - 4.82 (4.04)	0.25 - 0.57 (0.4)	B - M (B)	8 - 18 (13)
1409	SE1767920549	11	2010 to 2023	0.8 - 1.05 (0.94)	6.11 - 7.75 (7.05)	0.18 - 1.12 (0.76)	11.76 - 74.29 (48.12)	0.65 - 0.87 (0.78)	P - G (M)	4.35 - 5.85 (5.05)	0.39 - 0.86 (0.64)	B - H (M)	10 - 22 (16)
164101	SE3625124288	8	2013 to 2022	0.98 - 1.14 (1.02)	6 - 7.2 (6.36)	0.52 - 1.67 (1.13)	10.53 - 40 (25.58)	0.65 - 1.02 (0.87)	P - H (G)	2.94 - 4.83 (4)	0.26 - 0.91 (0.54)	B - H (P)	7 - 25 (15)

Data presented in the format Min - Max (AVG.) and B - Bad / P - Poor / M - Moderate / G - Good / H - High

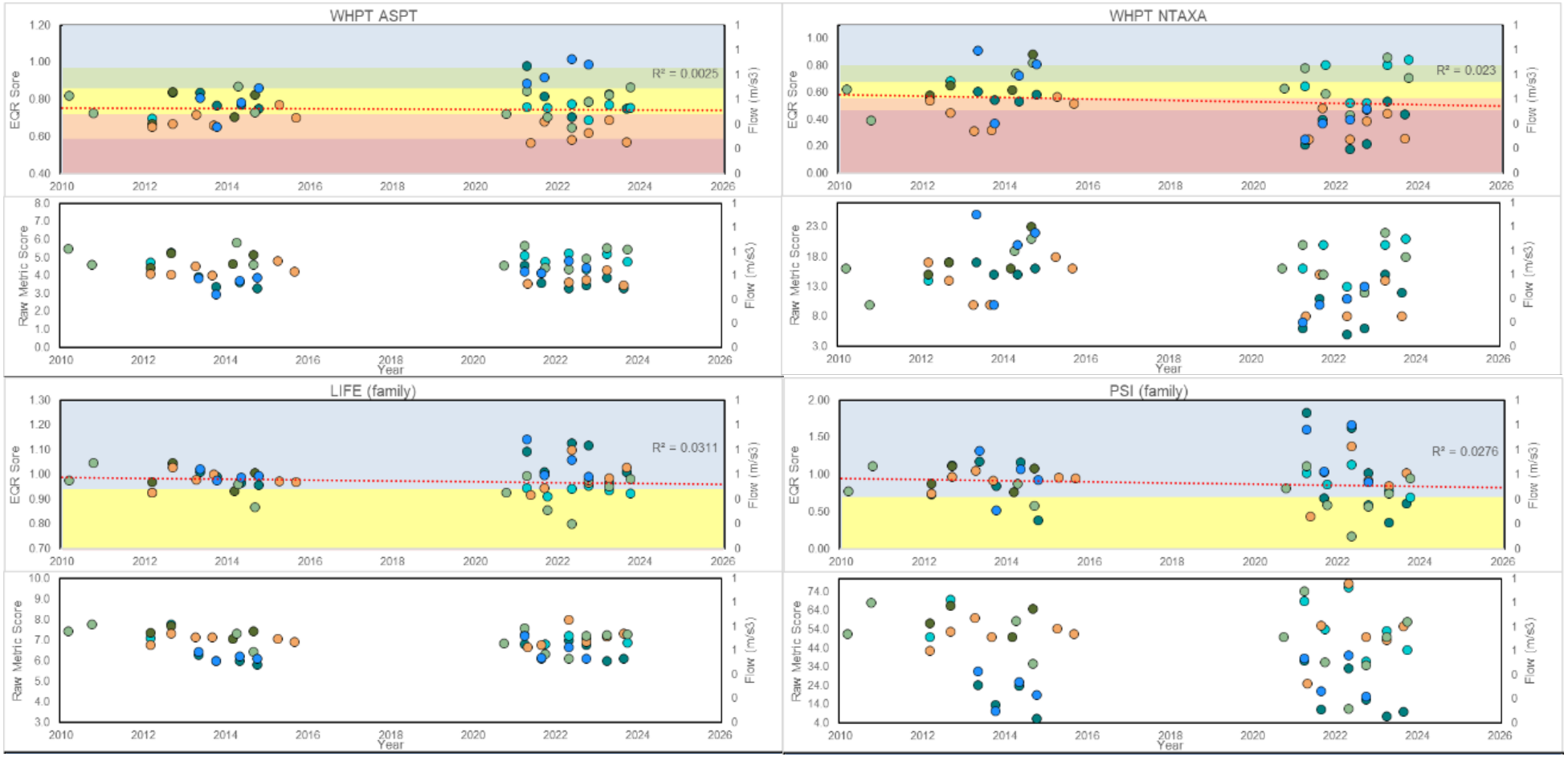


Figure B2-15: LIFE score sensitivities, EQR values for $WHPT_{NTAXA}$, $WHPT_{ASPT}$ and PSI score

B2.16.4.2 Fish

The Calder 4 reach spans 3 WFD waterbodies:

Waterbody GB104027062642 Calder from Ryburn Confluence to River Colne is classified under Cycle 3 (2022) as 'moderate'. The classification is informed by two sites, Cornmill Weir (ID 8359), classified as 'moderate' in 2019 and Elland Power Station D/S (ID 8303), classified as 'good' in 2019.

Waterbody GB104027062631 Calder from River Colne to River Chald is classified under cycle 3 (2022) as 'moderate'. No classifications for cycle 3 are available for fish.

Waterbody GB104027062632 Calder from River Chald to River Aire is classified under cycle 3 (2022) as 'poor'. The classification is informed by one site, Smalley Bight (ID 22130), classified as 'poor' in 2019.

Baseline fisheries data, with the addition of YWSL commissioned monitoring data is available for 10 sites, surveyed between 2010 and 2023. A summary of sites is detailed in **Table B2-124**.

The WFD status of the fish community in Calder 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 Elland power Station d/s is individually classified as good with a site EQR of 0.5362, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively good diversity, with six species present from an expected eight species. Trout had a lower observed density than expected, with a low EQR score of 0.2973. Bullhead, stone loach and minnow were observed at increased numbers, with an EQR score of 1. Gudgeon, pike and chub were not observed in this reach, although they are expected to be present. 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 Cornmill Weir is individually classified as moderate with a site EQR of 0.2136, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively good diversity, with nine species present from an expected nine species. Trout had a lower observed density than expected, with a low EQR score of 0.2163. 3-spined-stickleback, stone loach and minnow were observed at increased numbers, with an EQR score of 1. Bullhead, roach, chub were not observed in this reach, although they are expected to be present. Barbel were recorded to be present at the site, though were not expected at the site with a low prevalence score of 0.3153. The low EQR scores for trout and absence of bullhead had a significant effect in the overall site classification, however the generally good diversity of the site positively contributed to the 'moderate' overall site classification.

The site Smalley Bight is individually classified as poor with a site EQR of 0.0832, based on the FCS2 EQR scores from the 2015 survey. The site has a moderate diversity, with five species present from an expected nine species. Trout were not observed in this reach, although they are expected to be present, resulting in a low EQR score of 0.1693. Bullhead, stone loach and minnow were observed at increased numbers, with an EQR score of 1. Chub and gudgeon were recorded at the site with lower observed densities than expected (EQR scores of 0.432 and 0.4213 respectively). Roach, perch, dace and pike were not observed in this reach, although they are expected to be present. The absence of trout had an effect in the overall site classification, with the moderate diversity also contributing to the overall 'poor' classification of the site.

All surveys except one utilised a single-catch methodology, with the exception being Brighouse-Fry Survey (ID 42075) in 2022. Techniques used included both electric-fishing and seine netting, with minnow, stone loach and roach present in high abundance. Brown trout, grayling and bullhead were present in low to moderate abundance but were not counted for several years of survey, furthermore, numbers have typically decreased inverse to survey age. Methley (ID 22110) displayed reduced species richness relative to other sites, with other sites including Smalley Bight (ID 22130), Sands Mill (Dewsbury) (ID 36757), Brighouse – Fry Survey and Dewsbury Fry Survey (ID 70148) only occasionally recording brown trout and bullhead in very low abundance. A single catch of lamprey sp. consisting of nine individuals was made in 2012 at Chantry Bridge (ID 8302), whilst low counts of European eel were made across several years. Barbel were typically counted in low numbers, with the exception of a moderate abundance counted in 2024 with 40 individuals counted at Dewsbury Fry Survey. Chub, dace and gugeon are present in moderate numbers, primarily at Chantry Bridge and Dewsbury Fry Survey sites.

Table B2-125 details species presence by year across all sites within the Calder 4 reach. 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 B2-124: Calder 4 Fish Survey Site Information

Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
8302	Chantry Bridge	SE3385120115	Electric Fishing (AC, PDC and DC)	7	2010	2024
8303	Elland power Station d/s	SE1237222157	Electric Fishing (AC, PDC and DC)	5	2010	2024
8336	Brighouse Industrial Estate	SE1493822560	Electric Fishing (AC, PDC and DC)	1	2010	2010
8359	Cornmill Weir	SE1698321822	Electric Fishing (AC, PDC and DC)	2	2010	2015
13886	Dewsbury (end of flood relief channel)	SE2404020932	Electric Fishing (AC, PDC and DC)	2	2012	2024
22110	Methley	SE4081125715	Electric Fishing (AC, PDC and DC)	3	2015	2022
22130	Smalley Bight	SE3510824004	Electric Fishing (AC, PDC and DC)	1	2015	2015
36757	Sands Mill (Dewsbury)	SE2511121001	Electric Fishing (AC, PDC and DC)	1	2015	2015
42075	Brighouse - Fry Survey	SE1517422473	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	8	2010	2022
70148	Dewsbury Fry Survey	SE2541920429	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	5	2017	2024

Table B2-125: Calder 4 Fish Survey Results

Tolerance Category[4]	Species Name	2010	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
High tolerance	3-spined stickleback	X	X	X	X	X	X	X	X	X	X	X	X	X	X
High tolerance	Barbel	X	X			X								X	X
High tolerance	Perch	X	X	X	X	X					X	X	X		X
High tolerance	Roach	X	X	X		X		X	X		X	X	X	X	X
High tolerance	European eel	X	X								X		X		X
High tolerance	Roach x common bream hybrid		X												
High tolerance	10-spined stickleback				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
Medium tolerance	Bleak	X	X			X					X				X
Medium tolerance	Chub	X	X	X	X	X		X	X	X	X	X	X	X	X
Medium tolerance	Dace	X	X			X		X	X		X			X	X
Medium tolerance	Gudgeon	X	X	X		X		X	X				X		X
Medium tolerance	Pike	X	X			X					X	X	X		X

Medium tolerance	Common bream		X												
Low tolerance	Bullhead	X	X	X		X		X			X	X	X		X
Low tolerance	Brown trout	X	X	X		X									X
Low tolerance	Grayling	X	X	X		X		X							X
Low tolerance	Lamprey sp.		X												
Unclassified tolerance	Brown trout x salmon hybrid														X

B2.16.4.3WFD waterbody status

Table B2-126 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-126** 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 B2-126: WFD classifications

Waterbody ID & Name		**GB104027062642 Calder from Ryburn Confluence to River Colne**	**GB104027062631 Calder from River Colne to River Chald**	**GB104027062632 Calder from River Chald to River Aire**	**Sensitivity** *(Uncertain, High, Medium, Low, Not Sensitive)*
Physical Environment Impact at Location (Major, Moderate, Minor, Negligible)		Moderate (Summer) Minor (Winter)	Moderate (Summer) Minor (Winter)	Moderate (Summer) Minor (Winter)	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	Moderate	Moderate	
	Fish	Moderate	Moderate	Poor	Medium
	Macroinvertebrates	Good	Moderate	Moderate	Medium
Hydro-morph designation		Heavily modified	Heavily modified	Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	Moderate	Moderate	
	Fish	Good	Good	Good	
	Macroinvertebrates	Good	Moderate	Moderate	
Waterbody Measures					

B2.16.5 Invasive non-native species (INNS)

Table B2-127 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 B2-127**).

Table B2-127: 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)*
INNS – mammals -American mink (*Neovision vision*)	Moderate (Summer) Minor (Winter)	The implementation of this drought order is not	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)*
		expected to increase the distribution of these INNS.		
INNS – Macroinvertebrates -Signal Crayfish (*Pacifastacus leniusculus*) -Northern Crangonyctid (*Crangonyx pseudogracilis*) -New Zealand mud snail (*Potamopyrgus antipodarum*) -Caspian mud shrimp *(Chelicorophium curvispinum)* -Tiger scud *(Gammaru tigrinus)* -Bladder Snail *(Physella sp.)*	Moderate (Summer) Minor (Winter)	The implementation of this drought permit is not anticipated to increase the spread of invasive non-native species.	Not sensitive	No
INNS – Terrestrial and Aquatic plants Himalayan balsam (*Impatiens glandulifera)* Japanese knotweed *(Fallopia japonica)* Canadian pondweed *(Elodea canandensis)*	Moderate (Summer) Minor (Winter)	The implementation of this drought permit is not anticipated to increase the spread of invasive non-native species.	Not sensitive	No

B2.16.6 Landscape, navigation, recreation and heritage

Table B2-128 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 B2-128**).

Table B2-128: 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)*
Angling – River Calder	Moderate (Summer) Minor (Winter)	Casual angling only	Not sensitive	No
Calder/Aire Link – National Trail	Moderate (Summer) Minor (Winter)	The route of the trail runs alongside Hebden Water. The river forms part the landscape setting of the trail.	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)*
National Trails	Moderate (Summer) Minor (Winter)	The route of many trails run alongside Hebden Water and the River Calder. The rivers form part of the landscape setting of several trails in the region.	Not sensitive	No

B3 ENVIRONMENTAL RECEPTORS SCREENING SUMMARY

Table B3-1 Environmental Receptors summary of the Middle Calder Area

Reach	Black Brook 1	Colne 1	Colne 2	Colne 3	Colne 4	Colne T1	Colne T3	Colne T4	Holme 1	Holme 2	Holme 3	Holme 4	Holme T1	Holme T3	Calder 4
Hydrological Impact	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Moderate (Summer) Minor (Winter)
Associated Drought Options	Scammoden Water – Black Brook	Colne Maintained Flow at Marsden Reservoir	Colne Maintained Flow at Marsden Reservoir; Butterley Reservoir	Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir and Blackmoorfoot Reservoir – Hoyle House Clough	Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoor Reservoir – Brow Grains, Digley Reservoir, and Brownhil Reservoir	Butterly Reservoir	Blackmoorfoot Reservoir Hoyle House Clough	Scammonden Water Bradshaw Clough	Brownhill Reservoir	Digley Reservoir and Brownhill Reservoir	Digley Reservoir and Brownhill Reservoir	Digley Reservoir, Brownhill Reservoir and Blackmoorfoot Reservoir Brow Grains	Digley Reservoir	Blackmoorfoot Reservoir Brow Grains	Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoot Reservoir – Brow Grains, Digley Reservoir, Brownhill Reservoir, Scammonden Water – Black Brook and the Upper Calder
WFD Waterbody	GB104027062570 Black Brook from Source to River Calder	GB104027063250 Colne from Source to Wessenden Brook	GB104027063330 Colne from Wessenden Brook to River Holme	GB104027063330 Colne from Wessenden Brook to River Holme	GB104027062550 Colne from River Holme to River Calder	GB104027063190 Wessenden Brook from Butterly Reservoir to River Colne	GB104027063330 Colne from Wessenden Brook to River Holme	GB104027063330 Colne from Wessenden Brook to River Holme	GB104027057600 River Holme from source to New Mill Dyke	GB104027057600 River Holme from source to New Mill Dyke	GB104027057600 River Holme from source to New Mill Dyke; GB104027063301 Holme from New Mill Dike to River Colne	GB104027063301 Holme from New Mill Dike to River Colne	GB104027057600 River Holme from source to New Mill Dyke	GB104027063590 River Holme from Mag Brook to River Colne	GB104027062642 Calder from Ryburn Confluence to River Colne; GB104027062631 Calder from River Colne to River Chald; GB104027062632 Calder from River Chald to River Aire
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*
SSSI	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*
LNR	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	✓
LWS	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	✓
NERC Habitats	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*
Notable Macroinvertebrates	✓	*X*	*X*	*X*	✓	*X*	✓	*X*	✓	✓	*X*	✓	*X*	*X*	✓
White-clawed crayfish	✓	✓	✓	✓	*X*	✓	✓	✓	✓	*X*	✓	✓	*X*	*X*	*X*
Otter	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Water vole	✓	✓	✓	✓	*X*	*X*	✓	✓	✓	✓	✓	✓	*X*	✓	✓
Barbel	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	✓
Brook lamprey	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	✓
Brown trout	✓	✓	✓	✓	✓	✓	✓	*X*	✓	✓	✓	✓	✓	✓	✓
Bullhead	✓	✓	✓	✓	✓	*X*	*X*	*X*	✓	✓	✓	✓	*X*	*X*	✓
Grayling	*X*	*X*	*X*	✓	✓	*X*	*X*	*X*	*X*	*X*	*X*	✓	*X*	*X*	✓
River lamprey	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	✓
Fish	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Invertebrates	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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[7]. The potential changes to the physical environment as a result of drought option implementation are described in **Appendix A**.

B4.1 BLACK BROOK 1

B4.1.1 Receptor 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. The overall confidence in the notable macroinvertebrate data and subsequent assessment has been classed as medium due to the number of surveys completed, and dates of completion where the species were observed.

Table B4-1: Impacts on notable macroinvertebrates in Black Brook 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Atherix ibis	• The species is associated with moderate/fast flows therefore any reduction in flow could potentially impact habitat availability. • There is moderate risk on the species as a result of water quality pressures	County	Medium	Minor

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Colne 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, it is possible that individuals will become stranded as river levels reduce, and habitats become exposed. These impacts are considered to be of major significance.

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 White-clawed crayfish in Black Brook 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 dependent) as a result of increased predation. • Increased competition for resources as habitat availability reduces. • Water quality risks are considered moderate and water quality related impacts are considered likely.	National	High	Moderate

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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Black Brook 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. There are uncertainties relating to the presence of this species with the impacted reach.

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

Table B4-3: Impacts on water vole in Black Brook 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 but is unlikely to directly impact on the receptor. • Species has a preference for waterbodies that do not have extreme fluctuations in water level. • Increased predation as a result of decreased water width and exposure of burrows. • The major reduction in wetted width could increase the distance from the burrows to the food source for this receptor. • Increased predation as a result of decreased water width and exposure of burrows. • Alteration to food supply although the species has been known to feed upon crayfish at times and the water quality impacts could reduce the abundance of this prey.	National	High	Major

Otter

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

Table B4-4: Impacts on otter in Black Brook 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 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 B4-5,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout and bullhead 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 NERC and notable fish species in Black Brook 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). • 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. • It is noted that depth of water is not critical to bullhead[8].	National	High	Major
Bullhead		Regional	Medium	Moderate

B4.1.1.2 WFD Receptors

Macroinvertebrates

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 moderate to high $WHPT_{ASPT}$ EQRs, additionally 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 two listed CSOs during rainfall events. The risk of medium-term chronic, regular, temporary water quality pressures (acute toxicity of ammonia) downstream of each of Scammonden Reservoir WwTW and Barsey Green WwTW, as identified in **Appendix A**. Furthermore, there is the potential for two flow depleted reaches (with potential for zero flow without mitigation) within Black Brook 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 GB104027062570 Black Brook from Source to River Calder (associated with Black Brook 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[9,10]. 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 B4-6.** 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.

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

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

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

Table B4-6: Impacts on macroinvertebrate communities in Black Brook 1

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, acute ammonia and 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 **major** risk to the fish component of the WFD GB104027062570 Black Brook from Source to River Calder (associated with Black Brook 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 to available aquatic habitat and longitudinal connectivity due to 13 noted weirs. A moderate risk of change to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

A moderate risk of deterioration in water quality owing to discharges from Scammonden Dam WwTW and Barsey Green WwTW pose a medium-term chronic regular water quality pressure for total ammonia and phosphate. There is a risk of short term, acute, infrequent temporary water quality pressures for ammonia toxicity and oxygen sags downstream of two listed CSOs during rainfall events. There is potential for one flow depleted reach (with potential for zero follow without mitigation) and major flow impacts within Black Brook 1 if the drought option is operated in combination with existing licensed abstractions. Water quality and flow pressures are identified in **Appendix A**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-7**. 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 B4-7: 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, oxygen sags, elevated phosphate levels).	High	Major	Medium

B4.1.2 Summary of impacts

Table B4-8 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 B4-8: Summary of impacts identified in Black Brook 1's environmental Receptors assessment

Reach	Black Brook 1	
	Significance of Impact[11]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Atherix ibis	Minor	No
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Major	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes
WFD Status Receptors		
Fish	Major	Yes
Invertebrates	Moderate	Yes

B4.2 COLNE 1

B4.2.1 Receptor assessment

B4.2.1.1 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 Colne 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 B4-9.** 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 white-clawed crayfish in Colne 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 moderate and water quality related impacts are considered likely.	National	Medium	Moderate

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Colne 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.

[11] Risk of Deterioration for WFD receptors

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-10.** 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 B4-10: Impacts on water vole in Colne 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[12]. • 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

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-11**.

Table B4-11: Impacts on otter in Colne 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

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-12**, with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout and bullhead has been classed as high due to the number of surveys and the age of the most recent surveys completed.

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

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

Table B4-12: Impacts on NERC and notable fish species in Colne 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). • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration. • Stranding of individuals is as the risk to longitudinal connectivity is major. • Increased mortality (density dependant) as a result of increased predation. • Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel.	National	High	Major
Bullhead		Regional	Medium	Moderate

B4.2.1.2 WFD Receptors

Macroinvertebrates

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 good to high $WHPT_{ASPT}$ 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 Colne 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 component of the WFD GB104027063250 River Colne from Source to Wessenden Brook (associated with Colne 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[14,15]. 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 B4-13.** The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as medium due to the recency of the surveys and coverage over time, however only one site monitored in the reach.

Table B4-13: Impacts on macroinvertebrate communities in Colne 1

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa.	Medium	Moderate	Medium

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

15 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
• 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).			

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 GB104027063250 River Colne from Source to Wessenden Brook (associated with Colne 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 to available aquatic habitat and longitudinal connectivity owing to the presence of four noted weirs. A moderate risk of change to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

There is no risk of flow depleted reaches within Colne 1, however, there is a risk of significant flow pressures if drought options are operated in combination with existing licensed abstractions. Water quality and flow pressures are identified in **Appendix A**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-14**. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys, number of sites and age of the most recent surveys completed.

Table B4-14: 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.	High	Major	Medium

B4.2.2 Summary of impacts

Table B4-15 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 B4-15: Summary of impacts identified in Colne 1's environmental Receptors assessment

Reach	Colne 1	
	Significance of Impact[16]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes

[16] Risk of Deterioration for WFD receptors

Reach	Colne 1	
WFD Status Receptors		
Fish	Major	Yes
Invertebrates	Moderate	Yes

B4.3 COLNE 2

B4.3.1 Receptor assessment

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Colne 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 B4-16.** 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 white-clawed crayfish in Colne 2

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 moderate and water quality related impacts are considered likely.	National	Medium	Moderate

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Colne 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 B4-17.**

Table B4-17: Impacts on water vole in Colne 2

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as moderate but will not 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	National	Medium	Moderate

[17] 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[18] 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.			

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-18**.

Table B4-18: Impacts on otter in Colne 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

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-19**, with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, grayling and bullhead has been classed as high due to the number of surveys, sites and the age of the most recent surveys completed.

Table B4-19: Impacts on NERC and notable fish species in Colne 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). • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration. • Stranding of individuals due to the risk to longitudinal connectivity. • Increased mortality (density dependant) as a result of increased predation. • It is noted that depth of water is not critical to bullhead[8]. • Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel.	National	Medium	Moderate
Bullhead		Regional	Low	Minor
Grayling		County	Medium	Moderate

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

B4.3.1.1 WFD Receptors

Macroinvertebrates

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 have a medium sensitivity to water quality pressures as indicated by moderate $WHPT_{ASPT}$ EQRs, although 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 CSOs during rainfall events. Furthermore, there is the potential for a flow depleted reach (with potential for zero flow without mitigation) within Colne 2. are no significant flow pressures, either abstractions or discharges, influencing flow in Colne 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 GB104027063330 Colne from Wessenden Brook to R Holme (associated with Colne 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[19'20]. 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 B4-20.** 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 B4-20: Impacts on macroinvertebrate communities in Colne 2

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, with major flow reductions and a depleted reach. • Mortality as a result of water quality deterioration.	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 GB104027063330 Colne from Wessenden Brook to R Holme (associated with Colne 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 minor risk of reduction to available aquatic habitat, longitudinal connectivity owing to the presence of eight in-channel structures, and a minor risk to changes in sediment dynamics increasing fine sediment deposition.

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

[20] 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.

A moderate risk to water quality of short term acute toxicity of ammonia and oxygen sags downstream of one listed CSO during rainfall events. One flow depleted reach covering 500 m is possible without or in combination with drought options. Water quality and flow pressures are identified in **Appendix A**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-21** The overall confidence in the fisheries data and subsequent assessment has been classed as high due to the number of surveys, number of sites and age of the most recent surveys completed.

Table B4-21: Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows (reductions up to 67%) and one depleted reach • 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 and oxygen sags).	Medium	Moderate	High

B4.3.2 Summary of impacts

Table B4-22 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 B4-22: Summary of impacts identified in Colne 2's environmental Receptors assessment

Reach	Colne 2	
	Significance of Impact[21]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
Bullhead	Minor	Yes
WFD Status Receptors		
Fish	Moderate	Yes
Invertebrates	Moderate	Yes

[21] Risk of Deterioration for WFD receptors

B4.4 COLNE 3

B4.4.1 Receptor assessment

B4.4.1.1 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 Colne 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, 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 B4-23.**

Table B4-23: Impacts on White-clawed crayfish in Colne 3

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 moderate and water quality related impacts are considered likely.	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 B4-24**.

Table B4-24: Impacts on otter in Colne 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

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-25,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, grayling and bullhead has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-25: Impacts on NERC and notable fish species in Colne 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 moderate. • 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. • It is noted that depth of water is not critical to bullhead[8]. • Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel.	National	High	Major
Bullhead		Regional	Medium	Moderate
Grayling		County	Medium	Moderate

B4.4.1.2 WFD Receptors

Macroinvertebrates

The potential changes to river flows is likely to result in major reduction in flow and will lead to a major 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 bad to high level of diversity, and consequently, loss of habitat may reduce the diversity of the community as a result of habitat loss for certain species. Furthermore, the increased friction between flow and channel bed may reduce flow velocity, as the macroinvertebrate community is sensitive to flow velocity reductions, as indicated by low to 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 low 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 ten listed CSOs during rainfall events. There are no significant flow pressures, either abstractions or discharges, influencing flow in Colne 3, 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 GB104027063330 River Colne from Wessenden Brook to River Holme (associated with Colne 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[22'23]. 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 B4-26**.** 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, however only at two sites.

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

[23] 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 B4-26: Impacts on macroinvertebrate communities in Colne 3

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	Medium

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 GB104027063330 River Colne from Wessenden Brook to River Holme (associated with Colne 3). 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 64% reduction in flow for the duration of the drought option poses a major risk of reduction to available aquatic habitat and longitudinal connectivity due to 15 noted weirs. A moderate risk of change to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

A moderate risk of deterioration in water quality locally downstream of 10 listed CSOs of acute toxicity of ammonia and oxygen sags may result in the mortality of fish. There is potential for one flow depleted reach (with potential for zero follow without mitigation) and major flow impacts within Colne 3 if the drought option is operated in combination with existing licensed abstractions. Water quality and flow pressures are identified in **Appendix A**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-27**. 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 B4-27: 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, oxygen sags)	High	Major	Medium

B4.4.2 Summary of impacts

Table B4-28 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 B4-28: Summary of impacts identified in Colne 3's environmental Receptors assessment

Reach	Colne 3	
	Significance of Impact[24]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes
Grayling	Moderate	Yes
WFD Status Receptors		
Fish	Major	Yes
Invertebrates	Moderate	Yes

[24] Risk of Deterioration for WFD receptors

B4.5 COLNE 4

B4.5.1 Receptor assessment

B4.5.1.1 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 B4-29.** 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 medium, based on the consistent number of surveys conducted over time at both sites within the reach.

Table B4-29: Impacts on notable macroinvertebrates in Colne 4

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Large Cinnamon Sedge *(Potamophylax rotundipennis)*	• The notable species within the reach are generally associated with moderate/fast flows therefore any reduction in flow could potentially impact habitat availability. However, reductions in flow will be temporary and will occur against a baseline of drought conditions. • There is a possibility of impacts on the species as a result of water quality pressures, with a moderate risk in the reach.	County	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 B4-30.**

Table B4-30: Impacts on otter in Colne 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	Low	Moderate

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-31,** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, grayling and bullhead has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

Table B4-31: Impacts on NERC and notable fish species in Colne 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). • 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. • It is noted that depth of water is not critical to bullhead[8].	National	High	Major
Bullhead		Regional	Medium	Moderate
Grayling		Regional	Medium	Moderate

B4.5.1.2 WFD Receptors

Macroinvertebrates

The potential changes to river flows are likely to result in major reduction in flow and will lead to a major 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 bad to moderate 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. 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 twenty two listed CSOs during rainfall events. There are no significant flow pressures, either abstractions or discharges, influencing flow in Colne 4, 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 GB104027062550 Colne from River Holme to River Calder (associated with Colne 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[25'26]. 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 with one of the two sites having consistent data throughout the monitoring period.

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

26 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 B4-32: Impacts on macroinvertebrate communities in Colne 4

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa, with reductions of up to 67% in river flows. • 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. • Potential changes in sediment dynamics affect macroinvertebrate communities by altering habitat structure. • Mortality as a result of water quality - potential point source pollution with 22 listed CSO's present within the reach.	Medium	Moderate	Medium

Fish

The fish component of WFD waterbody GB104027062550 Colne from River Holme to River Calder (associated with Colne 4) has no fish component classification and is therefore not considered to be at risk of deterioration. The potential significance of impact on individual NERC and other notable fish species are considered separately in **Section 0.**

B4.5.2 Summary of impacts

Table B4-33 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 B4-33: Summary of impacts identified in Colne 4's environmental Receptors assessment

Reach	Colne 4	
	Significance of Impact[27]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Potamophylax rotundipennis	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes
Grayling	Moderate	Yes
WFD Status Receptors		
Fish	Major	Yes
Invertebrates	Moderate	Yes

[27] Risk of Deterioration for WFD receptors

B4.6 COLNE T1

B4.6.1 Receptor assessment

B4.6.1.1 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 Colne T1 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 B4-34.**

Table B4-34: Impacts on White-clawed crayfish in Colne T1

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	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 B4-35**.

Table B4-35: Impacts on otter in Colne T1

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 B4-36,** 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 high due to the number of surveys and the age of the most recent surveys completed.

Table B4-36: Impacts on NERC and notable fish species in Colne T1

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). • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration. • Stranding of individuals due to the risk to longitudinal connectivity. • Increased mortality (density dependant) as a result of increased predation. • Exposure/loss of important habitats (wetland habitats for juveniles and adults) eel.	National	Medium	Major

B4.6.1.2 WFD Receptors

Macroinvertebrates

The potential changes to river flows is likely to result in major reduction in flow and will lead to a major 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 bad to moderate 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, the water quality changes as a result of the implementation of the drought option are predicted to present a minor risk. The potential reduction in flow may impact water vole, as burrow located along the banks on the two separate potentially depleted reaches without mitigation within Colne T1. Furthermore, two separate flow pressures are present in this reach influencing flow in Colne T1, 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 GB104027063190 Wessenden Bk from Butterly Resr to River Colne (associated with Colne T1). 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[28,29]. 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 B4-37.** 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 with one of the two sites having consistent data throughout the monitoring period.

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

[29] 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 B4-37: Impacts on macroinvertebrate communities in Colne T1

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. • Potential changes in sediment dynamics affect macroinvertebrate communities by altering habitat structure.	Medium	Moderate	Medium

Fish

The fish component of WFD waterbody GB104027063190 Wessenden Bk from Butterfly Resr to River Colne (associated with Colne T1) has no fish component classification and is therefore not considered to be at risk of deterioration. The potential significance of impact on individual NERC and other notable fish species are considered separately in **Section 0.**

B4.6.2 Summary of impacts

Table B4-38 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 B4-38: Summary of impacts identified in Colne T1's environmental Receptors assessment

Reach	Colne T1	
	Significance of Impact[30]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Brown trout	Major	Yes
WFD Status Receptors		
Fish	N/A	No
Invertebrates	Moderate	Yes

[30] Risk of Deterioration for WFD receptors

B4.8 COLNE T3

B4.8.1 Receptor assessment

B4.8.1.1 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 Colne T3 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 B4-39.** 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 B4-39: Impacts on White-clawed crayfish in Colne T3

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 moderate	National	Low	Moderate

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Colne T3 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 B4-40.** 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 B4-40: Impacts on water vole in Colne T3

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as moderate but is unlikely to directly impact on the receptor. • Species has a preference for waterbodies that do not have extreme fluctuations in water level31. • 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

[31] 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
	times32 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.			

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-41.**

Table B4-41: Impacts on otter in Colne T3

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 B4-42**, 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 low due to the number of surveys and absence of fish counted.

Table B4-42: Impacts on NERC and notable fish species in Colne T3

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). • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration. • Stranding of individuals due to the major risk to longitudinal connectivity. • Increased mortality (density dependant) as a result of increased predation.	National	High	Major

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

B4.8.1.2 WFD Receptors

Macroinvertebrates

The potential changes to river flows is likely to result in major reduction in flow and will lead to a major 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 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 to 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. There are no significant flow pressures, either abstractions or discharges, influencing flow in Colne T3, 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 GB104027063330 River Colne from Wessenden Brook to River Holme (associated with Colne T3). 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[33'34]. 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 B4-43.** 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, with one site in the reach.

Table B4-43: Impacts on macroinvertebrate communities in Colne T3

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 oxygen stress due to potential reduced flows. • Potential changes in sediment dynamics affect macroinvertebrate communities by altering habitat structure.	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 **low** risk to the fish component of the WFD GB104027063330 River Colne from Wessenden Brook to River Holme (associated with Colne T3). 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 longitudinal connectivity with pools becoming disconnected and riffles drying. A moderate risk of change to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

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

[34] 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.

There is a moderate risk of short term, acute, infrequent temporary water quality pressures for ammonia toxicity and oxygen sags downstream of one listed CSO during rainfall events. No flow depleted reaches are associated with Colne T3. Water quality and flow pressures are identified in **Appendix A**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-44**. The overall confidence in the fisheries data and subsequent assessment has been classed as low due to the number of surveys and age of the most recent surveys completed.

Table B4-44: 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 due to moderate risk to sediment dynamics. • Increased risk of stress and predation. • Mortality as a result of oxygen stress due to potential reduced flows.	Low	Minor	Low

B4.8.2 Summary of impacts

Table B4-45 Table B4-44 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 B4-45: Summary of impacts identified in Colne T3's environmental Receptors assessment

Reach	Colne T3	
	Significance of Impact[35]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Minor	Yes
WFD Status Receptors		
Fish	Minor	Yes
Invertebrates	Moderate	Yes

[35] Risk of Deterioration for WFD receptors

B4.9 COLNE T4

B4.9.1 Receptor 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 Colne T4 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 B4-46.** 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 B4-46: Impacts on White-clawed crayfish in Colne T4

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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Colne T4 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 B4-47.** 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 B4-47: Impacts on water vole in Colne T4

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[36]. • 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.	National	Medium	Moderate

[36] 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
	• Alteration to food supply could occur although the species has been known to feed upon crayfish at times[37] 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.			

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-48.**

Table B4-48: Impacts on otter in Colne T4

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

B4.9.1.2 WFD Receptors

Macroinvertebrates

The potential changes to river flows is likely to result in major reduction in flow and will lead to a major 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 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 minor risk. Furthermore, there are no significant flow pressures, either abstractions or discharges, influencing flow in Colne T4, 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 GB104027063330 River Colne from Wessenden Brook to River Holme (associated with Colne T4). 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 B4-49.** The overall confidence in the macroinvertebrate data and subsequent assessment has been classed as medium due to the number of recent surveys however a lack of historical surveys between 2010 and 2020.

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

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.

Table B4-49: Impacts on macroinvertebrate communities in Colne T4

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 oxygen stress due to potential reduced flows. • Potential changes in sediment dynamics affect macroinvertebrate communities by altering habitat structure.	Medium	Moderate	Medium

Fish

This receptor was not considered for further assessment, as Bradshaw Brook is a small tributary of the River Colne from Wessenden Brook to River Holme (GB104027063330), and the baseline review assessed the fish community as not sensitive.

B4.9.2 Summary of impacts

Table B4-50 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 B4-50: Summary of impacts identified in Colne T4's environmental Receptors assessment

Reach	Colne T4	
	Significance of Impact[40]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
WFD Status Receptors		
Fish	N/A	No
Invertebrates	Moderate	Yes

[40] Risk of Deterioration for WFD receptors

B4.10 HOLME 1

B4.10.1 Receptor assessment

B4.10.1.1 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 B4-51.** 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 medium due to the a general good number of surveys completed over time, however only one site has been surveyed within the reach, where the notable species were observed.

Table B4-51: Impacts on notable macroinvertebrates in Holme 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Fingernet Caddisfly *(Wormaldia subnigra)* Large Cinnamon Sedge *(Potamophylax rotundipennis)* *Tinodes unicolor* Black-legged Alderfly *(Sialis nigripes))*	• The notable species within the reach are generally associated with moderate/fast flows therefore any reduction in flow could potentially impact habitat availability. However, reductions in flow will be temporary and will occur against a baseline of drought conditions. • There will be no likely impacts on the species as a result of water quality pressures, with water quality pressures expected to present a minor risk.	County	Medium	Minor

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Holme 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.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-52.** 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 B4-52: Impacts on White-clawed crayfish in Holme 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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Holme 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 B4-53.** 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 B4-53: Impacts on water vole in Holme 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Species has a preference for waterbodies that do not have extreme fluctuations in water level[41]. • 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[42] 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 B4-54.**

Table B4-54: Impacts on otter in Holme 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

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-55**, with drought option impacts on the physical environment summarised in **Appendix A.** 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.

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

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

Table B4-55: Impacts on NERC and notable fish species in Holme 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. • It is noted that depth of water is not critical to bullhead[8].	National	Medium	Moderate
Bullhead		Regional	Low	Minor

B4.10.1.2WFD Receptors

Macroinvertebrates

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 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 to high $WHPT_{ASPT}$ 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 Holme 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 GB104027057600 Holme from Source to New Mill Dike (associated with Holme 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 B4-56.** 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, with surveys being conducted consistently over time at the site.

Table B4-56: Impacts on macroinvertebrate communities in Holme 1

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa.	Medium	Moderate	High

[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.

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• 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 oxygen stress due to potential reduced flows.			

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 GB104027057600 Holme from Source to New Mill Dike (associated with Holme 1). The fish component deteriorated from 'good' in 2019 to 'poor' in 2022, highlighting the risk to the waterbody of deterioration under unfavourable conditions with additional disruptions potentially further impacting 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. 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 longitudinal connectivity due to the steep nature of the channel. A minor risk of change to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites. The risk of deterioration to water quality is minor, with no flow depleted reaches associated with Holme 1. Water quality and flow pressures are identified in **Appendix A**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-57**. 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 B4-57: Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to major risk of reduced flows, with 67% potential reduction. • Increased risk of stress and predation, with moderate risk of changes in available habitat.	Medium	Moderate	Medium

B4.10.2 Summary of impacts

Table B4-58 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 B4-58: Summary of impacts identified in Holme 1's environmental Receptors assessment

Reach	Holme 1	
	Significance of Impact[45]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Wormaldia subnigra	Minor	No
Potamophylax rotundipennis	Minor	No
Tinodes unicolor	Minor	No

[45] Risk of Deterioration for WFD receptors

Reach	Holme 1	
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
Bullhead	Minor	No
WFD Status Receptors		
Fish	Moderate	Yes
Invertebrates	Moderate	Yes

B4.11 HOLME 2

B4.11.1 Receptor assessment

B4.11.1.1 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 B4-59.** 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 medium due to the a general good number of surveys completed, however some sites have few recent surveys, where the notable species were not observed.

Table B4-59: Impacts on notable macroinvertebrates in Holme 2

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Large Cinnamon Sedge *(Potamophylax rotundipennis)* Upland Summer Mayfly *(Ameletus inopinatus)*	• The species are generally associated with moderate/fast flows therefore any reduction in flow could potentially impact habitat availability. However, reductions in flow will be temporary and will occur against a baseline of drought conditions. • There will be no likely impacts on the species as a result of water quality pressures	County	Medium	Moderate

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Holme 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 ~5m potentially depleted reach without mitigation within Holme 2.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-60.** 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 B4-60: Impacts on water vole in Holme 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 level[46]. • 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.	National	Medium	Moderate

[46] 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
	• Alteration to food supply could occur although the species has been known to feed upon crayfish at times[47] 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.			

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-61.**

Table B4-61: Impacts on otter in Holme 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

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-62**, with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout and bullhead has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-62: Impacts on NERC and notable fish species in Holme 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 moderate. • 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. • It is noted that depth of water is not critical to bullhead.	National	High	Major
Bullhead		Regional	Medium	Moderate

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

B4.11.1.2WFD Receptors

Macroinvertebrates

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 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. There are no significant flow pressures, either abstractions or discharges, influencing flow in Holme 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 GB104027057600 Holme from Source to New Mill Dike (associated with Holme 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[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 B4-63.** 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, with some sites missing data from recent years.

Table B4-63: Impacts on macroinvertebrate communities in Holme 2

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa through major changes in flow. • 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. • Potential mortality as a result of oxygen stress due to potential reduced flows. • Potential moderate changes in sediment dynamics affect macroinvertebrate communities by altering habitat structure.	Medium	Moderate	Medium

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 GB104027057600 Holme from Source to New Mill Dike (associated with Holme 2). The fish component deteriorated from 'good' in 2019 to 'poor' in 2022, highlighting the risk to the waterbody of deterioration under unfavourable conditions with additional disruptions potentially further impacting 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. Drought option impacts on the physical environment are summarised in **Appendix A**.

[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.

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 longitudinal connectivity due to five noted weirs. A moderate risk of change to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

The risk of water quality deterioration is minor, with no flow depleted reaches within Holme 2. Water quality and flow pressures are identified in **Appendix A**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-64**. The overall confidence in the fisheries data and subsequent assessment has been classed as high due to the number of surveys and age of the most recent surveys completed.

Table B4-64: Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to potential major reduced flows. • Reduction in brown trout spawning and juvenile survival due to habitat loss, through sediment deposition on substrate alongside flow decrease within potential spawning grounds. • Increased risk of stress and predation, with more exposure through flow reduction.	High	Major	High

B4.11.2 Summary of impacts

Table B4-65 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 B4-65: Summary of impacts identified in Holme 2's environmental Receptors assessment

Reach	Holme 2	
	Significance of Impact[50]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Potamophylax rotundipennis	Minor	No
Ameletus inopinatus	Minor	No
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
Bullhead	Moderate	No
WFD Status Receptors		
Fish	Major	Yes
Invertebrates	Moderate	Yes

[50] Risk of Deterioration for WFD receptors

B4.12 HOLME 3

B4.12.1 Receptor 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 Holme 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, it is possible that individuals will become stranded as river levels reduce, and habitats become exposed. **Appendix A** also details the potential impact of the implementation of the associated drought option on depleted reach with potential for a major reduction in river flow up to 67%.

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 B4-66: Impacts on White-clawed crayfish in Holme 3

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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Holme 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 B4-67**. 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 B4-67: Impacts on water vole in Holme 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 feature • Species has a preference for waterbodies that do not have extreme fluctuations in water level[51]. • 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

[51] 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[52] 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.			

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-68**.

Table B4-68: Impacts on otter in Holme 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 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 B4-69** with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment of brown trout and bullhead has been classed as medium due to the number of surveys, age of the most recent surveys and number of sites.

Table B4-69: Impacts on NERC and notable fish species in Holme 3

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 as a result of a reduction in velocity, depth and/or wetted width	National	High	Major
Bullhead		Regional	Medium	Moderate

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

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[8]			

B4.12.1.2WFD receptors

Macroinvertebrates

The potential changes to river flows are likely to result in minor reduction in flow up to 63% and will lead to a major reduction in wetted width which will directly impact 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 good $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present no continuous pressures within this reach. Water quality deterioration as a result of the drought option may potentially have an acute, short-term impact on invertebrate community, associated with additional temporary water quality pressures locally downstream of eight listed CSOs during rainfall events. Furthermore, there are no significant flow pressures, either abstractions or discharges, influencing flow in Holme 3, 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 GB104027057600 Holme from Source to New Mill Dike and GB104027063301 Holme from New Mill Dike to R Colne (associated with Holme 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[9,10]. 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 B4-70.** 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, with a lack of historical data between 2010 and 2017.

Table B4-70: Impacts on macroinvertebrate communities in Holme 3

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa, with potential major flow reductions. • 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. • Potential impact on macroinvertebrate communities with water company discharge flow pressures within the reach. • Potential major changes in sediment dynamics affect macroinvertebrate communities by altering habitat structure. • Mortality as a result of water quality deterioration due to point source pollution with eight CSO's listed within the reach.	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 GB104027057600 Holme from Source to New Mill Dike (associated with Holme 3) waterbody. The deterioration from 'good' to 'poor' is a drastic deterioration in the classification of the fish element and highlights the impact unfavourable conditions can have on fish communities. Drought order implementation risks exacerbating existing pressures on the fish community and 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. 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 63% reduction in flow for the duration of the drought option poses a major risk of reduction to available aquatic habitat and longitudinal connectivity due to 10 noted weirs. A moderate risk of change to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

A moderate risk of water quality deterioration is associated acute toxicity of ammonia and oxygens sags locally downstream of eight listed CSOs during rainfall events, impacts are short term and acute. No flow depleted reaches are present within Holme 3. Water quality and flow pressures are identified in **Appendix A**.

The likely impacts arising from the hydrological changes as a result of the drought order are identified in **Table B4-71.** 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 B4-71: Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Habitat loss resulting from reduced flows and sediment deposition on suitable spawning substrates may lead to declines in spawning success and juvenile survival. • 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

B4.12.2 Summary of impacts

Table B4-72 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 B4-72: Summary of impacts identified in Holme 3's environmental receptors assessment

Reach	Holme 3	
	Significance of Impact[53]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes
WFD Status Receptors		
Fish	Major	Yes

[53] Risk of Deterioration for WFD receptors

Reach	Holme 3	
Invertebrates	Moderate	Yes

B4.13 HOLME 4

B4.13.1 Receptor assessment

B4.13.1.1 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 B4-73**. 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 medium due to the number and recency of surveys completed.

Table B4-73: Impacts on notable macroinvertebrates in Holme 4

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Atherix ibis	• The species is associated with moderate/fast flows therefore any reduction in flow could potentially impact habitat availability. • There is moderate risk on the species as a result of water quality pressures	County	Medium	Minor

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Holme 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, it is possible that individuals will become stranded as river levels reduce, and habitats become exposed. **Appendix A** also details the potential impact of the implementation of the associated drought option on depleted reach with potential for a major reduction in river flow up to 34%.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-734**. 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 B4-74: Impacts on White-clawed crayfish in Holme 4

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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Holme 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 likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-75.** 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 B4-75: Impacts on water vole in Holme 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[54]. • 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[55] 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 B4-76.**

Table B4-76: Impacts on otter in Holme 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	Low	Moderate

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-77**, with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout, grayling and bullhead has been classed as high due to the number of surveys and the age of the most recent surveys completed.

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

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

Table B4-77: Impacts on NERC and notable fish species in Holme 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 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. • It is noted that depth of water is not critical to bullhead[8].	National	High	Major
Bullhead		Regional	Medium	Moderate
Grayling		County	Medium	Moderate

B4.13.1.2WFD Receptors

Macroinvertebrates

The potential changes to river flows is likely to result in major reduction in flow and will lead to a major 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 not 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 seven listed CSOs during rainfall events. Furthermore, there is one significant flow pressure influencing flow in Holme 4, 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 GB104027057600 Holme from Source to New Mill Dike (associated with Holme 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[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 B4-78.** 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, with some sites lacking recent data but an overall consistent baseline.

[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.

Table B4-78: Impacts on macroinvertebrate communities in Holme 4

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa, through reduced flows • 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 potential downstream point source CSO discharge during rainfall events.	Medium	Moderate	Medium

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 GB104027057600 Holme from Source to New Mill Dike (associated with Holme 4) waterbody. The deterioration from 'good' to 'poor' is a drastic deterioration in the classification of the fish element and highlights the impact unfavourable conditions can have on fish communities. Drought order implementation risks exacerbating existing pressures on the fish community and 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. 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 longitudinal connectivity due to six noted weirs. A minor risk of change to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

Water quality is at moderate risk of deterioration due to changes in dilution of diffuse pollution pressures and from short term local acute toxicity of ammonia and oxygen sags downstream of seven listed CSOs during rainfall events. Drought option impacts on the physical environment are summarised in **Appendix A**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-79**. The overall confidence in the fisheries data and subsequent assessment has been classed as high due to the age of the oldest surveys completed and age of the most recent su

Table B4-79: Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• 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, oxygen sags, elevated phosphate levels).	High	Major	High

B4.13.2 Summary of impacts

Table B4-80 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 B4-80: Summary of impacts identified in Holme 4's environmental Receptors assessment

Reach	Holme 4	
	Significance of Impact[58]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Atherix ibis	Minor	No
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes
Grayling	Moderate	Yes
WFD Status Receptors		
Fish	Major	Yes
Invertebrates	Moderate	Yes

[58] Risk of Deterioration for WFD receptors

B4.14 HOLME T1

B4.14.1 Receptor assessment

B4.14.1.1 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 B4-81.**

Table B4-81: Impacts on otter in Holme T1

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 B4-82**, with drought option impacts on the physical environment summarised in **Appendix A.** The overall confidence in the data and subsequent assessment for brown trout and bullhead has been classed as medium due to the year of the oldest and most recent surveys completed.

Table B4-82: Impacts on NERC and notable fish species in Holme T1

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). • 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.	National	Medium	Moderate

B4.14.1.2 WFD Receptors

Macroinvertebrates

The potential changes to river flows is likely to result in major reduction in flow and will lead to a major 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 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 high $WHPT_{ASPT}$ 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 Holme T1, 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 GB104027057600 Holme from Source to New Mill Dike (associated with Holme T1). 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[59'60]. 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 medium due to the number of surveys and the age of the most recent surveys completed, with some sites lacking recent data but an overall consistent baseline.

Table B4-83: Impacts on macroinvertebrate communities in Holme T1

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa, with potential major flow reductions within the reach. • 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. • Potential changes in sediment dynamics affect macroinvertebrate communities by altering habitat structure. • Mortality as a result of water quality deterioration with elevated SRP levels potentially altering macroinvertebrate communities by promoting algal growth and reducing oxygen availability.	Medium	Moderate	Medium

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 GB104027057600 Holme from Source to New Mill Dike (associated with Holme 4) waterbody. The deterioration from 'good' to 'poor' is a drastic deterioration in the classification of the fish element and highlights the impact unfavourable conditions can have on fish communities. Drought order implementation risks exacerbating existing pressures on the fish community and 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. 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 moderate risk to longitudinal connectivity due to one noted weir. A moderate risk of change to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

The risk to water quality deterioration is moderate for phosphate, with reduced dilution increasing phosphate concentrations and lowering WFD status. There is only a minor risk to WFD status for ammonia and dissolved oxygen. There are no potentially flow depleted reaches within Holme T1. Drought option impacts on the physical environment are summarised in **Appendix A**.

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

60 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 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 age of the oldest surveys and 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 brown trout spawning and juvenile survival due to habitat loss through decreasing flow and sediment deposition on spawning substrate. • Increased risk of stress and predation through decreasing availability of habitat and a reduction of potential refuge areas.	Medium	Moderate	Medium

B4.14.2 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.

Table B4-85: Summary of impacts identified in Holme T1's environmental Receptors assessment

Reach	Holme T1	
	Significance of Impact[61]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Otter	Negligible	No
Brown trout	Moderate	Yes
WFD Status Receptors		
Fish	Moderate	Yes
Invertebrates	Moderate	Yes

B4.15 HOLME T3

B4.15.1 Receptor assessment

B4.15.1.1 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 Holme T3 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. **Appendix A** also details the potential impact of the implementation of the associated drought option on depleted reach with potential for flow reduced by 67% without mitigation within Holme T3.

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.

[61] Risk of Deterioration for WFD receptors

Table B4-86: Impacts on water vole in Holme T3

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[62]. • 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[63] 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 B4-87.**

Table B4-87: Impacts on otter in Holme T3

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 B4-88**, 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 high due to the number of surveys and the age of the most recent surveys completed.

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

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

Table B4-88: Impacts on NERC and notable fish species in Holme T3

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). • 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	High	Major

B4.15.1.2WFD Receptors

Macroinvertebrates

The potential changes to river flows is likely to result in major reduction in flow and will lead to a major 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 minor risk. Furthermore, there are no significant flow pressures, either abstractions or discharges, influencing flow in Holme T3, as indicated in **Appendix A**. **Appendix A** also details the potential impact of the implementation of the associated drought option on depleted reach with potential for flow reduced by 39% without mitigation within Holme T3.

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 GB104027063590 Mag Brook from Source to River Holme (associated with Holme T3). 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[64'65]. 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 B4-89.** 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.

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

65 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 B4-89: Impacts on macroinvertebrate communities in Holme T3

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, with a potential depleted reach and major reduction in flows. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities. • Potential changes in sediment dynamics affect macroinvertebrate communities by altering habitat structure. • 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 **major** risk to the fish component of the WFD GB104027063590 Mag Brook from Source to River Holme (associated with Holme T3). 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 longitudinal connectivity due to six noted weirs. A minor risk of change to sediment dynamics could result in increased fine sediment deposition, adversely impacting brown trout spawning sites.

There is potential for one flow depleted reach (with potential for zero flow without mitigation) for periods of time, however, there is only a minor risk to water quality. Water quality and flow pressures are identified in **Appendix A**.

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 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 B4-90: 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.	High	High	High

B4.15.2 Summary of impacts

Table B4-91 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 B4-91: Summary of impacts identified in Holme T3's environmental Receptors assessment

Reach	Holme T3	
	Significance of Impact[66]	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
WFD Status Receptors		
Fish	Moderate	Yes
Invertebrates	Moderate	No

[66] Risk of Deterioration for WFD receptors

B4.16 CALDER 4

B4.16.1 Receptor assessment

B4.16.1.1 NERC and local wildlife sites

Cromwell Bottom LNR/LWS

Cromwell Bottom is one of the richest areas in Calderdale in terms of biodiversity, acting as a stepping stone this site boasts over 130 species of plant, 200 species of recorded birds, large numbers of mammals, amphibians and a plethora of invertebrate life. Cromwell Bottom is split into 3 areas by the looping river Calder[67]. It has been designated as a non-statutory LWS for the diversity of wetland and transitional habitats present within the site that have developed on the former gravel pits and PFA lagoons; and for a number of scarce species, it supports within the Calder Valley. It has also been designated as a LNR as it provides important access to greenspace with biodiversity value. As such, the risk from reduced river levels as a result of the implementation of the drought option to Cromwell Bottom LNR is deemed to be **moderate**.

Southern Washlands LNR/LWS

Southern Washlands Nature Reserve comprises open water, swamp, marshy grassland, neutral grassland scrub and woodland. The site comprised of two lakes; one is used for fishing by the local angling club and left undisturbed and the area acts as a controlled flood storage basin for the River Calder. The two large lakes are in close proximity to the adjacent River Calder and given the proximity to the river, the site is likely be in connectivity with the impacted reach. Based on the available information the lakes are likely hydrologically connected, however the site acts mainly as flood storage for the River Calder during high flow occurrences. The implementation of the drought option will not significantly affect the hydrological functioning of the lake habitats as flood storage, against a baseline of reduced flows characteristic of drought. As such, the risk to Southern Washlands LNR is deemed to be **minor**.

Stanley Marsh LNR/LWS

Stanley Marsh was part of Stanley Deep Drop Pit, one of the five working pits that formed Stanley Victoria Colliery. The site supports a small wetland area, created by mining subsidence, surrounded by woodland and a hay meadow. Good site for dragonflies, frogs and newts. New ponds were also dug and mini-islands created within the marsh to attract nesting birds. The site is known to retain winter rainfall well as the site prior to being designated a LNR the site was vacant due to deteriorating drainage system and mining subsidence, added to these problems were the colliery spoil heaps and remains of an elevated tram line bed which retained water on the northern and eastern sides of the site during the winter. Given the sites poor drainage and water retention from rainfall the site is unlikely to be significantly affect by the implementation of the drought option against a baseline of reduced flows characteristic of drought. As such, the risk to Stanley Marsh LNR is deemed to be **negligible**.

Horbury Lagoons LWS

The Horbury Lagoon is around 5 acres in size with an average depth of 7 metres. It was developed from an old gravel pit by Whitaker's Sand and Gravel Company in the early 1950s. The site includes two large ponds/lakes adjacent to the River Calder and given the proximity to the river, the site may potentially be in connectivity with the impacted reach through alluvial deposits. Connectivity to the river is assumed on a precautionary basis. Over the past few years the lagoon has been stocked regularly with good quality Carp. Pike, tench and bream have also been reported in the lagoon. The site may potentially be in connectivity with the impacted reach through alluvial deposits. Based on the available information the pond may be hydrologically connected and a reduction in flows within the River Calder may result in a disconnection of the ponds with the impacted reach, however given the large size of the ponds the risk from the implementation of the drought option to Horbury Lagoons LWS is deemed to be **minor**.

Altoft Ings LWS

Altoft Ings Local wildlife site includes a large pond/lake on the meander of the River Calder and given the proximity to the river, connectivity to the river is assumed on a precautionary basis. Based on the available

[67] Cromwell Bottom LNR site details, accessed 09 September 2020. https://designatedsites.naturalengland.org.uk/SiteLNRDetail.aspx?SiteCode=L1009897&SiteName=bottom&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=

information the pond may be hydrologically connected and a reduction in flows within the River Calder 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 Altoft Ings LWS is deemed to be **minor**.

Foxholes LWS

Foxholes includes a woodland and wetland habitat on the meander of the River Calder and given the proximity to the river, the wetland is likely to have connectivity to the river, this connectivity has been assumed on a precautionary basis. 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[68]. The site serves as a natural floodplain for the River Calder 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 wetland habitat, against a baseline of reduced flows characteristic of drought. As such, the risk from the implementation of the drought option to Foxholes LWS is deemed to be **negligible**.

B4.16.1.2 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 B4-92**. 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 high due to the number of surveys completed, and the of completion where the species were observed.

Table B4-92: Impacts on notable macroinvertebrates in Calder 4

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Atherix ibis	• The species is associated with moderate/fast flows therefore any reduction in flow could potentially impact habitat availability. • There is moderate risk on the species as a result of water quality pressures	County	Medium	Minor

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Calder 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 likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-93.** 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.

[68] 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 B4-93: Impacts on water vole in Calder 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, but will not impact on this receptor. • Species has a preference for waterbodies that do not have extreme fluctuations in water level[69]. • 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[70] 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 B4-94.**

Table B4-94: Impacts on otter in Calder 4

Recpetor	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	Low	Moderate

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-95**, 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, European eel, barbel and grayling has been classed as high due to the number of surveys, number of survey sites and the age of the most recent surveys completed. The confidence in the assessment for brook lamprey and river lamprey has been classed as low due to a single catch of *Lampetra sp.*, which could be either brook lamprey or river lamprey.

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

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

Table B4-95: Impacts on NERC and notable fish species in Calder 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 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[8]. • Exposure/loss of important habitats for juveniles and adults eel.	National	Medium	Moderate
River lamprey		Regional	Medium	Moderate
Bullhead		Regional	Low	Minor
Brook lamprey		Regional	Medium	Moderate
Grayling		County	Medium	Moderate
Barbel		County	Low	Minor
European eel		National	Medium	Moderate

B4.16.1.3WFD Receptors

Macroinvertebrates

The potential changes to river flows is likely to result in moderate reduction in flow and will lead to a minor 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 bad to 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 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 27 listed CSO during rainfall events. Furthermore, there are no significant flow pressures, either abstractions or discharges, influencing flow in Calder 4, 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 GB104027062642 Calder from Ryburn Confluence to River Colne, GB104027062631 Calder from River Colne to River Chald and GB104027062632 Calder from River Chald to River Aire (associated with Calder 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[71'72]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **minor**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-96.** 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.

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

72 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 B4-96: Impacts on macroinvertebrate communities in Calder 4

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).	Low	Minor	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 GB104027062642 Calder from Ryburn Confluence to River Colne, GB104027062631 Calder from River Colne to River Chald and GB104027062632 Calder from River Chald to River Aire (associated with Calder 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 moderate risk of change in energy of the system associated with up to 21% reduction in flow for periods of time during dry autumn conditions and minor effects during winter refill drought options poses a minor risk of reduction in available aquatic habitat, longitudinal connectivity from eight in-channel structures and changes in sediment dynamics. The risk of water quality is considered moderate, owing to short term acute toxicity of ammonia and oxygen sags downstream locally of 27 listed CSOs during rainfall events, and a moderate risk of increase phosphate concentrations from diffuse pollution pressures. No potential flow depleted reaches are present within Calder 4, however there is potential for increased flow pressure from additional abstractions and discharges in combination with the drought option. Water quality and flow pressures are identified in **Appendix A**.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-97**. The overall confidence in the fisheries data and subsequent assessment has been classed as high due to the number of surveys, number of survey sites and age of the most recent surveys completed.

Table B4-97: 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, oxygen sags, elevated phosphate levels).	Medium	Medium	High

B4.16.2 Summary of impacts

Table B4-98 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 B4-98: Summary of impacts identified in Calder 4's environmental Receptors assessment

Reach	Calder 4	
	Significance of Impact[73]	**Mitigation Required** *(Y/N)*
NERC and local wildlife sites		
Cromwell Bottom LNR/LWS	Moderate	Yes
Southern Washlands LNR/LWS	Minor	No
Stanley Marsh LNR/LWS	Negligible	No
Horbury Lagoons LWS	Minor	No
Altoft Ings LWS	Minor	No
Foxholes LWS	Negligible	No
NERC and Notable Species Receptors		
Atherix ibis	Minor	No
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
River lamprey	Moderate	Yes
Bullhead	Minor	No
Brook lamprey	Moderate	Yes
Grayling	Minor	No
Barbel	Minor	No
European eel	Moderate	Yes
WFD Status Receptors		
Fish	Moderate	Yes
Invertebrates	Minor	No

[73] Risk of Deterioration for WFD receptors

B5 ENVIRONMENTAL RECEPTORS ASSESSMENT SUMMARY

Reach	Blackbrook 1	Colne 1	Colne 2	Colne 3	Colne 4	Colne T1	Colne T3	Colne T4	Holme 1	Holme 2	Holme 3	Holme 4	Holme T1	Holme T3	Calder 4
Hydrological Impact	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Moderate (autumn) Minor (winter)
Associated Drought Options	**Scammonden Water – Black Brook**	**River Colne Maintained Flow at Marsden**	**River Colne Maintained Flow at Marsden, Butterley Reservoir**	**Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough**	**Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoor Reservoir – Brow Grains, Digley Reservoir, Brownhil Reservoir**	**Butterley Reservoir**	**Blackmoorfoot Reservoir - Hoyle House Clough**	**Scammonden Water - Bradshaw Clough**	**Brownhill Reservoir**	**Digley Reservoir, Brownhill Reservoir**	**Digley Reservoir, Brownhill Reservoir**	**Digley Reservoir, Brownhill Reservoir, Blackmoorfoot Reservoir - Brow Grains**	**Digley Reservoir**	**Blackmoorfoot Reservoir - Brow Grains**	**Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoot Reservoir – Brow Grains, Digley Reservoir, Brownhill Reservoir, Scammonden Water – Black Brook and the Upper Calder Drought Measures**
WFD Waterbody	GB10402706257 0 Black Brook from Source to River Calder	GB10402706325 0 River Colne from Source to Wessenden Brook	GB10402706333 0 Colne from Wessenden Brook to R Holme	GB10402706333 0 River Colne from Wessenden Brook to River Holme	GB10402706255 0 Colne from River Holme to River Calder	GB10402706319 0 Wessenden Bk from Butterly Resr to River Colne	GB10402706333 0 River Colne from Wessenden Brook to River Holme	GB10402706333 0 River Colne from Wessenden Brook to River Holme	GB10402705760 0 Holme from Source to New Mill Dike	GB10402705760 0 Holme from Source to New Mill Dike	GB10402705760 0 Holme from Source to New Mill Dike, GB10402706330 1 Holme from New Mill Dike to River Colne	GB10402705760 0 Holme from Source to New Mill Dike	GB10402705760 0 Holme from Source to New Mill Dike	GB10402706359 0 Mag Brook from Source to River Holme	GB10402706264 2 Calder from Ryburn Confluence to River Colne, GB10402706263 1 Calder from River Colne to River Chald, GB10402706263 2 Calder from River Chald to River Aire
Statutory designated sites															
None															
Non-statutory designated sites															
Cromwell Bottom – LNR/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
Southern Washlands - LNR/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	Minor
Stanley Marsh LNR/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	Negligible
Horbury Lagoons 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	Minor
Altoft Ings 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	Minor
Foxholes 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	Negligible
NERC and Notable Species															
White-clawed crayfish *Austropotamobius pallipe*	Moderate	Moderate	Moderate	Moderate	N/A	Moderate	Moderate	Moderate	Moderate	N/A	Moderate	Moderate	N/A	N/A	N/A
Otter *Lutra lutra*	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Water vole *Arvicola amphibious*	Major	Moderate	Moderate	Moderate	Moderate	N/A	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	N/A	Moderate	Moderate
Atherix ibis	Minor	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	Minor
Potamophylax rotundipennis	N/A	N/A	N/A	N/A	Moderate	N/A	N/A	N/A	Minor	Minor	N/A	N/A	N/A	N/A	N/A
Ameletus inopinatus	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
Wormaldia subnigra	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
Tinodes unicolor	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

Reach	Blackbrook 1	Colne 1	Colne 2	Colne 3	Colne 4	Colne T1	Colne T3	Colne T4	Holme 1	Holme 2	Holme 3	Holme 4	Holme T1	Holme T3	Calder 4
Hydrological Impact	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Major	Moderate (autumn) Minor (winter)
Associated Drought Options	**Scammonden Water – Black Brook**	**River Colne Maintained Flow at Marsden**	**River Colne Maintained Flow at Marsden, Butterley Reservoir**	**Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough**	**Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoor Reservoir – Brow Grains, Digley Reservoir, Brownhil Reservoir**	**Butterley Reservoir**	**Blackmoorfoot Reservoir - Hoyle House Clough**	**Scammonden Water - Bradshaw Clough**	**Brownhill Reservoir**	**Digley Reservoir, Brownhill Reservoir**	**Digley Reservoir, Brownhill Reservoir**	**Digley Reservoir, Brownhill Reservoir, Blackmoorfoot Reservoir - Brow Grains**	**Digley Reservoir**	**Blackmoorfoot Reservoir - Brow Grains**	**Colne Maintained Flow at Marsden Reservoir, Butterley Reservoir, Blackmoorfoot Reservoir – Hoyle House Clough, Blackmoorfoot Reservoir – Brow Grains, Digley Reservoir, Brownhill Reservoir, Scammonden Water – Black Brook and the Upper Calder Drought Measures**
WFD Waterbody	GB10402706257 0 Black Brook from Source to River Calder	GB10402706325 0 River Colne from Source to Wessenden Brook	GB10402706333 0 Colne from Wessenden Brook to R Holme	GB10402706333 0 River Colne from Wessenden Brook to River Holme	GB10402706255 0 Colne from River Holme to River Calder	GB10402706319 0 Wessenden Bk from Butterly Resr to River Colne	GB10402706333 0 River Colne from Wessenden Brook to River Holme	GB10402706333 0 River Colne from Wessenden Brook to River Holme	GB10402705760 0 Holme from Source to New Mill Dike	GB10402705760 0 Holme from Source to New Mill Dike	GB10402705760 0 Holme from Source to New Mill Dike, GB10402706330 1 Holme from New Mill Dike to River Colne	GB10402705760 0 Holme from Source to New Mill Dike	GB10402705760 0 Holme from Source to New Mill Dike	GB10402706359 0 Mag Brook from Source to River Holme	GB10402706264 2 Calder from Ryburn Confluence to River Colne, GB10402706263 1 Calder from River Colne to River Chald, GB10402706263 2 Calder from River Chald to River Aire
Barbel *Barbus barbus*	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
Brook lamprey *Lampetra planeri*	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
River Lamprey *Lampetra fluviatilis*	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
Brown trout *Salmo trutta*	Major	Major	Moderate	Major	Major	Major	Minor	N/A	Moderate	Major	Major	Major	Moderate	Major	Moderate
Bullhead *Cottus gobio*	Moderate	Moderate	Minor	Moderate	Moderate	N/A	N/A	N/A	Minor	Moderate	Moderate	Moderate	N/A	N/A	Minor
European eel *Anguilla anguilla*	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
Grayling *Thymallus thymallus*	N/A	N/A	N/A	Moderate	Moderate	N/A	N/A	N/A	N/A	N/A	N/A	Moderate	N/A	N/A	Minor
WFD Status Receptors															
Fish	Major	Major	Moderate	Major	N/A	N/A	Minor	N/A	Moderate	Major	Major	Major	Moderate	Moderate	Moderate
Macroinvertebrates	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Minor
Landscape, navigation, recreation and heritage															
none															

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 be present in all impact reaches, no further baseline monitoring surveys have been included for these species. Mitigation measures and protection for sensitive species such as brown trout which are screened in should provide adequate protection where required of water levels and flows to ensure that riparian species such as water vole and otter are adequately protected for the duration of the drought 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.3-2 of YWSL's Draft Drought Plan 2021 EMP and a summary is provided in the main EAR Section 6.2.

Reach specific actions are included in Appendix A.3-2 for significant water quality pressures related to YWSL WwTWs. In addition to specific surveillance monitoring the following is specified:

- **Black Brook 1:** the assessment has identified a significant water quality pressure in the reach associated with Scammonden Dam WwTW and Barsey Green WwTW.

  YWSL have identified that for the period of implementation of the drought option, sewage treatment can be enhanced, reducing the water quality pressure on the impacted Receptors from ammonia, and oxygen balance. Further information can be found in the YWSL WwTW optimisation plan[74] which 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 Environment Agency regarding any WwTWs not identified as significant water quality pressures at the time of the writing of this EAR, but which may be a cause for concern. Additional sites will be added to the priority list of sites for optimisation as required.

A 'Combined Sewer Overflows Optimisation and Maintenance for Drought Plan' has also been developed by YWSL, which identifies all significant intermittent water quality pressures identified in this EAR. During any future drought onset period YWSL will also consult with the Environment Agency and additional sites could be identified as required.

[74] YWSL (2018) Wastewater Treatment Works Optimisation and Maintenance for Drought Plan.

ANNEX 1 FULL FISH SURVEY COUNTS

							Low tolerance					Medium tolerance								High tolerance							Unclassified tolerance
Reach	**Site ID**	**Site Name**	**Survey NGR**	**Year**	**Survey Method**	**Survey Strategy**	Bullhead	Brown / sea trout	Grayling	Lamprey sp.	Rainbow trout	Stone loach	Bleak	Chub	Dace	Gudgeon	Pike	Minnow	Common bream	3-spined stickleback	Barbel	Perch	Roach	European eel	Roach x common	10-spined	Brown / sea trout x salmon hybrid
Black Brook 1	8299	Freudenberg	SE0842420695	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99†	72																			
Black Brook 1	8299	Freudenberg	SE0842420695	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	26	95																			
Black Brook 1	8299	Freudenberg	SE0842420695	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	25	27																			
Black Brook 1	8299	Freudenberg	SE0842420695	2013	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	54	128				1															
Black Brook 1	8299	Freudenberg	SE0842420695	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	42	50				1															
Black Brook 1	8299	Freudenberg	SE0842420695	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	34	130																			
Black Brook 1	8299	Freudenberg	SE0842420695	2019	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	14	21				1															
Black Brook 1	8299	Freudenberg	SE0842420695	2021	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	19	54				1															
Black Brook 1	8299	Freudenberg	SE0842420695	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	999†	61																			
Black Brook 1	11821	Barkisland	SE0660519803	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		132																			
Black Brook 1	11821	Barkisland	SE0660519803	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		154																			
Black Brook 1	11821	Barkisland	SE0660519803	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		121																			
Black Brook 1	11821	Barkisland	SE0660519803	2023	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		154																			
Black Brook 1	11837	Gate Head Lane	SE0770220594	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	42	34																			
Black Brook 1	11837	Gate Head Lane	SE0770220594	2021	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	35	51																			
Black Brook 1	11958	Penny Hill (WR)	SE0636318410	2010	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		111																			
Black Brook 1	80005	d/s Holywell Brook Confluence	SE0908020841	2024	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99†	21				9†															
Black Brook 1	80006	u/s Holywell Brook confluence	SE0907120803	2024	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99†	35				9†															
Holme 2	14181	Co-op Lane	SE1256707013	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	93	67																			
Holme 2	14181	Co-op Lane	SE1256707013	2019	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	19	21																			
Holme 2	14181	Co-op Lane	SE1256707013	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	129	33																			
Holme 2	14181	Co-op Lane	SE1256707013	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	132	32			3																
Colne 1	130	Church Lane	SE0478711662	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	1	27																			
Colne 1	130	Church Lane	SE0478711662	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		19																			
Colne 1	130	Church Lane	SE0478711662	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	13	50																			
Colne 1	131	u/s of pond	SE0409311873	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	3	4																			
Colne 1	131	u/s of pond	SE0409311873	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	4	9																			
Colne 1	131	u/s of pond	SE0409311873	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9	8												1							
Colne 1	131	u/s of pond	SE0409311873	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	134	6												33							
Colne 1	131	u/s of pond	SE0409311873	2024	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	120	6																			
Colne 1	29861	Clough Lea	SE0474311667	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	1	46																			
Colne 1	29861	Clough Lea	SE0474311667	2016	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	17	59																			
Colne 1	29861	Clough Lea	SE0474311667	2017	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	31	23																			
Colne 1	29861	Clough Lea	SE0474311667	2018	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	68	60												1							
Colne 1	29861	Clough Lea	SE0474311667	2021	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	2	23												1							
Colne 2	11851	Lees Mill lane	SE0896914294	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		1	17			99†								9†							
Colne 2	11851	Lees Mill lane	SE0896914294	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		89	13			47							21	4							
Colne 2	11851	Lees Mill lane	SE0896914294	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		33	5			15							3								
Colne 2	11851	Lees Mill lane	SE0896914294	2013	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		218	23			66							4								
Colne 2	11851	Lees Mill lane	SE0896914294	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		55	2			23							5								
Colne 2	11851	Lees Mill lane	SE0896914294	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		39	6			42								3							
Colne 2	11851	Lees Mill lane	SE0896914294	2019	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		19	11			26								2							
Colne 2	11851	Lees Mill lane	SE0896914294	2021	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	46	22	11			62							4	13							
Colne 2	11851	Lees Mill lane	SE0896914294	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99†	17	5			99†								9†							
Colne 2	29858	Holme Mills	SE0642913052	2013	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		71				10															
Colne 2	29858	Holme Mills	SE0642913052	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		61				35															
Colne 2	29858	Holme Mills	SE0642913052	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	36	15				18															

							Low tolerance					Medium tolerance								High tolerance							Unclassified tolerance
Reach	**Site ID**	**Site Name**	**Survey NGR**	**Year**	**Survey Method**	**Survey Strategy**	Bullhead	Brown / sea trout	Grayling	Lamprey sp.	Rainbow trout	Stone loach	Bleak	Chub	Dace	Gudgeon	Pike	Minnow	Common bream	3-spined stickleback	Barbel	Perch	Roach	European eel	Roach x common	10-spined	Brown / sea trout x salmon hybrid
Colne 2	29858	Holme Mills	SE0642913052	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	80	30				22								1							
Colne 2	29858	Holme Mills	SE0642913052	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	162	12				23								1							
Colne 2	44166	Titanic Mill	SE0961614543	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE						1															
Colne 2	44166	Titanic Mill	SE0961614543	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		6				4															
Colne 2	44166	Titanic Mill	SE0961614543	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		13	3			34															
Colne 2	44166	Titanic Mill	SE0961614543	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		6	1			1															
Colne 2	44166	Titanic Mill	SE0961614543	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		33	4			35						3		2							
Colne 2	44167	DS Slaithewaite Park	SE0863414211	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		52	3			5						10		1							
Colne 2	44167	DS Slaithewaite Park	SE0863414211	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		27	3			26															
Colne 2	44168	Slaithewaite park footbridge	SE0846314105	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		31				99†															
Colne 2	44168	Slaithewaite park footbridge	SE0846314105	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		43	2			46															
Colne 3	35969	Stafford Mills	SE1204216013	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE			1			16								1							
Colne 3	35969	Stafford Mills	SE1204216013	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		33	2			30								1							
Colne 3	35969	Stafford Mills	SE1204216013	2016	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		21	13			55															
Colne 3	35969	Stafford Mills	SE1204216013	2017	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		11	11			8															
Colne 3	35969	Stafford Mills	SE1204216013	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		7	4			29						14									
Colne 3	35969	Stafford Mills	SE1204216013	2021	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		2				4						10					1				
Colne 3	44165	Stoney Battery Lane	SE1277416010	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		17				1															
Colne 3	44165	Stoney Battery Lane	SE1277416010	2013	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		79	1			11															
Colne 3	44165	Stoney Battery Lane	SE1277416010	2016	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		13	1			32															
Colne 3	44165	Stoney Battery Lane	SE1277416010	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		2				8															
Colne 3	44165	Stoney Battery Lane	SE1277416010	2018	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		37	21			77						2		3							
Colne 3	44165	Stoney Battery Lane	SE1277416010	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	5	40	52			124						1									
Colne 4	63383	Galpham Stadium	SE1515717441	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		2	3																		
Colne 4	63383	Galpham Stadium	SE1515717441	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	151	7	19			94						22		10			1				
Colne 4	63383	Galpham Stadium	SE1515717441	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	179	6	5			71						10		2							
Colne 4	63383	Galpham Stadium	SE1515717441	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	219	6	1			80						9		31							
Colne T1	133	Weir Side	SE0481411560	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE														24							
Colne T1	133	Weir Side	SE0481411560	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE														94							
Colne T1	133	Weir Side	SE0481411560	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		17												4							
Colne T1	29862	Wessenden Brook	SE0475411522	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE														4							
Colne T1	29862	Wessenden Brook	SE0475411522	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE														3							
Colne T1	29862	Wessenden Brook	SE0475411522	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		2												1							
Colne T1	29862	Wessenden Brook	SE0475411522	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		9																			
Colne T1	29862	Wessenden Brook	SE0475411522	2024	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		48															4				
Colne T4	YW10037	Claridge House Bridge	SE066143	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE														26							
Holme 1	11966	Brownhill Reservoir (WR)	SE1182906461	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	42	39				1											1				
Holme 1	11966	Brownhill Reservoir (WR)	SE1182906461	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	158	28				3															
Holme 1	11966	Brownhill Reservoir (WR)	SE1182906461	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	100	25																			
Holme 1	11966	Brownhill Reservoir (WR)	SE1182906461	2023	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	199	30																			
Holme 2	14128	New Houses	SE1347907605	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	58	44																			
Holme 2	14128	New Houses	SE1347907605	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	67	29																			
Holme 2	14128	New Houses	SE1347907605	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	80	27																			
Holme 2	14188	Bottoms Dam	SE1310807362	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	79	33															2				
Holme 2	14188	Bottoms Dam	SE1310807362	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	108	49																			
Holme 2	14188	Bottoms Dam	SE1310807362	2022	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9	18																			
Holme 3	14129	Sands Recreation Ground	SE1460009200	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	79	115																			
Holme 3	14129	Sands Recreation Ground	SE1460009200	2019	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	13																				
Holme 3	14129	Sands Recreation Ground	SE1460009200	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	199	8																			
Holme 3	14129	Sands Recreation Ground	SE1460009200	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	154	14																			

							Low tolerance					Medium tolerance								High tolerance							Unclassified tolerance
Reach	Site ID	Site Name	Survey NGR	Year	Survey Method	Survey Strategy	Bullhead	Brown / sea trout	Grayling	Lamprey sp.	Rainbow trout	Stone loach	Bleak	Chub	Dace	Gudgeon	Pike	Minnow	Common bream	3-spined stickleback	Barbel	Perch	Roach	European eel	Roach x common	10-spined	Brown / sea trout x salmon hybrid
Holme 3	14180	Tennis Courts	SE1480909695	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	999†	112				999†						9†									
Holme 3	14180	Tennis Courts	SE1480909695	2011	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	15	110																			
Holme 3	14180	Tennis Courts	SE1480909695	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	28	91																			
Holme 3	14180	Tennis Courts	SE1480909695	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	78	86																			
Holme 3	14180	Tennis Courts	SE1480909695	2019	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	8	8																			
Holme 3	14180	Tennis Courts	SE1480909695	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	150	48																			
Holme 3	14180	Tennis Courts	SE1480909695	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	238	59																			
Holme 3	14180	Tennis Courts	SE1480909695	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	79	44																			
Holme 3	14180	Tennis Courts	SE1480909695	2023	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99†	69																			
Holme 3	14187	Co-op car park	SE1431708330	2019	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	31	6																			
Holme 3	14187	Co-op car park	SE1431708330	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	277	5																			
Holme 3	14187	Co-op car park	SE1431708330	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	362	21																			
Holme 3	14187	Co-op car park	SE1431708330	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	169	25																			
Holme 3	45184	Brockholes	SE1507310995	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		17				1															
Holme 4	11844	Huddersfield RUFC	SE1318414634	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	1	26				1						10									
Holme 4	11844	Huddersfield RUFC	SE1318414634	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	17	44	38			6						2									
Holme 4	11844	Huddersfield RUFC	SE1318414634	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	25	26	24			11															
Holme 4	11844	Huddersfield RUFC	SE1318414634	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	19	23	8			18															
Holme 4	12006	Berry Brow	SE1349913643	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		41	4									6		11							
Holme 4	12006	Berry Brow	SE1349913643	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		4	2									2									
Holme 4	12006	Berry Brow	SE1349913643	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	1	14	2			2						3									
Holme 4	12006	Berry Brow	SE1349913643	2021	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	5	31												1							
Holme 4	12006	Berry Brow	SE1349913643	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	81	15	4			2								5							
Holme 4	12006	Berry Brow	SE1349913643	2023	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE	54	56	22			7								2							
Holme 4	45182	Lockwood	SE1363315053	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		17	1									32		1							
Holme 4	45183	Honley	SE1409711986	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		31																			
Holme T1	11993	d/s Digley Res (WR)	SE1169906789	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		67																			
Holme T1	11993	d/s Digley Res (WR)	SE1169906789	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		86																			
Holme T1	11993	d/s Digley Res (WR)	SE1169906789	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		64																			
Holme T1	11993	d/s Digley Res (WR)	SE1169906789	2023	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		81																			
Holme T2	14194	Washpits	SE1417206619	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		45				1								4							
Holme T2	14197	Dover Road	SE1449307289	2015	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		77																			
Holme T2	14198	Underbank (Near Flats)	SE1447407800	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		41				1															
Holme T2	14198	Underbank (Near Flats)	SE1447407800	2022	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		52				1															
Holme T2	14198	Underbank (Near Flats)	SE1447407800	2023	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		65																			
Holme T3	136	Wood Bottom Road	SE1184812132	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		23																			
Holme T3	136	Wood Bottom Road	SE1184812132	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		24																			
Holme T3	136	Wood Bottom Road	SE1184812132	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		32												1							
Holme T3	136	Wood Bottom Road	SE1184812132	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		13																			
Holme T3	136	Wood Bottom Road	SE1184812132	2024	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		90																			
Holme T3	137	Lea Lane	SE1256912382	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		54																			
Holme T3	137	Lea Lane	SE1256912382	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		77																			
Holme T3	137	Lea Lane	SE1256912382	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		67																			
Holme T3	137	Lea Lane	SE1256912382	2021	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		12																			
Holme T3	137	Lea Lane	SE1256912382	2024	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		192																			
Holme T3	11963	Meltham (WR)	SE0988310807	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		73																			
Holme T3	11963	Meltham (WR)	SE0988310807	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		84																			
Holme T3	36731	Mag Brook at Honley	SE1360112335	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		13																			
Holme T3	36731	Mag Brook at Honley	SE1360112335	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		43																			
Holme T3	36731	Mag Brook at Honley	SE1360112335	2016	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		72																1			

							Low tolerance					Medium tolerance								High tolerance							Unclassified tolerance
Reach	**Site ID**	**Site Name**	**Survey NGR**	**Year**	**Survey Method**	**Survey Strategy**	Bullhead	Brown / sea trout	Grayling	Lamprey sp.	Rainbow trout	Stone loach	Bleak	Chub	Dace	Gudgeon	Pike	Minnow	Common bream	3-spined stickleback	Barbel	Perch	Roach	European eel	Roach x common	10-spined	Brown / sea trout x salmon hybrid
Holme T3	36731	Mag Brook at Honley	SE1360112335	2017	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		58																			
Holme T3	36731	Mag Brook at Honley	SE1360112335	2018	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		81												3							
Holme T3	36731	Mag Brook at Honley	SE1360112335	2020	Electric Fishing (AC, PDC and DC)	CATCH DEPLETION SAMPLE		42												10							
Calder 4	8302	Chantry Bridge	SE3385120115	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99†	10				9†	2	84	24	20	1	999†			5	22	283				
Calder 4	8302	Chantry Bridge	SE3385120115	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99†	12	1	9†		99†	4	80	119	113	1	99†	2	99†		24	355	1	1		
Calder 4	8302	Chantry Bridge	SE3385120115	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE (PART WIDTH)	26	1				20	10	104	33	114		92			1	5	58				
Calder 4	8302	Chantry Bridge	SE3385120115	2020	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	2						2	6	1		1	19				2	40	1			
Calder 4	8302	Chantry Bridge	SE3385120115	2021	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	6							2				15		1		3	90				
Calder 4	8302	Chantry Bridge	SE3385120115	2022	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	2							10			1			1		5	24				
Calder 4	8302	Chantry Bridge	SE3385120115	2024	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9†	6	6				24	148	39	22	2	999†			1	8	208	1			1
Calder 4	8303	Elland power Station d/s	SE1237222157	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99†	73	19			999†						9†									
Calder 4	8303	Elland power Station d/s	SE1237222157	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	999†	18	1			9999†						999†									
Calder 4	8303	Elland power Station d/s	SE1237222157	2013	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	6	43	33			43						32									
Calder 4	8303	Elland power Station d/s	SE1237222157	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	4	31	35			1190				30		1244									
Calder 4	8303	Elland power Station d/s	SE1237222157	2024	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9†	34	25			99†				2		999†									
Calder 4	8336	Brighouse Industrial Estate	SE1493822560	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99†	14	2			999†				1	2	9999†				6	1	1			
Calder 4	8359	Cornmill Weir	SE1698321822	2010	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9†	18	35			99†		5			5	999†		9†	2	2	3				
Calder 4	8359	Cornmill Weir	SE1698321822	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE (PART WIDTH)		20	38			1				1	1	18		1	1	1					
Calder 4	13886	Dewsbury (end of flood relief channel)	SE2404020932	2012	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	99†	18	14			99†		7	58	2	2	999†			1	1	11				
Calder 4	13886	Dewsbury (end of flood relief channel)	SE2404020932	2024	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	9†	11	24			99†		7	1	5		99†			1			2			
Calder 4	22110	Methley	SE4081125715	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE									5							8	10				
Calder 4	22110	Methley	SE4081125715	2021	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE											3			1		14	84				
Calder 4	22110	Methley	SE4081125715	2022	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE						1				13						14	39	2			
Calder 4	22130	Smalley Bight	SE3510824004	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE	1					4		7		4		6									
Calder 4	36757	Sands Mill (Dewsbury)	SE2511121001	2015	Electric Fishing (AC, PDC and DC)	SINGLE CATCH SAMPLE		13	4			1			25	1					1	1					
Calder 4	42075	Brighouse - Fry Survey	SE1517422473	2010	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE (PART WIDTH)								2		3		230		105			102				
Calder 4	42075	Brighouse - Fry Survey	SE1517422473	2012	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE	1													6							
Calder 4	42075	Brighouse - Fry Survey	SE1517422473	2013	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE								20		352		3196		44		12	12				
Calder 4	42075	Brighouse - Fry Survey	SE1517422473	2014	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE								3				11		9		4				1	
Calder 4	42075	Brighouse - Fry Survey	SE1517422473	2015	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE						9				3		173		29							
Calder 4	42075	Brighouse - Fry Survey	SE1517422473	2016	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE						1						83		77							
Calder 4	42075	Brighouse - Fry Survey	SE1517422473	2020	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE						2						146		97							
Calder 4	42075	Brighouse - Fry Survey	SE1517422473	2022	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	CATCH DEPLETION SAMPLE								10				102		32		3	2				
Calder 4	70148	Dewsbury Fry Survey	SE2541920429	2017	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE	1		2			3		18	44	5		147		19			20				
Calder 4	70148	Dewsbury Fry Survey	SE2541920429	2018	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE								51	16	104		1414		805			1450				
Calder 4	70148	Dewsbury Fry Survey	SE2541920429	2019	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE						1		11						2							
Calder 4	70148	Dewsbury Fry Survey	SE2541920429	2023	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE						4		14	1			160		95	1		13				
Calder 4	70148	Dewsbury Fry Survey	SE2541920429	2024	Netting (including Seine, Fyke, Dip, Dop, Gill and Kick)	SINGLE CATCH SAMPLE			20			40		180		20		650		540	40		10				

† Values represents the estimated observed abundance for the completed survey, ranging from 0-9,10-99,100-999, 1000+

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