DROUGHT PLAN: ENVIRONMENTAL ASSESSMENT REPORT

North Area Reservoirs

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) North 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 North Area reservoir drought options in Appendix A and Appendix B, with a summary presented in **Sections** Error! Reference source not found. and Error! Reference source not fo und.. 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** Error! Reference source not found. and provided in full in the Draft Drought Plan E nvironmental 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.

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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 North Area reservoir drought permits. This EAR has been prepared in support of a drought permit application in Summer 2025 to the Environment Agency, in accordance with the Water Resources Act 1991, as amended by the Environment Act 1995, the Water Act 2003 and subsequently the Water Act 2014.

The environmental assessment has been conducted in accordance with Government regulations and using the Environment Agency's DPG2025 and the 'Environmental Assessment for Water Company Drought Plans' supplementary guidance.

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

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

The methodology for this environmental assessment has been developed in consultation with the Environment Agency and is documented separately in 'YWSL's Drought Plan 2027 Environmental Assessment Methodology'[3]. A summary of the assessment approach is provided in **Section** Error! Reference source not f ound..

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

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

1.2 BACKGROUND TO STUDY

Water companies in England and Wales are required to prepare and maintain Statutory Drought Plans under Sections 39B and 39C of the Water Industry Act 1991, as amended by the Water Act 2003 (and subsequently the Water Act 2014), which set out the short operational steps a company will take before, during and after a drought. The Water Industry Act 1991 defines a Drought Plan as 'a plan for how the water undertaker will

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

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

continue, during a period of drought, to discharge its duties to supply adequate quantities of wholesome water, with as little recourse as reasonably possible to drought orders or drought permits'.

Yorkshire Water Services Limited (YWSL) published their current statutory Drought Plan in April 2022 (the 'DP 2022') which encompasses the period 2022-2027. Drought Plans are updated every five years to remain relevant and align with updated guidance. As a result, YWSL are now in the process of revising their statutory Drought Plan for the period 2027-2032. The Drought Plan (England) Directions set out the timescales for publication of the Drought Plans. The updated directions for Draft Drought Plan 2027 were published in July 2025 and state that water companies must submit their Draft Drought Plan to the Secretary of State by 31 March 2026.

The Drought Plan provides a comprehensive statement of the actions YWSL will consider implementing during drought conditions to safeguard essential water supplies to customers and minimise environmental impact. Drought Plans encompass a number of drought options that will only be implemented if and when required. Each drought is different in terms of its severity, season, location and duration and each combination of these factors may require a bespoke reaction in terms of measures. In the context of drought planning, individual drought options are taken to constitute alternatives.

1.3 CONSULTATION

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

Throughout the preparation and submission of the Final Drought Plan 2022, YWSL proactively engaged with key stakeholders and regulators regarding the scope and outcomes of the environmental assessment, including with the Environment Agency and Natural England. Discussions were also held between YWSL and the Environment Agency on the scope of monitoring/mitigation in Autumn 2018 following a period of prolonged dry weather. These discussions identified certain issues around the appropriateness and practicality of YWSL's monitoring-led mitigation plan as set out in its Draft Drought Plan 2019 EMP. The outcome of these discussions and resulting agreements informed the basis of the approach for the update of the environmental assessments and EMP for the Drought Plan 2022.

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

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

1.4 CONTENT OF REPORT

This EAR reflects the environmental assessment reporting components described in the DPG as being required to ensure the North Area reservoir drought permits are 'application ready'. The structure of this EAR is provided below with reference to other relevant documents.

Section 1: **Introduction**

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

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

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

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

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

Section 5: **Physical environment effects: North 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: North 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 permits may not be used by YWSL at the same time. This EAR considers the impacts of implementation of all five of the North Area reservoir drought permits.

The Environment Agency's 2025 DPG requires the completion of environmental assessment and production of an environmental monitoring plan for each of the supply side actions included in a drought plan. The environmental assessments should also include any mitigation measures that could be implemented. The Methodology provides detailed approaches to the specific requirements of the DPG which are:

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

The overall approach taken in completing the environmental assessment to demonstrate an understanding of the impact on the environment of implementing the proposed drought options is illustrated in **Figure 3-1**.

Results of the assessment have also informed the Habitats Regulations Assessment (HRA) and Strategic Environmental Assessment (SEA) which support YWSL's Draft Drought Plan 2027 and are documented separately. Outcomes of any subsequent assessment, i.e. as documented in this report, will be continually reviewed in terms of implications for SEA and HRA.

The Environment Agency's 2025 DPG also requires water companies to 'consider the combined environmental effects of your supply side drought options, and where relevant, the combination effects of your actions with those of neighbouring water companies and other abstractors'. The SEA and HRA for a drought plan as a whole should inform these combined assessments.

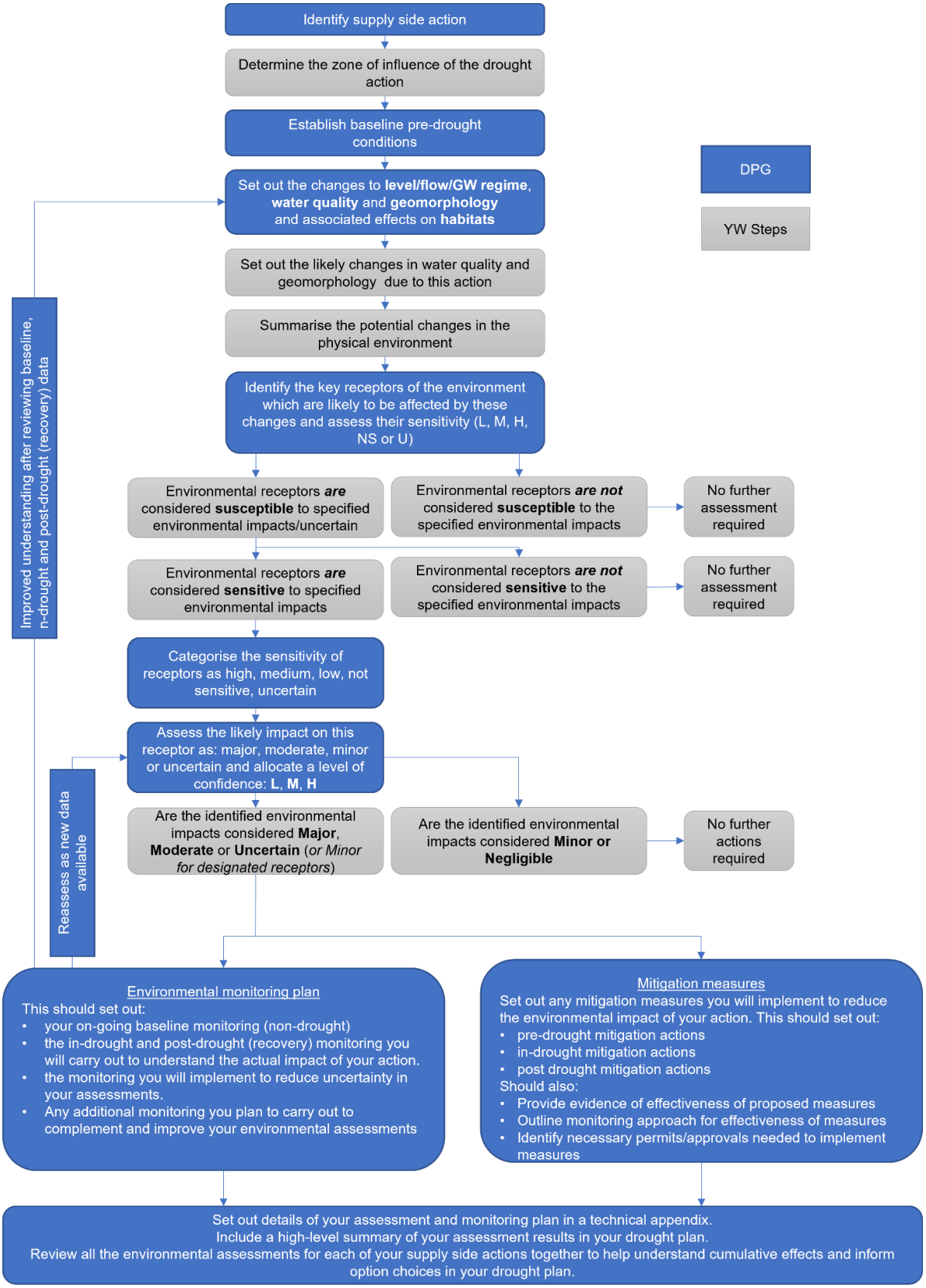
3.2 LIMITATIONS OF ASSESSMENT

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

For receptors where the assessment remains uncertain because of data limitation, the requirement for additional targeted monitoring has been considered and is documented in YWSL's Drought Plan 2027 EMP.

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

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



4. DROUGHT OPTIONS OVERVIEW

4.1 DROUGHT PERMIT DESCRIPTIONS

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

The North Area reservoirs comprise five drought options as summarised in **Table 4-1**:

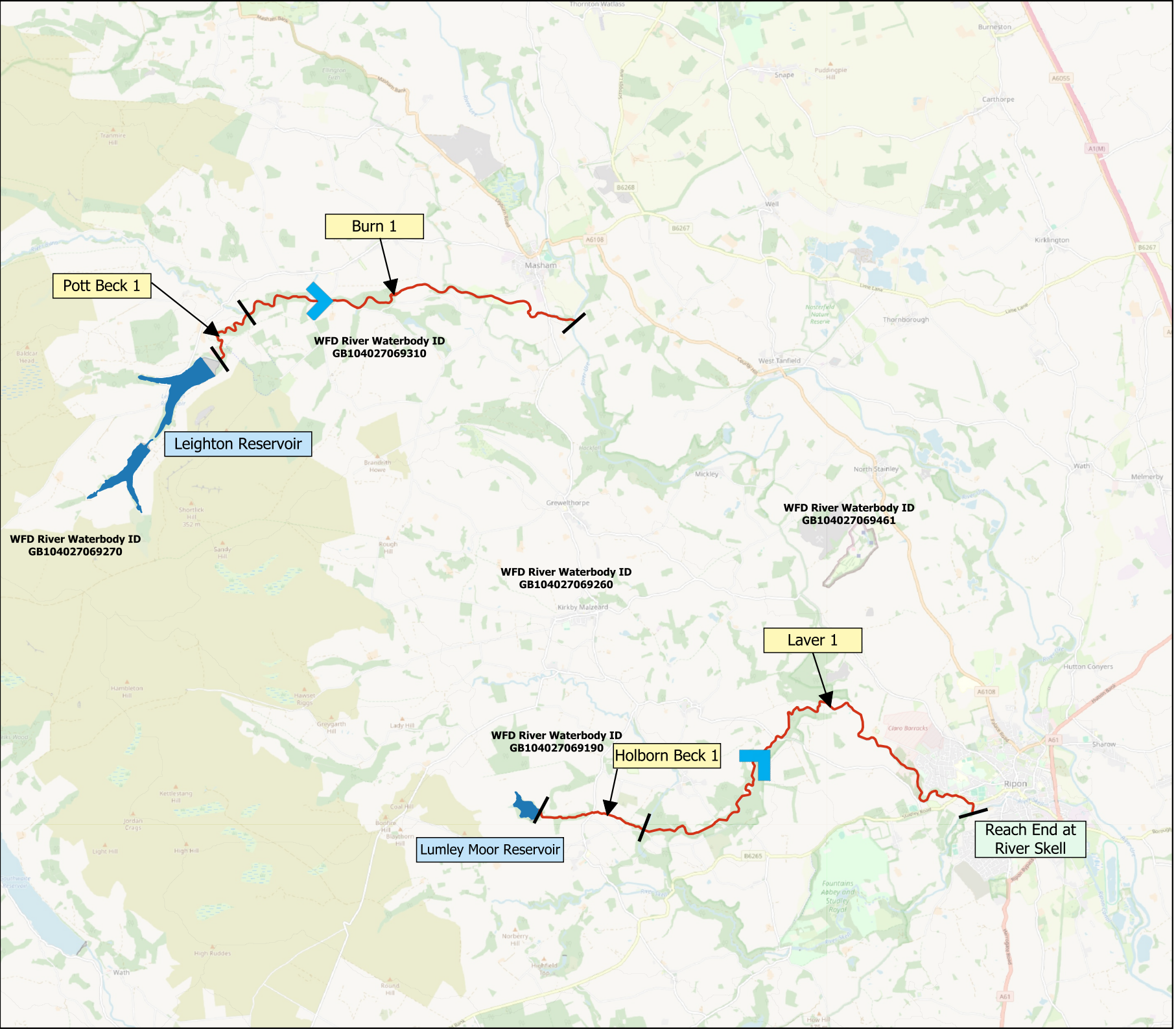
1. Leighton Reservoir drought permit;
2. Lumley Moor Reservoir drought permit;
3. Haverah Park (John O'Gaunts/Beaver Dyke and Scargill Reservoirs) drought permit;
4. Thruscross Reservoir drought permit; and
5. Lindley Wood Reservoir drought permit

All drought options outlined above are drought level 3a actions. 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: North Area reservoirs drought permit descriptions

Compensation Water Source	Receiving Watercourse	Normal Compensation Release Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Leighton Reservoir drought permit						
Leighton Reservoir	Pott Beck	12.10	6.05	6.05	3.99	8.11
Lumley Moor Reservoir drought permit						
Lumley Moor Reservoir	Holborn Beck	0.46	0.23	0.23	0.15	0.31
Haverah Park drought permit						
John O'Gaunts (via Beaver Dyke) Reservoir	Oak Beck	0.91Ml/d LEP states 0.75 of which at least 0.35Ml/d released from Scargill Reservoir and at least 0.20Ml/d from Beaver Dyke Reservoir	0.38 of which at least 0.18Ml/d must be released from Scargill Reservoir and 0.10Ml/d from Beaver Dyke Reservoir*	0.38	0.25; at least 0.12Ml/d from Scargill and 0.07Ml/d from Beaver Dyke	0.50
Thruscross Reservoir drought permit						
Thruscross Reservoir	River Washburn	16.90 (16th Nov – 15th April) 8.20 (16th April – 15th May, 16th Oct – 15th Nov) 3.90 (16th May - 15th Oct)	1.95 – 8.45	1.95 – 8.45	1.29 – 5.58	2.60 – 11.30
Lindley Wood Reservoir drought permit						
Lindley Wood	River Washburn	18.19	9.09	9.10	6.00	12.19

Note: figures have been rounded to two decimal places and may not align with other documentation.



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Legend

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- Reach Divides
- River Reaches
- Reservoir
- WFD Management Catchment
- Flow Direction

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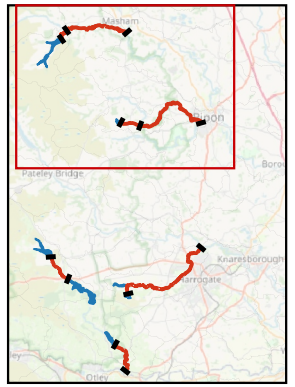

Project title:
Yorkshire Water Drought Plan
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Figure title:
North Overview Map

Figure 4.1	Date: Dec 2024
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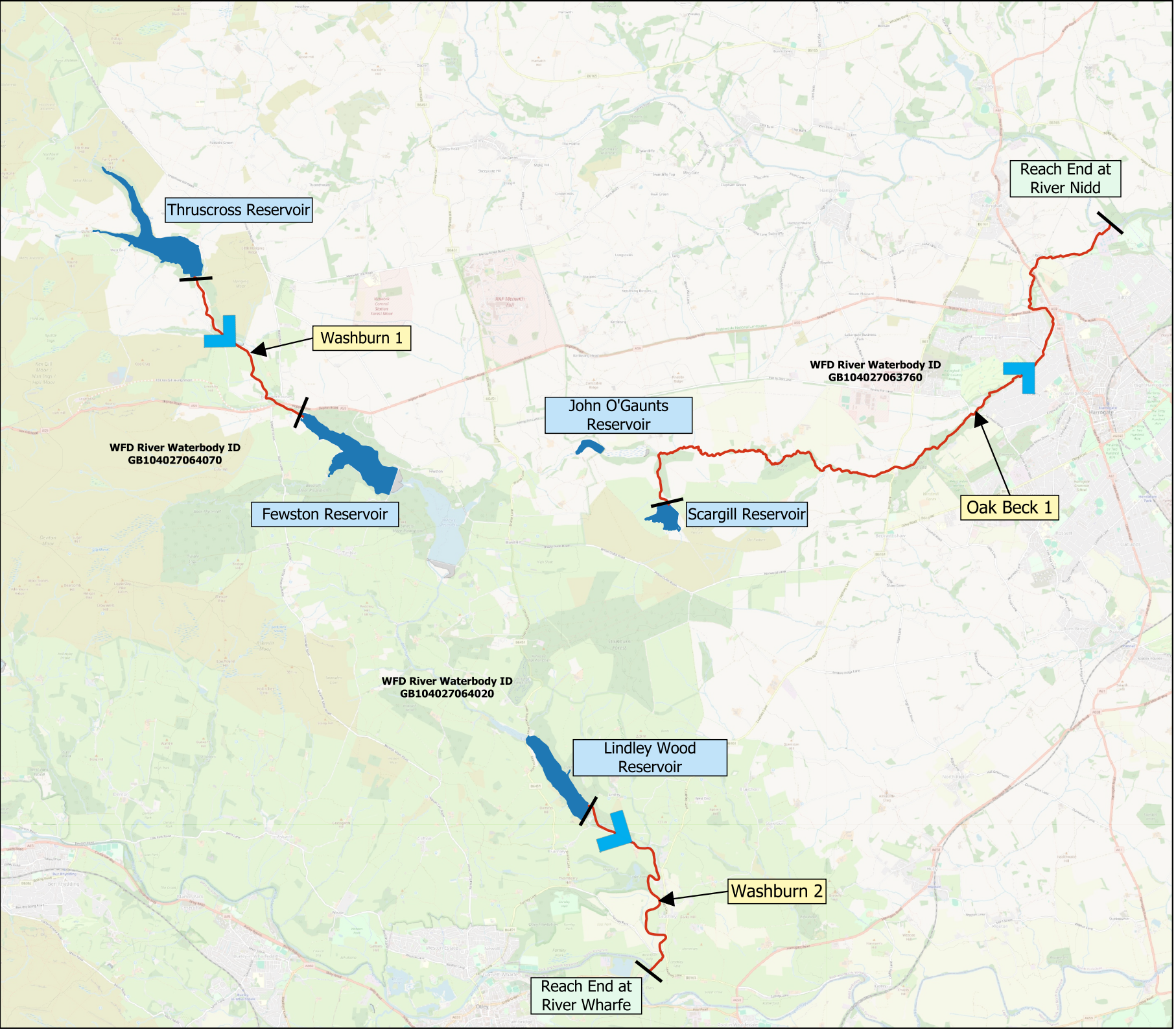
Note: All locations are approximate



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Legend

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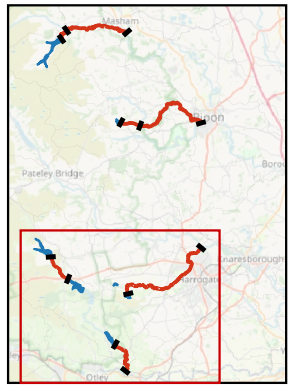


Project title:
Yorkshire Water Drought Plan
Environmental Assessment

Figure title:
North Overview Map

Figure 4.2	Date: Dec 2024
NGR: SE 21719 52822	Scale: 1:80,000

Note: All locations are approximate

4.2 POTENTIALLY IMPACTED REACHES

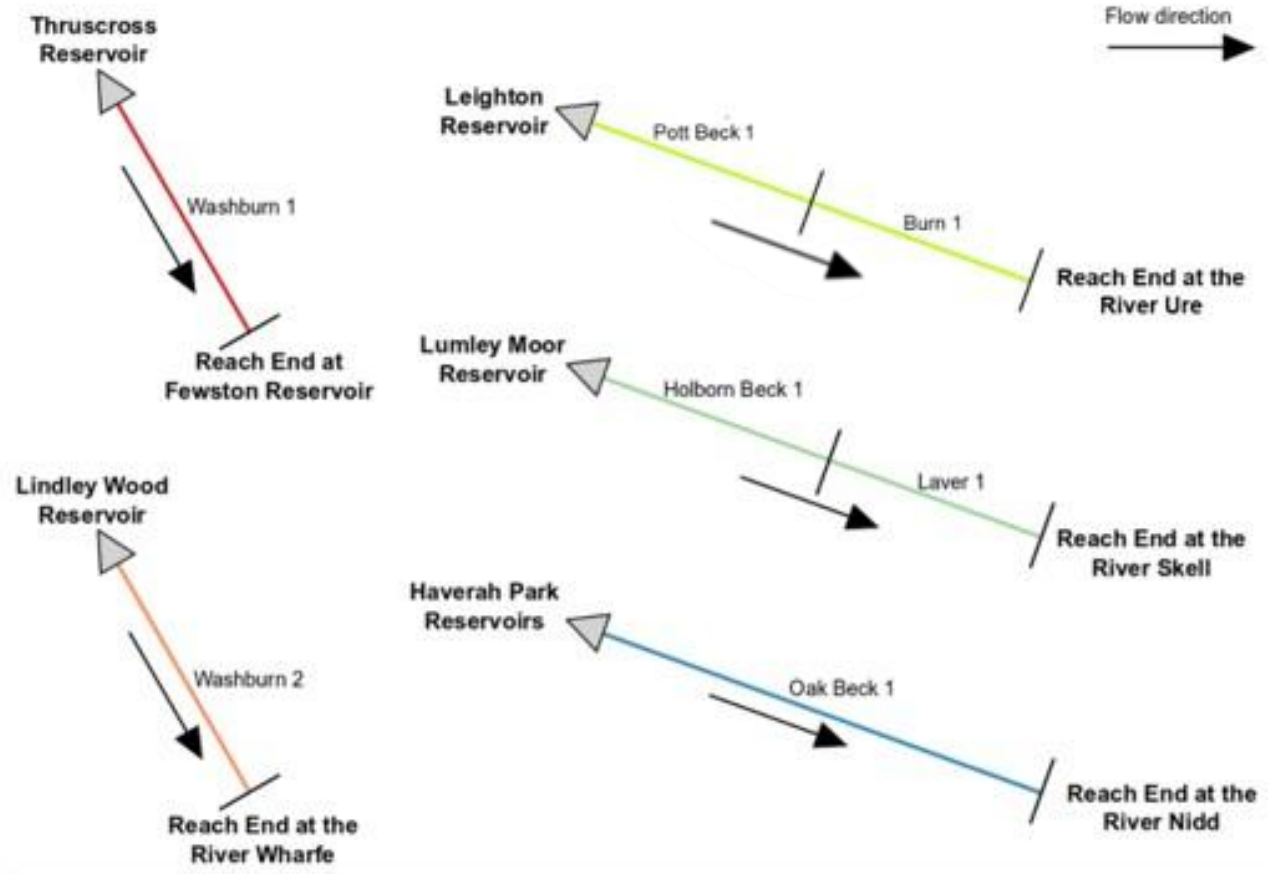
The zone of influence associated with each drought option is defined through hydrological effects. Within the overall zone of influence, reaches are then defined on a hydrological basis. **Section 3.4** of YWSL's Drought Plan 2027 Environmental Assessment Methodology[7] sets out this approach in detail. The reaches for the North Area reservoir drought permits have been defined previously during the environmental assessment of YWSL past drought plans. **Table 4-2** provides details of these reaches, which are illustrated in **Figure 4-1** and **Figure 4-2**, and in a schematic below in **Figure 4-3**.

Table 4-2: North Area reach details

Reach name	Watercourse name	Reach start	Reach end	Down-stream reach	Drought option				
					Leighton Reservoir	Lumley Moor Reservoir	Haverah Park Reservoirs	Thruscross Reservoir	Lindley Wood Reservoir
Pott Beck 1	Pott Beck	Leighton Reservoir	Confluence between Pott Beck and the River Burn	Burn 1	✓				
Burn 1	River Burn	Confluence between Pott Beck and the River Burn	Confluence between the River Burn and the River Ure	Ure 2	✓				
Holborn Beck 1	Holborn Beck	Lumley Moor Reservoir	Confluence between Holborn Beck and the River Laver	Laver 1		✓			
Laver 1	River Laver	Confluence between the River Laver and Holborn Beck	Confluence between the River Laver and the River Skell	n/a		✓			
Oak Beck 1	Oak Beck	Haverah Park Reservoirs	Confluence between Oak Beck and the River Nidd	n/a			✓		
Washburn 1	River Washburn	Thruscross Reservoir	Fewston Reservoir	n/a				✓	
Washburn 2	River Washburn	Lindley Wood Reservoir	Confluence between the River Washburn and the River Wharfe	n/a					✓

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

Figure 4-3: North 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
Leighton Reservoir drought permit	Pott Beck1	Leighton Beck from Source to River Burn (GB104027069270)
Leighton Reservoir drought permit	Burn 1	Burn from Leighton Beck to River Ure (GB104027069310)
Lumley Moor Reservoir drought permit	Holburn Beck 1	Laver from Carlesmoor Beck to Kex Beck (GB104027069190)
Lumley Moor Reservoir drought permit	Laver 1	Laver from Carlesmoor Beck to Kex Beck (GB104027069190); Kex Beck and the Laver (GB104027069260)
Haverah Park Reservoirs drought permit	Oak Beck 1	Oak Beck Catchment (Trib of Nidd) (GB104027063760)
Thruscross Reservoir drought permit	Washburn 1	Washburn Source to Spinksburn Bk (Swinsty Res) (GB104027064070)
Lindley Wood Reservoir drought permit	Washburn 2	Washburn Spinksburn Bk (Swinsty Res) to Wharfe (GB104027064020)

5. PHYSICAL ENVIRONMENT EFFECTS: NORTH AREA RESERVOIRS

Potential impacts on the physical environment due to the North Area reservoir drought permits are summarised below in **Table 5-1**. Full details are provided in **Appendix A**.

Table 5-1: Summary of potential changes in the physical environment as a result of the North Area reservoirs drought options

Reach	River flow impact	Flow depleted reaches*/significant flow pressures	Risk to river habitats	Risk to water quality
Pott Beck 1	Major	None	Moderate	Minor
Burn 1	Major	~520m; Major	Major	Major
Holborn Beck 1	Major	None	Moderate	Minor
Laver 1	Minor (summer), Negligible (winter)	None	Minor	Minor
Oak Beck 1	Major	None	Major	Moderate
Washburn 1	Major	None	Major	Minor
Washburn 2	Major	~670m; Major	Major	Major
Cumulative reaches				
Simultaneous deployment of the Wharfe at Lobwood abstraction drought option and the Lindley Wood Reservoir drought options may result in a moderate impact on flows in the River Wharfe from the confluence with the River Washburn to the tidal limit (noting that this is no greater than the impact of the Wharfe at Lobwood abstraction drought option when assessed alone). This level of impact is considered in EAR for the Wharfe at Lobwood Drought Option.				
Simultaneous deployment of the Ure at Kilgram Bridge drought option with the Leighton Reservoir drought option may impact river flows in the River Ure downstream of the River Burn and the confluence with the River Skell. This level of impact would be considered in the EAR for an application of the Ure at Kilgram Bridge Option.				

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

6. RECEPTORS ASSESSMENT, MONITORING AND MITIGATION: NORTH 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 North Area reservoir drought permits are summarised below in **Table 6-1**.

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

Reach	Pott Beck 1	Burn 1	Holborn Beck 1	Laver 1	Oak Beck 1	Washburn 1	Washburn 2
Hydrological Impact	**Major**	**Major**	**Major**	**Minor (summer) Negligible (winter)**	**Major**	**Major**	**Major**
Associated Drought Options	**Leighton Reservoir**	**Leighton Reservoir**	**Lumley Moor Reservoir**	**Lumley Moor Reservoir**	**Haverah Park**	**Thruscross Reservoir**	**Lindley Wood Reservoir**
WFD Waterbody	GB104027069270 Leighton Beck from source to River Burn	GB104027069310 Burn from Leighton Beck to River Ure	GB104027069190 Laver from Carlesmoor Beck to Kex Beck	GB104027069190 Laver from Carlesmoor Beck to Kex Beck GB104027069260 Kex Beck and the Laver	GB104027063760 Oak Beck Catchment (Trib of Nidd)	GB104027064070 Washburn Source to Spinksburn Bk	GB104027064020 Washburn Spinksburn Bk
NERC and Notable Habitat Receptors (including Local Wildlife Sites)							
NERC habitat- Lowland fens -412935	N/A	N/A	N/A	N/A	N/A	Minor	N/A
NERC and Notable Species Receptors							
Ameletus inopinatus	Moderate	N/A	N/A	N/A	N/A	N/A	N/A
Atherix ibis	Moderate	Moderate	N/A	N/A	N/A	N/A	Moderate
Capnia atra	N/A	Minor	N/A	N/A	N/A	N/A	N/A
Graptodytes flavipes	N/A	N/A	Minor	N/A	N/A	N/A	N/A
Hydraena palustris	N/A	N/A	N/A	N/A	Minor	N/A	N/A
Hydraena rufipes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paraleptophlebia cincta	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
Potamophylax rotundipennis	Minor	N/A	N/A	N/A	N/A	N/A	Minor
Psychomyia fragilis	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
Rhithrogena germanica	N/A	N/A	N/A	N/A	Moderate	N/A	N/A
Rhyacophila fasciata/ septentrionis	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
Riolus subviolaceus	Moderate	N/A	N/A	N/A	N/A	N/A	N/A
Stagnicola palustris/fuscus/corvus	Minor	N/A	N/A	N/A	N/A	N/A	N/A
Stictonectes lepidus	N/A	N/A	N/A	N/A	Moderate	N/A	N/A
Wormaldia subnigra	N/A	N/A	N/A	N/A	N/A	N/A	Moderate

Reach	Pott Beck 1	Burn 1	Holborn Beck 1	Laver 1	Oak Beck 1	Washburn 1	Washburn 2
Hydrological Impact	**Major**	**Major**	**Major**	**Minor (summer) Negligible (winter)**	**Major**	**Major**	**Major**
Associated Drought Options	**Leighton Reservoir**	**Leighton Reservoir**	**Lumley Moor Reservoir**	**Lumley Moor Reservoir**	**Haverah Park**	**Thruscross Reservoir**	**Lindley Wood Reservoir**
WFD Waterbody	GB104027069270 Leighton Beck from source to River Burn	GB104027069310 Burn from Leighton Beck to River Ure	GB104027069190 Laver from Carlesmoor Beck to Kex Beck	GB104027069190 Laver from Carlesmoor Beck to Kex Beck GB104027069260 Kex Beck and the Laver	GB104027063760 Oak Beck Catchment (Trib of Nidd)	GB104027064070 Washburn Source to Spinksburn Bk	GB104027064020 Washburn Spinksburn Bk
White-clawed crayfish	Moderate	Moderate	Moderate	Negligible	Moderate	N/A	Major
Otter	Negligible	Negligible	Negligible	N/A	Negligible	Negligible	Negligible
Water vole	Moderate	Moderate	Moderate	N/A	Moderate	Moderate	Major
Atlantic salmon	N/A	Major	N/A	N/A	N/A	N/A	Major
Brook lamprey	Moderate	Major	N/A	Negligible	N/A	Major	Major
Brown trout	Moderate	Major	Moderate	Negligible	Major	Major	Major
Bullhead	Minor	Moderate	Minor	Negligible	Moderate	Moderate	Moderate
Grayling	N/A	N/A	N/A	Negligible	N/A	N/A	Moderate
European eel	Moderate	Major	N/A	N/A	N/A	N/A	Moderate
River lamprey	Moderate	Major	N/A	Negligible	N/A	N/A	Major
WFD Status Receptors							
Invertebrates	Moderate	Major	Minor	Negligible	Moderate	Moderate	Moderate
Fish	Moderate	Major	Minor	Negligible	Major	Major	Major

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 Draft 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 will be ongoing, and the EMP will be updated as required to reflect future agreements.

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

A summary of the monitoring and mitigations recommendations for the North Area reservoir drought permits are provided in **Table 6-2** and **Table 6-3**. **Appendix C** provides a description of each monitoring and mitigation measure with reference to the codes used in **Table 6-2** and **Table 6-3**.

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

Reach		Pott Beck 1	Burn 1	Holborn Beck 1	Laver 1	Oak Beck 1	Washburn 1	Washburn 2
Hydrological Impact		**Major**	**Major**	**Major**	**Minor (summer) Negligible (winter)**	**Major**	**Major**	**Major**
Associated Drought Options		Leighton Reservoir	Leighton Reservoir	Lumley Moor Reservoir	Lumley Moor Reservoir	Haverah Park	Thruscross Reservoir	Lindley Wood Reservoir
WFD Waterbody		GB104027069270	GB104027069310	GB104027069190	GB104027069190, GB104027069260	GB104027063760	GB104027064070	GB104027064020
Code	**Description**	Leighton Beck from source to River Burn	Burn from Leighton Beck to River Ure	Laver from Carlesmoor Beck to Kex Beck	Laver from Carlesmoor Beck to Kex Beck, Kex Beck and the Laver	Oak Beck Catchment (Trib of Nidd)	Washburn Source to Spinksburn Bk	Washburn Spinksburn Bk
Baseline Monitoring								
BMON_H	Routine flow/levels	✓	✓	✓	✓	✓	✓	✓
BMON_WQ	Routine WQ	✓	✓	✓	✓	✓	✓	✓
BMON_E1	Macroinvertebrate	✓	✓	✓	✓	✓	✓	✓
BMON_E2	Fisheries (including Lamprey)	✓	✓	✓	✓	✓	✓	✓
BMON_E3	Habitat Walkover mapping	✓	✓	✓	✓	✓	✓	✓
On-set of Environmental Drought								
ODMON_WS	River condition walkover survey	✓	✓	✓	✓	✓	✓	✓
In-Drought (during drought option implementation)								
IDMON_WSE	Surveillance walkover (habitat quality and ecological stress)	✓	✓	✓	✓	✓	✓	✓

IDMON_WSWQ1	Surveillance walkover (water quality and ecological stress)	x	✓	x	x	x	x	✓
IDMON_WSWQ2	CSO Monitoring	x	x	x	✓	✓	x	x
Post Drought (Drought Options Removed)								
PDMON_E1	Macroinvertebrate	✓	✓	✓	✓	✓	✓	✓
PDMON_E2	Fisheries	✓	✓	✓	✓	✓	✓	✓

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

Reach		Pott Beck 1	Burn 1	Holborn Beck 1	Laver 1	Oak Beck 1	Washburn 1	Washburn 2
Hydrological Impact		**Major**	**Major**	**Major**	**Minor (summer) Negligible (winter)**	**Major**	**Major**	**Major**
Associated Drought Options		Leighton Reservoir	Leighton Reservoir	Lumley Moor Reservoir	Lumley Moor Reservoir	Haverah Park	Thruscross Reservoir	Lindley Wood Reservoir
WFD Waterbody		GB104027069270	GB104027069310	GB104027069190	GB104027069190 GB104027069260	GB104027063760	GB104027064070	GB104027064020
Code	**Description**	Leighton Beck from source to River Burn	Burn from Leighton Beck to River Ure	Laver from Carlesmoor Beck to Kex Beck	Laver from Carlesmoor Beck to Kex Beck, Kex Beck and the Laver	Oak Beck Catchment (Trib of Nidd)	Washburn Source to Spinksburn Bk	Washburn Spinksburn Bk
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
IDMIT_WQ1	Improving the effluent quality	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	✓	✓	x	x	✓	✓	✓
IDMIT_E5	Inspection and clearing of screens	✓	✓	x	✓	✓	✓	✓
IDMIT_E6	Fish/crayfish rescue and relocate	✓	✓	✓	✓	✓	✓	✓
Post–Drought (Drought Options Removed)								

PDMIT_E1	Habitat enhancement	✓	✓	✓	✓	✓	✓	✓
PDMIT_E2	Freshets	✓	✓	✓	✓	✓	✓	✓
PDMIT_E3	Barrier modification	✓	✓	✓	✓	✓	✓	✓
PDMIT_E4	Coarse fish restocking	✓	x	✓	x	✓	x	✓

Appendices

Appendix A Physical Environment

Appendix B Environmental Receptors

Appendix C Environmental Monitoring and Mitigation Measures

APPENDIX A – PHYSICAL ENVIRONMENT

A1 INTRODUCTION

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

The North Area reservoirs comprise five drought options as reported in this appendix:

1. Leighton Reservoir drought permit
2. Lumley Moor Reservoir drought permit
3. Haverah Park Reservoirs (John O'Gaunts and Scargill Reservoirs) drought permit
4. Thruscross Reservoir drought permit.
5. Lindley Wood Reservoir drought permit

Details regarding the approaches/methodologies used for assessing susceptibility and sensitivity to drought options and the assessment of the impacts associated with drought options are presented in YWSL's Drought Plan 2027 Environmental Assessment Methodology[1].

This appendix is set out in the following sections:

Section A.2 Drought options

Section A.3 Study area

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

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

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

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

Annex 3 maps the intermittent water quality pressures associated with the Oak Beck 1 reach (with the number of pressures in this reach making their presentation in **Figure A4.5**

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

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

A2 DROUGHT OPTIONS

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

1. Leighton Reservoir
2. Lumley Moor Reservoir
3. Haverah Park Reservoirs
4. Thruscross Reservoir
5. Lindley Wood Reservoir.

The licence conditions and drought permit conditions of each are introduced below. All of these options are Level 3a options in YWSLs Drought Plan.

A2.1 LEIGHTON RESERVOIR DROUGHT PERMIT

YWSL is licensed to impound water in Leighton Reservoir for supply to customers, under the terms of the Leeds Corporation Act 1907, as modified by abstraction licence number 2/27/22/210 ("the Licence") which was granted to the Yorkshire Water Authority on 17 March 1966. Under the terms of the License, YWSL has a legal obligation to discharge compensation water into Pott Beck immediately downstream of Leighton Reservoir in a regular, uniform and continuous flow of not less than 12.10 Ml/d. The drought permit application for Leighton Reservoir is to reduce the compensation release by 50% to 6.05 Ml/d from the date the permit is granted and to reduce further to 3.99Ml/d if Leighton Reservoir stocks are below the regional Drought Control Line for more than four consecutive weeks. These conditions are set out in **Table A2.1**.

Table A2.1 Leighton Reservoir licence data

Compensation Water Source	Receiving Watercourse	NGR	Normal Compensation Release Ml/d[2]	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Leighton	Pott Beck	SE166790	12.10	6.05	6.05	3.99	8.11

A2.2 LUMLEY MOOR RESERVOIR DROUGHT PERMIT

Under the terms of the Ripon Corporation Act 1886, Yorkshire Water must continuously discharge not less than 0.46Ml/d from Lumley Moor Reservoir to Holborn Beck, a tributary of the River Laver. The drought permit application for Lumley Moor Reservoir is to reduce the compensation release by 50% to 0.23Ml/d from the date the permit is granted and to reduce further to 0.15Ml/d if regional reservoir stocks are below the regional Drought Control Line, as defined in the YWSL Drought Plan, for more than four consecutive weeks. These conditions are set out in **Table A2.2**.

Table A2.2 Lumley Moor 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
Lumley Moor	Holborn Beck	SE225706	0.46	0.23	0.23	0.15	0.31

2 1Ml/d is 1 million litres per day.

A2.3 HAVERAH PARK RESERVOIRS DROUGHT PERMIT

Under the terms of the Beaver Dyke Impoundment Licence (Impoundment Licence NE 027 0021 022), YWSL must continuously discharge a compensation release of not less than 0.909Ml/d from Beaver Dyke reservoir. YWSL also hold an LEP for a flow trial that previously had a dry weather condition within it (subsequently removed). Under the LEP YWSL must continuously discharge a group compensation release of not less than 0.75Ml/d. Minimum releases from Beaver Dyke Reservoir and Scargill Reservoir to Oak Beck are 0.2Ml/d and 0.35Ml/d respectively.

The drought permit application for the Haverah Park option is to reduce the group compensation release by 59% to 0.38Ml/d from the date the permit is granted (of which a minimum of 0.18Ml/d would be released from Scargill Reservoir and 0.12Ml/d from Beaver Dyke Reservoir) and to reduce group compensation further to 0.25Ml/d if regional reservoir stocks are below the regional Drought Control Line, as defined in the YWSL Drought Plan, for more than four consecutive weeks. These conditions are set out in **Table A2.3**.

Table A2.3 Haverah Park Reservoirs licence data

Compensation Water Sources	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
John O'Gaunts (via Bever Dyke)	Oak Beck	SE230546	0.909Ml/d LEP states 0.75 of which at least 0.35Ml/d released from Scargill Reservoir and at least 0.20Ml/d from Beaver Dyke Reservoir	0.38 of which at least 0.18Ml/d must be released from Scargill Reservoir and 0.10Ml/d from Beaver Dyke Reservoir	0.38	0.25; at least 0.12Ml/d from Scargill and 0.07Ml/d from Beaver Dyke	0.50

A2.4 THRUSCROSS RESERVOIR DROUGHT PERMIT

Under the terms of the Thruscross licence, Yorkshire Water must continuously discharge a compensation flow into the River Washburn. The required volume of flow is dependent on seasonal variations, with 16.90Ml/d being released between 16 November and 15 April (winter), 8.20Ml/d being released between the 16 April and 15 May and 16 October and 15 November (spring and autumn), and 3.90Ml/d between 16 May and 15 October (summer). The drought permit application for Thruscross Reservoir is to reduce the compensation release by 50% to 8.45Ml/d in winter, 4.10Ml/d in spring and autumn, and 1.95Ml/d in summer from the date the permit is granted. A further reduction to 5.58Ml/d in winter, 2.71Ml/d in spring and autumn, and 1.29Ml/d in summer if regional reservoir stocks are below the Regional Drought Control Line, as defined in the YWSL Drought Plan, for more than four consecutive weeks. These conditions are set out in **Table A2.5**.

Table A2.5 Thruscross Reservoir Licence Data

Compensation Water Source	Receiving Watercourse	NGR	Normal Compensation Release Ml/d[1]	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Thruscross Reservoir	River Washburn	SE 15158 57874	16.90 (16th Nov – 15th April) 8.20 (16th April – 15th May, 16th Oct – 15th Nov) 3.90 (16th May - 15th Oct)	1.95 – 8.45	1.95 – 8.45	1.29 – 5.58	2.60 – 11.30

A2.5 LINDLEY WOOD RESERVOIR DROUGHT PERMIT

YWSL is licensed to abstract water from the Washburn Valley reservoirs north of Lindley Wood Reservoir for supply to customers. YWSL releases water from Lindley Wood reservoir under the terms of the Leeds Corporation (Consolidation) Act 1905, to compensate the downstream receiving watercourses, the River Washburn and the River Wharfe downstream of Otley. Under the terms of the Act, YWSL must continuously discharge not less than 18.19Ml/d. The drought permit application for Lindley Wood Reservoir is to reduce the compensation release by 50% to 9.10Ml/d from the date the permit is granted and to reduce further to 6.00Ml/d if regional reservoir stocks are below the regional Drought Control Line, as defined in the YWSL Drought Plan, for more than four consecutive weeks. These conditions are set out in Table A2.4.

Table A2.4 Lindley Wood Reservoir licence data

Compensation Water Source	Receiving Watercourse	NGR	Normal Compensation Release Ml/d[1]	Proposed Drought Option Compensation Release Ml/d (Trigger 1)	Benefit Ml/d	Proposed Drought Option Compensation Release Ml/d (Trigger 2)	Benefit Ml/d
Lindley Wood	River Washburn	SE221485	18.19	9.09	9.10	6.00	12.19

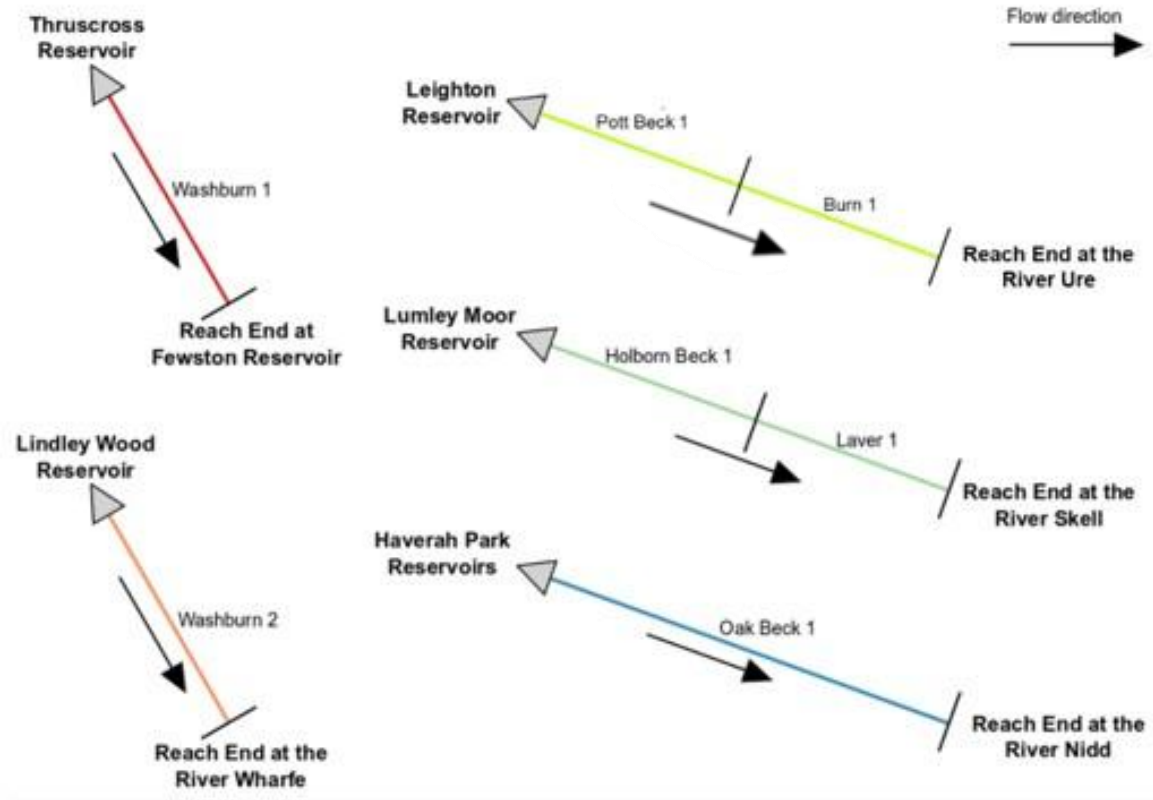
A3 STUDY AREA

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

A3.1 ZONE OF INFLUENCE OF THE DROUGHT OPTIONS

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

Figure A3.1 North Area reach schematic



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

Table A3.1 North Area reach details

Reach name	Watercourse name	Reach start	Reach end	Down-stream reach	Drought option				
					Leighton Reservoir	Lumley Moor Reservoir	Haverah Park Reservoirs	Thruscross Reservoir	Lindley Wood Reservoir
Pott Beck 1	Pott Beck	Leighton Reservoir	Confluence between Pott Beck and the River Burn	Burn 1	✓				
Burn 1	River Burn	Confluence between Pott Beck and the River Burn	Confluence between the River Burn and the River Ure	Ure 2	✓				
Holborn Beck 1	Holborn Beck	Lumley Moor Reservoir	Confluence between Holborn Beck and the River Laver	Laver 1		✓			
Laver 1	River Laver	Confluence between Holborn Beck and the River Laver	Confluence between the River Laver and the River Skell	n/a		✓			
Oak Beck 1	Oak Beck	Haverah Park Reservoirs	Confluence between Oak Beck and the River Nidd	n/a			✓		
Washburn 1	River Washburn	Thruscross Reservoir	Fewston Reservoir	n/a				✓	
Washburn 2	River Washburn	Lindley Wood Reservoir	Confluence between the River Washburn and the River Wharfe	n/a					✓

The end of each study area has been defined previously from review of hydrological information – either flow gauge data that corroborates that drought option hydrological impacts have reduced to negligible, or by simple review of contributing catchment area where there is an order of magnitude step change in this from confluence with a significantly larger river or joining tributary. No significant impacts related to the drought options occur below these points (see **Table A3.2**).

Table A3.2 North Area extent of zone of influence

Reach	Description	Downstream impacts
Burn 1	Confluence of the River Burn with the larger River Ure	At the point the River Burn meets the River Ure, the Leighton Reservoir catchment area makes up just 4% of the catchment area. The potential hydrological impact of the drought option on the River Ure downstream of the River Burn is considered to be negligible (6.5% reduction in Qs95 and 9.2% reduction in Qs99).
Laver 1	Confluence of the significant tributary of the River Skell with the River Laver	As a result of the reduction of the Lumley Moor Reservoir compensation release of 0.305Ml/d the reduction in flow statistics for the River Ure at Westwick and River Skell at Alma Weir Bridge would be low (and less than 10%). The potential hydrological impact of the drought option on the River Skell and Ure, following the confluence of the River Laver with the River Skell, is assessed as negligible.
Oak Beck 1	Confluence of Oak Beck with the larger River Nidd	As a result of the reduction of the Haverah Park Reservoirs compensation release of 0.5Ml/d the reduction in flow statistics for River Nidd at Birtswith would be low (and less than 2%). The potential hydrological impact of the drought option on the River Nidd, following

Reach	Description	Downstream impacts
		the confluence of the River Nidd with Oak Beck, is assessed as negligible.
Washburn 1	River Washburn flows into an impounding reservoir, Fewston Reservoir	YWSL has abstraction licences for potable supply from each of Thruscross Reservoir, Fewston Reservoir and Swinsty Reservoir. Lindley Wood Reservoir impounds water to manage the licensed compensation flow release to the downstream River Washburn. The Drought Permit does not seek to change the abstraction rate from these reservoirs and consequently the normal operational pattern would be in place at Fewston and Swinsty Reservoirs, unaffected by the drought permit. There is no licensed or trial compensation flow from Swinsty Reservoir to the River Washburn and on to Lindley Wood Reservoir. Any releases that are made from Swinsty Reservoir to support storage in Lindley Wood Reservoir would be negligible during an environmental drought baseline or with a drought permit in place. Furthermore, with a drought permit in place at Lindley Wood Reservoir [Section 5] there would be less demand on transferring water from Swinsty Reservoir to Lindley Wood Reservoir. Consequently, the Thruscross Reservoir drought permit would not influence the flow regime in the River Washburn either in the reach between Swinsty and Lindley Wood Reservoirs or in the reach between Lindley Wood Reservoir and the River Wharfe confluence
Washburn 2	Confluence of the River Washburn with the larger River Wharfe	As a result of the reduction of the Lindley Wood Reservoir compensation release of 12.125Ml/d the reduction in flow statistics for the Wharfe at Addingham would be less than 10%. The potential hydrological impact of the drought option on the River Wharfe, following the confluence of the River Wharfe with the River Washburn, is assessed as negligible.

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[4], 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

There are two cumulative hydrological impacts foreseen as a result of simultaneous deployment of drought options within the North Area reservoir group.

Simultaneous deployment of the Wharfe at Lobwood abstraction drought option and the Lindley Wood Reservoir drought options may result in a moderate impact on flows in the River Wharfe from the confluence with the River Washburn to the tidal limit (noting that this is no greater than the impact of the Wharfe at Lobwood abstraction drought option when assessed alone). This level of impact is considered in EAR for the Wharfe at Lobwood Drought Option.

Simultaneous deployment of the Ure at Kilgram Bridge drought option with the Leighton Reservoir drought option may impact river flows in the River Ure downstream of the River Burn and the confluence with the River Skell. This level of impact would be considered in the EAR for an application of the Ure at Kilgram Bridge Option.

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

A4 PHYSICAL ENVIRONMENT EFFECTS

A4.1 INTRODUCTION

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

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

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

YWSL's Drought Plan 2027 Environmental Assessment Methodology[5] provides details of the approach in Section 3.5. The approach has been developed to ensure compliance with the updated draft DPG with water companies in July 2024 (DPG2024)[6]. This also includes an updated draft of the supplementary guidance on the environmental assessment for water company drought planning. This draft guidance is anticipated to be published for formal consultation imminently, with a final guidance to be published in early 2025.

A4.2 POTT BECK 1

A4.2.1 Reach introduction

Pott Beck 1 is potentially impacted by a Leighton Reservoir 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 water body:

- Leighton Beck from Source to River Burn (GB104027069270).

A4.2.2 Reach setting

Pott Beck 1, located on main EAR **Figure 4.1,** comprises a 1.7km stretch of Pott Beck from Leighton Reservoir to the confluence with the River Burn (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 1.2km^2 along the length of the reach. Burn 1 (see **Section A4.3** below) is downstream.

A4.2.3 River flow regime

During the implementation of North Area drought options, storage in Leighton Reservoir is likely to be below top water level and therefore the reservoir compensation flow represents a high proportion of the flow in this reach. A reduction of up to 8.11Ml/d in the statutory compensation release rate of 12.1Ml/d represents a 67% reduction in the flow at the upstream end of the reach, regardless of the time of year. During a winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However, the flow reduction at the top of the reach will remain at 67% until the reservoir reaches top water level and begins to spill again.

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

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

6 Environment Agency (2024) Water company drought plan guideline. Draft for informal consultation, July 2024. Note: The guidance used to inform the approach to environmental assessment is currently in draft with a final version anticipated in early 2025.

There are no significant flow pressures, either abstractions or discharges, influencing flow in Pott Beck 1. There are no flow depleted reaches[7] within Pott Beck 1. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.2.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 19 September 2018 at a reservoir outflow of 14.7Ml/d.

Pott Beck 1 is a moderately sinuous and steep reach which falls ~26m over 1.7km, a slope of 0.88°. The channel is heavily shaded with extensive deciduous riparian tree cover along its entire length. Surrounding land use is generally improved grassland with some rough pasture. Approximately 0.6km from the reservoir outflow the reach passes through Hall Wood.

The channel is wide and shallow, with an average width of approximately 5m and with banks typically 0.5m in height where floodplain is present, but considerably higher where the river abuts the valley side and they form a continuation of the valley side. The channel bed is predominantly composed of cobbles and boulders with gravel being a minor constituent. The larger clasts (boulders) are covered by moss and do not appear to have moved recently. The bed is organised into a pool riffle sequence. The riffles are steep in places but elsewhere are elongated creating run type flows. Pools are deep on the outside of bends and are elongated in places and promote gliding flows. There are occasional exposed deposits composed of cobbles and boulders along the channel margin. These tend to be located where the channel is relatively wide or occur on the inside of bends (point bars). Within RHS survey (site ID 26401), two pool and five riffles were observed as well as an unvegetated point bar. The survey observed channel realignment in <33% of the reach, noting there was no impoundment of the channel.

Pott Beck 1 is likely to be a high energy environment, indicated by the steep valley shape and sinuosity of the channel, which is relatively typical of a low order stream. The extensive coverage of deciduous trees in the riparian habitat will ensure a high input of allochthonous energy into the stream and provide cover/refuge opportunities for fish and white-clawed crayfish. Consequently, the reach will be dominated by organisms that have adapted to high energy environments with an abundance of macroinvertebrates that feed on detritus. Some modification has occurred in the reach, and the presence of one weir could have impacts upon the movement/migration of fish and local sediment transfer.

The drought options reduction in flow could lead to several potential impacts within Pott Beck 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. Note: observations from Environment Agency representatives on the findings of the 1-day flow trial in 2017 indicate that a reduction in flows from Leighton reservoir to 5Ml/d would reduce energy within the river to an unacceptable level.
- Potentially moderate risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars and islands) and protrusion of bed elements (such as larger particles) through the flow surface for duration of the drought option.
- Potentially moderate risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for duration of the drought option, with retention of pool riffle sequences. The 1-day flow trail undertaken by YWSL in Pott Beck in 2017 indicated that up to 2cm reduction in wetted depths were observed at selected transect locations when flows were reduced from 13.6Ml/d to 5Ml/d.
- Minor risk to longitudinal connectivity noting the one weir is located high in the reach close to Leighton Reservoir dam.
- Minor risk of changes in sediment dynamics for duration of the 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.

7 'Flow depleted reach' refers to the length between the abstraction and discharge point of non-consumptive licences (e.g. aquaculture, hydropower).

The overall risk to river habitats on Pott Beck 1 from the drought option is therefore assessed as moderate.

A4.2.5 River water quality

One water quality monitoring site is present in Pott Beck 1: Leighton Beck at Burgess Bank Bridge (NE-49105205). There are no significant continuous or intermittent discharges either within Pott Beck 1 or at risk from changes in flow in the 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 Pott Beck 1 as a result of the drought option is presented in **Table A4.1**.

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

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly consistent with High (0.2mg/l) and Good (0.3 mg/l) WFD status throughout the monitoring period.	Dissolved oxygen saturation (%) values were predominantly consistent with High (80%) and Good (75%) WFD status throughout the monitoring period.	Orthophosphate concentrations were predominantly consistent with High (0.013 mg/l) and Good (0.028 mg/l) WFD status throughout the monitoring period.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	None apparent
WwTW presenting increased risk	None	None	None
Intermittent pressures presenting risk	None	None	None
Other point source pressures presenting risk	None	None	None
Summary	Minor risk from drought option	Minor risk from drought option	Minor risk from drought option

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

An overall summary of potential changes in the physical environment of Pott Beck 1 as a result of the drought option is presented in **Table A4.2**.

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

Physical environment aspect reviewed	Assessment of risk from implementation of the drought option
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that the drought option is implemented.
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Pott Beck 1.
River habitats *Moderate risk*	• The major reduction in flow will lead to a major change in the energy of the system with the potential for a moderate impact on wetted habitats and available habitats for different species requirements. The assessment concluded a minor risk to changes in longitudinal connectivity and sediment dynamics.
Water quality *Minor risk*	• Reported water quality is predominantly consistent with High or Good status and with no apparent associations between reducing flow and poorer water quality. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP (soluble reactive phosphorus) has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought option implemented and no significant intermittent pressures presenting risk.

Insert Figure A4.1

A4.3 BURN 1

A4.3.1 Reach introduction

Burn 1 is potentially impacted by a Leighton Reservoir drought permit. A summary of physical environment information for this reach is provided in **Figure A4.2**. The reach includes all of the main channel of the following river waterbody:

- Burn from Leighton Beck to River Ure (GB104027069310).

A4.3.2 Reach setting

Burn 1, located on main EAR **Figure 4.1,** comprises a 7.3km stretch of the River Burn from the confluence with Pott Beck (Pott Beck 1, see **Section A4.2** above) to the confluence with the River Ure (**Table A2.1**).

A4.3.3 River flow regime

River flow in Burn 1 is influenced by the semi-natural flows on the upstream River Burn and the Leighton Reservoir influenced flows of Pott Beck 1. As such, some flow variability would be apparent during the implementation of North Area drought options part-reflecting local hydrological response to rainfall conditions during the ongoing environmental drought.

Daily mean flows at the upper end of the reach, immediately downstream of the Pott Beck confluence, have been estimated by the Gustard flow transposition method (further detail of this is presented in Annex 4). This is based on catchment parameter ratios and gauged flow data from an available gauge on the River Ure at Kilgram Bridge. This donor gauge was selected due to its proximity to the catchment of interest and completeness of the flow record for the period 1990-2023.

Prior to applying the flow transposition, the Kilgram Bridge flow record was part-naturalised by adding the daily public water supply abstractions immediately upstream of the flow gauge. Adjustments to the River Burn catchment parameters were made to allow for the effects of Leighton Reservoir in the upper part of the catchment, and the daily reservoir outflows (consisting of compensation releases, and overflows when applicable) were then added back on to the estimated (transposed) data series. Daily measured abstractions from the River Burn/Birk Gill/Spruce Gill intakes and catchwaters, located upstream of the Pott Beck confluence, available from 2009 onwards, were also subtracted from the transposed flow record. This enabled the creation of an estimated daily flow record for the River Burn downstream of the Pott Beck confluence covering the period 2009-2023 with moderate confidence.

The maximum reduction in flow passed forward from Pott Beck 1 during implementation of the drought option is 8.11Ml/d. This represents a reduction of 50% and 62% in the summer Q95 and Q99 flow statistics, which is assessed as a major hydrological impact on this reach in summer and autumn months. The reduction in year-round Q95 and Q50 is 47% and 17% respectively, which is assessed as a major hydrological impact during winter months also.

There is one significant flow pressure influencing flow in Burn 1, a non-consumptive abstraction licence as described in **Section A4.3.3.1**. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.3.3.1 Flow depleted reaches/significant flow pressures

There is a licensed non-consumptive abstraction depleting flow for ~520m of Burn 1 between the offtake and outfall of a fish farm. Peak daily licensed abstraction rate is 12.1Ml/d, and abstraction at that rate could reduce flows in the depleted reach, 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 Burn 1 (see main EAR Section 6). YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures (see also Appendix B Section B6).

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 3 October 2018 at an estimated river flow at the flow assessment point for the reach of 26.1Ml/d.

Burn 1 is a fairly sinuous reach which declines in sinuosity towards the lower sections of the reach (towards the confluence with the River Ure). The reach falls ~67m over 7.3km, a slope of 0.53°. The channel is heavily shaded with extensive deciduous riparian tree cover along its entire length. Where the channel is visible the channel is between ~8-10m wide. Extant aerial imagery shows few sediment bars in the visible sections of the reach, although there are some deposits of sediment as point bars in a meandering section at ~0.9km prior to the confluence with the River Ure. Due to the extensive nature of these deposits it is likely that they are composed of pebble to cobble sized sediments. Within RHS survey (site ID 25069), three pools and 11 riffles were observed, there were no point bars observed. The survey did not observe ponding or channel modification. OS maps record the presence of three large islands along the reach. Surrounding land-use is comprised of improved grassland with some rough pasture in the upper- and mid-reaches with arable agricultural land towards the lower reach. The reach flows through several large deciduous woods and plantations, mostly within the upper 3km of the reach.

Burn 1 is likely to support a variety of high energy and low energy environments, with the sinuosity of the channel reducing along its reach and the presence of a couple of sediment bars at the meanders in the reach and large islands. The abundant tree cover will ensure a high input of allochthonous energy into the stream and provide cover/refuge opportunities for fish and white-clawed crayfish. Consequently, the reach provides a significant variety of habitat opportunities for organisms adapted to high and low energy environments. Some modification has been undertaken in the reach, and the presence of a weir and fords could have impacts upon the movement/migration of fish and local sediment transfer.

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

- Major risk of changes in the energy of the system associated with up to 60% reduction in flow for periods of time during the duration of the drought option. Note: observations from Environment Agency representatives on the findings of the 1-day flow trial in 2017 indicate that a reduction in flows from Leighton Reservoir to 5Ml/d would reduce energy within the river to an unacceptable level.
- Potentially moderate risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars and islands) and protrusion of bed elements (such as larger particles) through the flow surface for periods of time during the duration of the drought option.
- Potentially moderate risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of the drought option, with changes to the range and abundance of flow types.
- Major risk to longitudinal connectivity from two in-channel structures and fords for periods of time during the duration of the drought option.
- Moderate risk of changes in sediment dynamics for duration of the 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 Burn 1 from the drought option is therefore assessed as major.

A4.3.5 River water quality

Three water quality monitoring sites are present in Burn 1. For this assessment the first sample in the reach, Burn at Healey Sawmill Millrace -U/S T/F (NE-49100346), was used due to its position in the reach and its data quality. There is one significant continuous discharge into Burn 1, the flow return from Swinton Trout farm. See Annex 2 for a full list of discharges considered in the assessment. A summary description of the potential risks to water quality in Burn 1 as a result of the drought option is presented in **Table A4.3**.

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

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly	Dissolved oxygen saturation (%) values were	Orthophosphate concentrations were

	Total ammonia	Oxygen	Phosphate
	consistent with High (0.2 mg/l) and Good (0.3 mg/l) WFD status throughout the monitoring period	consistent with High (80%) and Good (75%) WFD status throughout the monitoring period. Some seasonality was apparent.	predominantly consistent with High (0.013 mg/l) and Good (0.028 mg/l) WFD status throughout the monitoring period. Some seasonality was apparent with notable peaks in June/ August.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	None apparent
WwTW presenting increased risk	None	None	None
Intermittent pressures presenting risk	None	None	None
Other point source pressures presenting risk	Swinton Trout Farm could at times of low river flows discharge flow into zero river flow. Ammonia permit conditions for the Fish Farm are consistent with Moderate WFD status.	Swinton Trout Farm could at times of low river flows discharge flow into zero river flow. Dissolved oxygen permit conditions for the Fish Farm are consistent with Poor WFD status.	None
Summary	Major risk from drought option in combination with fish farm discharge.	Major risk from drought option in combination with fish farm discharge.	Minor risk from drought option

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

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

Table A4.4 Summary of potential changes in the physical environment of Burn 1 as a result of the drought option

Physical environment aspect reviewed	Assessment of risk from implementation of the drought option
River flows *Major impacts*	• Reductions of up to 60% in river flows for periods of time during the duration of the drought option, throughout the reach, at any time of year that the drought option is implemented.
Flow depleted reaches/significant flow pressures *Major risk*	• ~520m flow depleted reach with potential for periods of time with zero flow without mitigation
River habitats *Major risk*	• The major reduction in flow will lead to a major change in the energy of the system with the potential for a major impact on longitudinal connectivity. The assessment concluded a moderate risk to changes in wetted habitats, habitat availability for different species requirements and sediment dynamics.
Water quality *Major risk*	• The fish farm permit conditions for dissolved oxygen are consistent with WFD Poor status and for total ammonia with Moderate WFD status and if discharged into zero flow at the end of the depleted reach would risk reduction of the water quality to maintain the current WFD status for fisheries and macroinvertebrates without mitigation. This represents a major risk to water quality. • Reported water quality is predominantly consistent with High or Good status and with no apparent associations between reducing flow and poorer water quality. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no significant intermittent pressures in this reach presenting risk.

Insert Figure A4.2

A4.4 HOLBORN BECK 1

A4.4.1 Reach introduction

Holborn Beck 1 is potentially impacted by a Lumley Moor Reservoir drought permit. A summary of physical environment information for this reach is provided in **Figure A4.3**. The reach includes part of the following river waterbody:

- Laver from Carlesmoor Beck to Kex Beck (GB104027069190).

A4.4.2 Reach setting

Holborn Beck 1, located on main EAR **Figure 4.1,** comprises a 2.2km stretch of Holborn Beck from Lumley Moor Reservoir to the confluence with the River Laver (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 3.3km^2 along the length of the reach. Laver 1 (see **Section A4.6** below) is downstream.

A4.4.3 River flow regime

During the implementation of North Area drought options, storage in Lumley Moor Reservoir is likely to be below top water level and therefore the compensation flow represents a high proportion of the flow in this reach. A reduction of up to 0.31Ml/d in the statutory compensation release rate of 0.46Ml/d represents a 67% reduction in the flow at the upstream end of the reach, regardless of the 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 Holborn Beck 1 is therefore assessed as **major** for both a summer/ autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the reservoir, the confidence in the assessment of the hydrological impact is high.

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

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 2 October 2018 at a reservoir outflow of 0.9Ml/d.

Holborn Beck 1 is a sinuous and steep reach which falls ~60m over 2.2km, a slope of 1.56°. The channel is heavily shaded with extensive deciduous riparian tree cover along most of its length, although there is some reduction in tree density towards the middle of the reach. The surrounding land-use is generally mixed woodland with improved grassland/rough pasture. Approximately 0.1-0.8km from the reservoir outflow the reach passes through a dense wood. Approximately 0.3km down from the outflow from the reservoir, OS maps indicate the presence of a waterfall. It is difficult to ascertain if this waterfall is within the reach or on a tributary. It indicates the potential presence of bedrock outcrops in and around the channel in this area. YWSL baseline monitoring site 13511 indicates the presence of flow variation within the reach, riffles (10%), run (40%), glide (5%) and pools (20%) were observed. The bed substrate is dominated by pebbles/gravels (60%), however areas of cobbles (25%), sand (10%) and boulders (5%) were also observed. The survey site also contained eroding banks with reinforced banks observed immediately downstream of the reservoir and natural flow restrictions.

Holborn Beck 1 is a high energy environment, indicated by the steep gradient and sinuosity of the channel, which is relatively typical of a low order stream. The extensive coverage of deciduous trees in the riparian habitat will ensure a high input of allochthonous energy into the stream and provide cover/refuge opportunities for fish and white-clawed crayfish. The waterfall identified, if present on the Holborn Beck, will potentially have implications on the movement/migration of organisms, however there are no artificial structures with migration implications. Consequently, the reach will be dominated by organisms that have adapted to high energy environments with an abundance of macroinvertebrates that feed on detritus. The likely substrate type and

features associated with watercourses of this type are also likely to provide habitat opportunity for white-clawed crayfish.

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

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for 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 the drought option, with retention of dominant habitat types.
- Moderate risk to longitudinal connectivity due to steep nature of channel.
- Minor risk of changes in sediment dynamics for duration of the 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 Holborn Beck 1 from the drought option is therefore assessed as moderate.

A4.4.5 River water quality

There are no water quality monitoring sites in Holborn Beck 1. As such, for this assessment the first sample site in the downstream reach (River Laver 1), Laver at Galphay Mill Road Bridge has been used, as this is considered representative of upstream conditions due to the absence of any known pressures between Lumley Moor Reservoir and this location. There are no significant continuous or intermittent discharges either within Holborn Beck 1 or at risk from changes in flow in the reach. A summary description of the potential risks to water quality in Holborn Beck 1 as a result of the drought option is presented in **Table A4.7**.

Table A4.7 Potential risks to water quality in Holborn Beck 1 as a result of the drought option

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly consistent with High (0.2 mg/l) and Good (0.3 mg/l) WFD status throughout the monitoring period	Dissolved oxygen saturation (%) values were consistent with High (80%) and Good (75%) WFD status throughout the monitoring period. Some seasonality was apparent.	Orthophosphate concentrations were predominantly consistent with High (0.025 mg/l) and Good (0.05 mg/l) WFD status throughout the monitoring period. Some seasonality was apparent with notable peaks in June/ August.
Flow sensitivity (diffuse pollution)	None apparent	Weak	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 option	Minor risk from drought option	Minor risk from drought option

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

An overall summary of potential changes in the physical environment of Holborn Beck 1 as a result of the drought option is presented in **Table A4.8**.

Table A4.8 Summary of potential changes in the physical environment of Holborn Beck 1 as a result of the drought option

Physical environment aspect reviewed	Assessment of risk from implementation of the drought option
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that the drought option is implemented.
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Holborn Beck 1.
River habitats *Moderate risk*	• The major reduction in flow will lead to a major change to the energy of the system resulting in the potential for moderate impacts to available habits for different species and longitudinal connectivity. Minor risks have been assessed to wetted habitat and sediment dynamics.
Water quality *Minor risk*	• No water quality data is available directly for the reach, but local reported water quality is predominantly consistent with High or Good status and with only weak associations between reducing flow and poorer water quality. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought option implemented and no significant intermittent pressures presenting risk.

Insert Figure A4.3

A4.5 LAVER 1

A4.5.1 Reach introduction

Laver 1 is potentially impacted by a Lumley Moor 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 waterbodies:

- Laver from Carlesmoor Beck to Kex Beck (GB104027069190).
- Kex Beck and the Laver (GB104027069260).

A4.5.2 Reach setting

Laver 1, located on main EAR **Figure 4.1,** comprises a 10.4km stretch of the River Laver from Holborn Beck to the confluence with the River Skell (**Table A2.1**). The reach is dominated by flows from the upstream catchment with an additional catchment area of 35.5km^2 along the length of the reach.

A4.5.3 River flow regime

River flow in Laver 1 is influenced predominantly by the semi-natural flows on the upstream River Laver and also by the Lumley Moor Reservoir influenced flows of Holborn Beck 1. As such much flow variability would be apparent during the implementation of North Area drought options part-reflecting local hydrological response to rainfall conditions during the ongoing environmental drought.

Daily mean flows at the upstream end of this reach, immediately downstream of the Holborn Beck confluence, have been estimated by the Gustard flow transposition method (further detail on the flow transposition approach in this reach is set out in Annex 4). This is based on catchment parameter ratios and gauged flow data from an available downstream gauge at Ripon Laver Weir. Prior to applying the flow transposition, adjustments to the gauged flow data and catchment parameters were made to allow for the effects of Lumley Moor Reservoir in the upper part of the River Laver catchment, and daily reservoir outflows (consisting of compensation releases, and overflows when applicable) were then added back on to the estimated (transposed) data series. This enabled the creation of an estimated daily flow record for the River Laver downstream of the Holborn Beck confluence covering the period 1990-2024 with moderate to high confidence.

The maximum reduction in flow passed forward from Holborn Beck 1 during implementation of the drought options is 0.31Ml/d. This represents a reduction of 7.7% and 13% in the summer Q95 and Q99 flow statistics, which is assessed as a minor hydrological impact on this reach in summer and autumn months. The reduction in year-round Q95 and Q50 is 6.8% and 1.3% respectively, which is assessed as a negligible hydrological impact during winter months associated with winter refill periods.

At the downstream end of the reach, flows are measured at the Ripon Laver Weir gauging station. A reduction of up to 0.31Ml/d represents a percentage reduction of 3.6% and 6.3% in the gauged summer Q95 (8.64Ml/d) and Q99 (4.92Ml/d) flow statistics, so that the summer and autumn hydrological impact would be reduced by flow accretion along the reach to negligible by the end of this reach.

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

A4.5.4 River habitats

River habitats have been characterised at a whole reach scale. No additional information for a representative 500m reach has been surveyed with there being no onset of drought walkover undertaken in 2018 (due to the assessment of a low hydrological impact in this reach).

Laver 1 is a fairly sinuous reach with relatively straight sections towards the centre of the reach. The reach falls ~80m over 10.4km, a slope of 0.44°. The channel is heavily shaded, particularly in the first 4km of the reach when the channel flows through mixed woodland and plantation. Tree cover is scattered thereafter, although increases to continuous cover towards the end of the reach. Where the channel is visible, towards the mid to lower sections of the reach, the channel is between ~7m wide in the mid-reaches, increasing to ~12m wide in the lower reaches. In the few visible sections of the reach only two channel bars are visible. Due to the extensive nature of these deposits it is likely that they are composed of pebble to cobble sized sediments.

Data from the single RHS site (site ID 4274) ~8.5km downstream from the start of the reach indicates that the river bed at the survey site was predominantly composed of cobble with 10% of sites as pebble. Within RHS survey, one pool and four riffles were observed, there were six unvegetated point bars, and no vegetated point bars observed. The survey observed <33% of the site was ponded, with no observed channel modification. YWSL baseline monitoring site 13512 confirmed the presence of cobbles (25%), however areas of gravel/pebble (40%), boulders (15%) and sand (20%) were also observed. The presence of exposed bedrock and exposed boulders was noted in the RHS Survey. RHS data show that 60% of observed flow was smooth, with 20% as rippled; this is confirmed by YWSL baseline monitoring data from site ID 13512. The remaining 20% was a mix of broken and unbroken standing waves. Data for the single RHS site identify that both the left and right banks are predominantly composed of earth (with 20-30% identified as cobble) with mostly bare or uniformly vegetated faces and simple vegetated bank tops. The left and right banks at the RHS site were noted as extensively undercut, with gently sloping banks present. Whole bank reinforcement was present along the reach. OS maps record the presence of two large islands along the reach, and this is confirmed by YWSL baseline monitoring data from site ID 13512. Surrounding land use is generally improved grassland, extensive woodland with several areas of parkland and gardens towards the end of the reach.

Laver 1 is likely to support a variety of high and low energy environments, due to the sinuosity of the reach and outcropping bedrock. This is confirmed by the RHS information obtained within the reach, where extensive undercutting of the banks indicating high energy environments were observed. Further the presence of depositional features such as point bars and marginal dead waters indicates a lower energy environments. The RHS information indicates that the substrate of the watercourse is predominantly cobble with some pebble. The reach contains some pools, riffles and marginal deadwater, which provides suitable spawning and nursery habitat for fish. The presence of five weirs in the reach, could have significant implications on the movement/migration of fish and local sediment transfer.

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

- Minor risk of changes in the energy of the system in summer/ autumn and negligible risk in winter associated with up to 13% reduction in lowest flow for periods of time during the duration of the drought option.
- Potentially minor 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 bed elements (such as larger particles) through the flow surface for periods of time during the duration of the 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 few changes to the range and abundance of flow types.
- Minor risk to longitudinal connectivity from five in-channel structures for periods of time during the duration of the drought option.
- Minor risk of changes in sediment dynamics for duration of the 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 Laver 1 from the drought option is therefore assessed as minor.

A4.5.5 River water quality

One water quality monitoring site is present in Laver 1: Laver at Galphay Mill Road Bridge. There is one CSO presenting a significant intermittent water quality pressure in this reach. No significant continuous discharges are identified within Laver 1 at risk from changes in flow in the 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 Laver 1 as a result of the drought option is presented in **Table A4.9**.

Table A4.9 Potential risks to water quality in Laver 1 as a result of the drought option

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly consistent with High (0.2 mg/l) and Good (0.3 mg/l) WFD status throughout the monitoring period	Dissolved oxygen saturation (%) values were consistent with High (80%) and Good (75%) WFD status throughout the monitoring period. Some seasonality was apparent.	Orthophosphate concentrations were predominantly consistent with High (0.025 mg/l) and Good (0.05 mg/l) WFD status throughout the monitoring period. Some seasonality was apparent with notable peaks in June/ August.
Flow sensitivity (diffuse pollution)	None apparent	Weak	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 one listed CSO during rainfall events.		None
Other point source pressures presenting risk	None	None	None
Summary	Moderate risk from drought option associated with CSO spill	Moderate risk from drought option associated with CSO spill	Minor risk from drought option

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

An overall summary of potential changes in the physical environment of Laver 1 as a result of the drought option is presented in **Table A4.10**.

Table A4.10 Summary of potential changes in the physical environment of Laver 1 as a result of the drought option

Physical environment aspect reviewed	Assessment of risk from implementation of the drought option
River flows *Minor impacts (summer)* *Negligible impacts (winter)*	• Reductions of up to 13% in summer river flows throughout the reach • Negligible impact assessed during winter months associated with winter refill periods
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Laver 1.
River habitats *Minor risk*	• The minor reduction in flow will present minor change to the energy of the system with the potential for minor impacts to the wetted habitat, available habitat for different species, longitudinal connectivity and sediment dynamics
Water quality *Moderate risk*	• Moderate risk of short term acute, infrequent, temporary water quality pressures to ammonia and dissolved oxygen locally downstream of one listed CSO during rainfall events. • Reported water quality is predominantly consistent with High or Good status and with only weak associations between reducing flow and poorer water quality. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought option implemented

Insert Figure A4.4

A4.6 OAK BECK 1

A4.6.1 Reach introduction

Oak Beck 1 is potentially impacted by a Haverah Park Reservoirs drought permit. A summary of physical environment information for this reach is provided in **Figure A4.5**. The reach includes part of the following river waterbody:

- Oak Beck Catchment (Trib of Nidd) (GB104027063760).

A4.6.2 Reach setting

Oak Beck 1, located on main EAR **Figure 4.1,** comprises a 11.8km stretch of Oak Beck from the confluence between Beaver Dyke and Scargill Beck to the confluence with the River Nidd (**Table A2.1**). The upper reach is dominated by reservoir outflows from Scargill Reservoir and John O'Gaunts Reservoir (noting that Beaver Dyke Reservoir is no longer operated as a reservoir) with an additional catchment area of 29.2km^2 along the length of the reach.

A4.6.3 River flow regime

During the implementation of North Area drought options, storage in Haverah Park Reservoirs is likely to be below top water level and therefore the reservoir compensation flow represents a high proportion of the flow in the upper reach. A reduction of up to 0.5Ml/d in the normal group compensation rate of 0.75Ml/d (as per the LEP) represents a 67% reduction in the flow at the upstream end of the reach, regardless of the time of year. During a winter refill period when catchment flows are generally increasing, there may be flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However, the flow reduction at the top of the reach will remain at 67% until the reservoir reaches top water level and begins to spill again.

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

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

A4.6.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 2 October 2018 at a combined reservoir outflow of 1.4Ml/d.

Oak Beck 1 is a sinuous reach which falls ~105m over 13km, a slope of 0.50°. There is variable tree cover along the length of the reach. In the upper reach YWSL baseline monitoring site 13513 indicates the presence of a variety of flows. The flow is dominated by smooth flow (60%), however there are areas of riffles (5%) and pools (30%). The bed substrate at the YWSL baseline monitoring site was dominated by gravels/pebbles (60%), however areas of cobble (25%), sand (10%) and boulders (5%) were observed. In the middle reach at YWSL baseline monitoring site 13514 the channel has been realigned and over-deepened. Channel width ranges from ~3m in the upper reaches and increases to 8m at the confluence with the River Nidd. Extant aerial imagery shows few distinct depositional features and no in-channel depositional features were observed in the YWSL baseline monitoring sites. However, a point bar is visible immediately downstream of Knox using aerial imagery. Most of the visible surface of the middle and lower river is generally smooth and free of broken flow. with bed substrate predominantly cobble. Some local bank erosion is noted in the lower reaches, particularly where riparian tree cover is limited. Within the furthest upstream RHS survey (site ID 23515), no pools and seven riffles were observed, no point bars were noted. It was observed that <33% of the survey reach channel had been realigned and over-deepened. At the further downstream RHS survey (site ID 23517), no pools and nine riffles were observed, no point bars were noted. It was also observed that <33% of the survey reach channel had been realigned and over-deepened The reach flows through several large deciduous woods and plantations, mostly within the first 5.8km of the reach. Outside of these wooded areas riparian tree

cover remains relatively high. Surrounding land-use is predominantly improved grassland and some scrub (the scrub occurring mostly in the first 1.8km. At 6km downstream the channel flows alongside a golf course for ~0.9km, continuing through Harrogate for 1.4km. The remaining land-use until the confluence with the River Nidd is comprised of improved grassland with scattered to continuous riparian tree cover and industrial land of Harrogate North WwTW (which is located prior to the confluence with the River Nidd).

Oak Beck 1 is likely to support a variety of high and low energy environments due to moderate slope and the presence of some, albeit few, distinct depositional features. The extensive tree cover in the upper reach will result in a high input of allochthonous energy. The reach supports a range of habitats due to the sinuosity of the reach, in more sinuous locations variation in flow is expected. Three weirs are noted on the main channel that could have impacts upon the movement/migration of fish and local sediment transfer.

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

- Moderate risk of changes in the energy of the system associated with up to 67% reduction in flow for periods of time during the duration of the drought option.
- Potentially moderate risk of reduction in wetted aquatic habitat (wetted width reduction) with increasing exposure of channel margins, the margins of within-channel features (such as channel bars and islands) and protrusion of bed elements (such as larger particles) through the flow surface for periods of time during the duration of the drought option.
- Potentially major risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for periods of time during the duration of the drought option, with changes to the range and abundance of flow types.
- Major risk to longitudinal connectivity from three main channel in-channel structures for periods of time during the duration of the drought option.
- Moderate risk of changes in sediment dynamics for duration of the 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 Oak Beck 1 from the drought option is therefore assessed as major.

A4.6.5 River water quality

One water quality monitoring site is present in Oak Beck 1: Oak Beck @ Spruisty Footbridge D/S A61 (NE-49800075). There are no significant continuous discharges either within Oak Beck 1 or at risk from changes in flow in the reach. There are 22 CSOs with the potential to present a significant environmental risk in the reach (a map of these CSOs is presented in Annex 3). See Annex 2 for a full list of discharges considered in the assessment. A summary description of the potential risks to water quality in Oak Beck 1 as a result of the drought option is presented in **Table A4.11**.

Table A4.11 Potential risks to water quality in Oak Beck 1 as a result of the drought option

	Total ammonia	Oxygen	Phosphate
General quality	Ammonia concentrations were predominantly consistent with High and Good (0.3 mg/l) WFD status throughout the monitoring period. Some seasonality was apparent with concentrations rising in spring and falling in autumn.	Dissolved oxygen saturation (%) values were predominantly consistent with High (80%) and Good (75%) WFD status throughout the monitoring period. Some seasonality was apparent with saturation rising in late winter/spring and falling in late summer/autumn.	Orthophosphate concentrations were predominantly consistent with 'Moderate' WFD status (0.153 mg/l) throughout the monitoring period. Some seasonality was apparent with notable peaks in June/ August.
Flow sensitivity (diffuse pollution)	Weak	Weak	Weak

	Total ammonia	Oxygen	Phosphate
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 CSO during rainfall events.		None
Other point source pressures presenting risk	None	None	None
Summary	Moderate risk from drought option associated with CSO spill	Moderate risk from drought option associated with CSO spill	Minor risk from drought option

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

An overall summary of potential changes in the physical environment of Oak Beck 1 as a result of the drought option is presented in **Table A4.12**.

Table A4.12 Summary of potential changes in the physical environment of Oak Beck 1 as a result of the drought option

Physical environment aspect reviewed	Assessment of risk from implementation of the drought option
River flows *Major impacts*	• Reductions of up to 67% in river flows at any time of year that the drought option is implemented. Potential for flow accretion to reduce some of these effects in the lower reach, particularly during a winter refill period.
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Oak Beck 1.
River habitats *Major risk*	• The major reduction in flow will lead to a major change to the energy of the system resulting in the potential for major impacts to available habits for different species and longitudinal connectivity. moderate risks have been assessed to wetted habitat and sediment dynamics.
Water quality *Moderate risk*	• Moderate risk of short term acute, infrequent, temporary water quality pressures to ammonia and dissolved oxygen locally downstream of 22 listed CSOs during rainfall events. • Reported water quality is predominantly consistent with Good status, with the exception of SRP which is predominately consistent with Moderate status, and with only weak flow sensitivity. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought option implemented.

Insert Figure A4.5

A4.7 WASHBURN 1

A4.7.1 Reach introduction

Washburn 1 is potentially impacted by a Thruscross 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:

- Washburn Source to Spinksburn Bk (Swinsty Res) (GB104027064070).

A4.7.2 Reach setting

Washburn 1, located on main EAR **Figure 4.1,** comprises a 2.9km stretch of the River Washburn from Thruscross Reservoir to the next impounding reservoir, Fewston Reservoir (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 11.0km^2 along the length of the reach.

A4.7.3 River flow regime

During the implementation of this drought option, it is likely that the level in Thruscross Reservoir will be below top water level and therefore the reservoir compensation flow represents a high proportion of the flow in this reach.

Seasonally variable compensation flows have been released from Thruscross Reservoir since the summer of 2016, under trial arrangements which were formalised in a new licence issued on 31 March 2020. In addition YWSL release higher flows through the scour valve to create a white water canoeing and rafting course downstream, and this is reflected in the measured reservoir outflow data series. No releases for this purpose have been made since 2021, with YWSL and the British Canoeing currently in talks to restart the canoe release programme. Despite the releases potentially restarting, the additional releases for white water sports would not take place during the implementation of a drought option.

During the spring period of 16 April to 15 May, a reduction of 5.47 Ml/d (the maximum spring reduction under a Thruscross Reservoir drought option) 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. Similarly, during the summer period of 16 May to 15 October, the maximum reduction of 2.60 Ml/d also represents a 67% reduction in flows and is also assessed as a major impact. Similarly, during the autumn period of 16 October to 15 November, the maximum reduction of 5.47 Ml/d also represents a 67% reduction in flows and is also assessed as a major impact.

During the winter refill period, there is likely to be higher flow accretion along the length of the reach so that the percentage reduction in flows will be less at the lower end of the reach. However, at the upstream end of this reach it is assumed that flow would still consist of compensation releases only during the implementation of a Thruscross Reservoir drought option. The maximum flow reduction of 11.30Ml/d during the winter period of 16 November to 15 April, still represents a 67% reduction in flows and is also assessed as a major impact during this period.

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

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

A4.7.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 25 June 2020 at a reservoir outflow of 88.8 Ml/d.

In Washburn 1 the channel, between Thruscross Reservoir and Fewston Reservoir, falls 45m in 2.93km, a gradient of 0.89°. The reach is fairly sinuous. Surrounding land-use is dominated by woodland and farmland.

Flow within the channel, recorded by the furthest downstream RHS survey site (site ID 25058), was a riffle-pool sequence. The upstream RHS survey (site ID 27021), observed six pools and one riffle, one unvegetated

point bar was noted. Within the surveys, 30 riffles and 19 pools were observed. The bed substrate was dominated by cobbles, however, there may be areas of increased fine-grained deposition behind the two weirs within the lower RHS reach. The YWSL baseline monitoring site most upstream (survey 13490), recorded dominant cobbles (45%), with boulders (30%), pebbles/gravel (20%) and sand (5%) also present, the sites downstream (survey 13491 and survey 13492) also recorded similar material ratios for the bed substrate, with only some variance in the percentage of boulders and cobbles. Data for the downstream RHS site identify that both the left and right banks are predominantly composed of earth. Given the upland location, some sections of bedrock are expected, whilst concrete is expected in the more managed sections of the reach, for example around weirs and the reservoir outflow.

The reach is heavily managed, the RHS surveys classified the reach as obviously modified, and there is evidence of channel reinforcement. As noted before, the baseline conditions are adapting to the new compensation flow regime. Prior to the compensation regime, during low flows, the channel was not connected due to the weirs within the reach which would inhibit fish passage; this would also inhibit sediment movement downstream. Since the compensation flow regime has been in place, connectivity has increased. However, during low flow conditions, such as those in a drought, it is expected there may be limited connectivity downstream to Fewston Reservoir until fish passage improvements are undertaken.

Washburn 1 is considered likely to support a variety of high energy and moderate energy environments, as indicated by the fairly steep gradient and sinuosity of the watercourse; however, as the reach is a recovering system, little can be inferred about habitat availability. Due to the compensation regime, however, the extent of habitats and quality of habitats is expected to improve. The extensive riparian shading will provide a high allochthonous energy input into the watercourse, with a likely abundance of macroinvertebrates that feed upon detritus. The presence of four weirs in the reach could have significant impacts upon the movement/migration of organisms and have been known to stop connectivity in low flow conditions.

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

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow particularly throughout the mid May to mid October period when seasonal compensation flows are lowest.
- 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 bed elements (such as larger particles) through the flow surface particularly throughout the ‘summer’ (mid May to mid October period when seasonal compensation flows lowest, moderate risk during the ‘spring’ (mid April to mid May) and ‘autumn’ (mid October to mid November) periods when river flows would be higher. Minor risk during the ‘winter’ (mid November to mid April) period when wetted habitat would more closely resemble the spring and autumn conditions without the drought option.
- Potentially moderate risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for duration of the drought option, with retention of pool riffle sequences.
- Major risk to longitudinal connectivity noting the known effects of the weirs present during low flow conditions.
- Minor risk of changes in sediment dynamics for duration of the drought option. Reductions in discharge will lead to reductions in flow depth and velocity. This will lead to increased potential for the deposition of any fine sediment in transport. There may be increased fine grained deposition between the weirs within the reach. Coarse sediment dynamics are unlikely to be affected.

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

A4.7.5 River water quality

Two water quality monitoring sites are present in this reach. As such, the site with the longest data set has been utilised for this assessment: Washburn at Blubberhouse Bridge (NE-49700266). There are no significant continuous or intermittent discharges either within Washburn 1 or at risk from changes in flow in the 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 Washburn 1 as a result of the drought option is presented in **Table A4.13**.

Table A4.13 Potential risks to water quality in Washburn 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. Some seasonality was apparent with concentrations rising in spring and falling in autumn.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period.	Orthophosphate concentrations were predominantly consistent with High (0.013 mg/l) and Good (0.028 mg/l) WFD status throughout the monitoring period.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	None apparent
WwTW presenting increased risk	None	None	None
Intermittent pressures presenting risk	None	None	None
Other point source pressures presenting risk	None	None	None
Summary	Minor risk from drought option	Minor risk from drought option	Minor risk from drought option

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

An overall summary of potential changes in the physical environment of Washburn 1 as a result of the drought option is presented in **Table A4.14**.

Table A4.14 Summary of potential changes in the physical environment of Washburn 1 as a result of the drought option

Physical environment aspect reviewed	Assessment of risk from implementation of the drought option
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that the drought option is implemented. Due to the seasonal compensation regime, the lowest remaining flows would be in the mid May to mid October period.
Flow depleted reaches/significant flow pressures *None*	• There are no flow depleted reaches or significant flow pressures within Washburn 1.
River habitats *Major risk*	• The major reduction in flow will lead to a major change in the energy of the system with the potential for major risks to wetted habitat and longitudinal connectivity. The risk to available habitat for different species requirements is assessed as moderate and the risk to sediment dynamics is assessed as minor.
Water quality *Minor risk*	• Reported water quality is predominantly consistent with High and Good status and without apparent flow sensitivity. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed. • There are no continuous water quality pressures identified as presenting increased risk with drought option implemented and no significant intermittent pressures presenting risk.

Insert Figure A4.6

A4.8 WASHBURN 2

A4.8.1 Reach introduction

Washburn 2 is potentially impacted by a Lindley Wood Reservoir 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:

- Washburn Spinksburn Bk (Swinsty Res) to Wharfe (GB104027064020)

A4.8.2 Reach setting

Washburn 2, located on main EAR **Figure 4.1,** comprises a 4.3km stretch of the River Washburn from Lindley Wood Reservoir to the confluence with the River Wharfe (**Table A2.1**). The reach is dominated by reservoir outflows with an additional catchment area of 5.9km^2 along the length of the reach.

A4.8.3 River flow regime

During the implementation of this drought option, it is likely that the level in Lindley Wood Reservoir will be below top water level and therefore the reservoir compensation flow represents a high proportion of the flow in this reach. A reduction of up to 12.19Ml/d in the statutory compensation release rate of 18.19Ml/d represents a 67% reduction in the flow at the upstream end of the reach, regardless of the time of year. During a winter refill period when catchment flows are generally increasing, there may be some limited flow accretion along the reach so that the percentage flow reduction is less at the lower end of the reach. However, the flow reduction at the top of the reach will remain at 67% until the reservoir reaches top water level and begins to spill again.

The hydrological impact of the drought option on Washburn 2 is therefore assessed as **major** for both a summer/ autumn period and any winter refill period while drought options remain in place. With this reach being immediately downstream of the reservoir, the confidence in the assessment of the hydrological impact is high.

There is one significant flow pressure influencing flow in Washburn 2, a non-consumptive abstraction licence leading to a depleted reach as described in **Section A4.8.3.1**. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.

A4.8.3.1 Flow depleted reaches/significant flow pressures

There is a licensed non-consumptive abstraction (NE/027/0020/017) depleting flow in Washburn 2 between the offtake and outfall of a fish farm. Peak daily licensed abstraction rate is 18.18Ml/d, and abstraction at that rate could reduce flows in the depleted reach, in combination with the drought option, to zero. The associated discharge permit (EPRAB3590VW) returns the permitted 18Ml/d ~670m downstream of the abstraction point which marks the end of the depleted reach. It is noted that at the statutory compensation release rate the effects of flow depletion are also significant. A walkover reach covering the section of the river has been included in the schedule of monitoring for Washburn 2 (see main EAR Section 6). YWSL will liaise with the abstractors in advance of permit implementation to determine appropriate mitigation measures.

A4.8.4 River habitats

River habitats have been characterised at a whole reach scale and with additional information for a representative 500m reach from survey information on 26 September 2018 at a reservoir outflow of 21.8Ml/d.

Washburn 2 is a fairly sinuous reach which falls ~34m over 4.3km, a slope of 0.45°. The channel is heavily shaded with extensive deciduous riparian tree cover along its entire length. The channel measures ~10m wide immediately prior to the confluence with the River Wharfe. At the RHS sites (site ID 26431 and 25115), there was a total of six pools, five riffle and one vegetated point bar recorded. Sections of the reach are modified such as at the downstream RHS site (25115) where <33% of the channel was recorded as realigned and impounded. In addition to the extensive riparian tree cover, land use is predominantly improved grassland. There is an extensive area of open water ~1.8km downstream on the right bank (Farnley Lake) separated from the river bank by a plantation.

Washburn 2 is considered likely to support a variety of high energy and low energy environments downstream of the flow depleted reach, as indicated by the fairly steep gradient and sinuosity of the watercourse. The

extensive riparian shading will provide a high allochthonous energy input into the watercourse, with a likely abundance of macroinvertebrates that feed upon detritus. The presence of a weir low in the reach could have significant impacts upon the movement/migration of organisms between the River Washburn and River Wharfe.

The reduction in flow could lead to several potential impacts within the reaches:

- Major risk of changes in the energy of the system associated with up to 67% reduction in flow for duration of the 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 bed elements (such as larger particles) through the flow surface for duration of the drought option.
- Potentially major risk of change in available aquatic habitat (flow velocity reduction and depth reduction) for duration of the drought option.
- Major risk to longitudinal connectivity noting the one weir is located low in the reach close to the River Wharfe confluence.
- Minor risk of changes in sediment dynamics for duration of the 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 Washburn 2 from the drought option is therefore assessed as major.

A4.8.5 River water quality

The most downstream of the two water quality monitoring sites present in this reach has been used to characterise the water quality in this reach: River Washburn at Leathley Bridge. (NE-49700150). There is one significant continuous discharge into Washburn 2, the flow return from Farnley fish farm. It is noted that permit conditions for dissolved oxygen for the fish farm require water consistent with High status for oxygen to be returned to the river at all times. See Annex 2 for a full list of discharges considered in the assessment. A summary description of the potential risks to water quality in Washburn 2 as a result of the drought option is presented in **Table A4.15**.

Table A4.15 Potential risks to water quality in Washburn Beck 2 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. Some seasonality was apparent with concentrations rising in spring and falling in autumn.	Dissolved oxygen saturation (%) values were consistent with High WFD status (80%) throughout the monitoring period. Some seasonality was apparent with saturation rising in late winter/spring and falling in late summer/autumn.	Orthophosphate concentrations were predominantly consistent with High (0.024 mg/l) and Good (0.048 mg/l) WFD status throughout the monitoring period. Some seasonality was apparent with notable peaks in June/ August.
Flow sensitivity (diffuse pollution)	None apparent	None apparent	None apparent
WwTW presenting increased risk	None	None	None
Intermittent pressures presenting risk	None	None	None
Other point source pressures presenting risk	At times the drought permit is operational, Farnley Fish Farm could abstract up to 18.18Ml/d and discharge the equivalent flow into	None	None

	Total ammonia	Oxygen	Phosphate
	zero river flow. Ammonia permit conditions for the Fish Farm are consistent with Moderate WFD status.		
Summary	Major risk from drought option in combination with fish farm discharge.	Minor risk from drought option	Minor risk from drought option

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

An overall summary of potential changes in the physical environment of Washburn 2 as a result of the drought option is presented in **Table A4.16**.

Table A4.16 Summary of potential changes in the physical environment of Washburn 2 as a result of the drought option

Physical environment aspect reviewed	Assessment of risk from implementation of the drought option
River flows *Major impacts*	• Reductions of up to 67% in river flows throughout the reach at any time of year that the drought option is implemented.
Flow depleted reaches/significant flow pressures *Major risk*	• ~670m flow depleted reach with potential for zero flow without mitigation
River habitats *Major risk*	• The major reduction in flow will lead to a major change to the energy of the system with the potential for major risks wetted habitat, available habitat for different species requirements, longitudinal connectivity. A minor risk of change in sediment dynamics has been assessed.
Water quality *Major risk*	• The fish farm permit conditions for total ammonia are consistent with Moderate WFD status and if discharged into zero flow at the end of the depleted reach would risk reduction of the water quality to maintain the current WFD status for fisheries and macroinvertebrates without mitigation. • Reported water quality is predominantly consistent with High and Good status and without apparent flow sensitivity. As such only a minor risk associated with change in dilution of diffuse pollution pressures to ammonia, dissolved oxygen and SRP has been assessed.

Insert Figure A4.7

ANNEX 1 – REGULATED ABSTRACTIONS IN NORTH AREA REACHES

DP reach	Licence No.	Use Description	NGR 1	Max Annual Quantity (m^3/ annum)	Max Daily Quantity (m^3/day)	Significant flow pressure
Burn 1	2/27/22/086	Spray Irrigation - Direct	SE216802	4090	40.9	No
Burn 1	2/27/22/406	Fish Farm/Cress Pond Throughflow	SE180802	4050500	12100	Yes
		Milling & Water Power Other Than Electricity Generation				
Washburn 2	NE/027/0020/017	Mill Goit at Farnley Hall Estate	SE2259848297	3784320	10368	Yes

n.b. 1000m^3 = 1Ml

ANNEX 2 – WATER QUALITY PRESSURES CONSIDERED IN THE ASSESSMENT

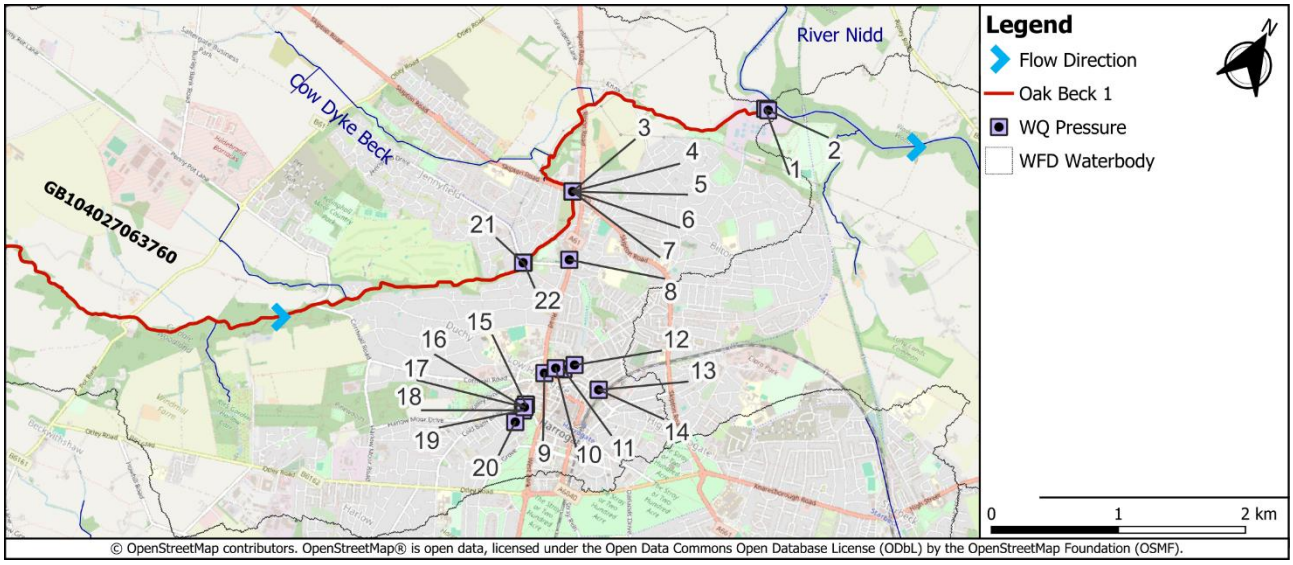
Name	URN (permit number and schedule)	Outfall NGR	Significant Water Quality Pressure	Intermittent/ Continuous
5 CSO At Borrage Bridge	2749	SE 30100 71100	Yes	Intermittent
Albert Street/CSO	27/21/0216 7	SE 29954 55248	Yes	Intermittent
Cambridge Street/CSO	27/21/0216 5	SE 29956 55559	Yes	Intermittent
Chudleigh Road/CSO	27/21/0216 4	SE 30392 55659	Yes	Intermittent
Cold Bath Road/CSO	27/21/0216 16	SE 29956 55222	Yes	Intermittent
Harrogate North/STW/6xDWF Overflow	QR.27/21/0047 A3	SE 30184 57958	Yes	Intermittent
Harrogate North/STW/3xDWF Overflow	QR.27/21/0047 A2	SE 30200 57985	Yes	Intermittent
Hotel Majestic/CSO	27/21/0216 14	SE 30070 55660	Yes	Intermittent
Hyde Park Road/CSO	27/21/0216 19	SE 30392 55659	Yes	Intermittent
Jenny Plain Bridge/CSO	27/21/0216 10	SE 29680 56430	Yes	Intermittent
Kings Road/CSO	27/21/0216 2	SE 30014 55637	Yes	Intermittent
Millgate Masham/CSO	27/22/0162 A1	SE 22714 80804	No	Intermittent
Montpellier Rd27/CSO	27/21/0216 3	SE 29953 55272	Yes	Intermittent
Oakdale Avenue/CSO	WADC1184 A1	SE 29380 56231	Yes	Intermittent
Oakdale Harrogate/CSO	EPR/UP3221GE A1	SE 29376 56228	Yes	Intermittent
Skipton Road 109/CSO	27/21/0211 A1	SE 29433 56908	Yes	Intermittent
Skipton Road 179/CSO	27/21/0207 1	SE 29433 56908	Yes	Intermittent
Skipton Road 33/CSO	27/21/0209 1	SE 29433 56908	Yes	Intermittent
Skipton Road 83/CSO	27/21/0210 A1	SE 29433 56908	Yes	Intermittent
St Marys Walk 112/CSO	27/21/0216 13	SE 29957 55221	Yes	Intermittent
St Marys Walk 29/CSO	27/21/0216 12	SE 29950 55111	Yes	Intermittent
Strawberry Dale/CSO	27/21/0216 8	SE 30130 55733	Yes	Intermittent
Unity Grove/CSO	27/21/0208 A1	SE 29433 56908	Yes	Intermittent

Name	URN (permit number and schedule)	Outfall NGR	Significant Water Quality Pressure	Intermittent/ Continuous
West Park/CSO	27/21/0216 6	SE 29954 55248	Yes	Intermittent
Aldfield STW	E762 1	SE259696 8804	No	Continuous
Beckwithshaw STW	2644 A1	SE268805 2775	No	Continuous
Bishop Monkton STW	27/22/0077 2	SE339306 7430	No	Continuous
Bland Hill STW	E768 (SS)/1/1	SE196455 3202	No	Continuous
Blubberhouses STW	QR.27/20/0006 1	SE169755 5310	No	Continuous
Burley	E164 A1	SE185994 5903	No	Continuous
East Carlton STW	E776(SS) 1	SE220844 2031	No	Continuous
Farnley Fish Farm	EPRAB3590VW	SE226834 8194	Yes	Continuous
Fearby STW	1109 1	SE199628 1869	No	Continuous
Grantley STW	2905 1	SE233116 9273	No	Continuous
Harrogate North STW	QR.27/21/0047 A1	SE304215 8231	No	Continuous
Killinghall STW	27/21/0089 1	SE270715 9085	No	Continuous
Kirkby Malzeard STW	27/22/0048 A1	SE247007 4165	No	Continuous
Kirklington WPC Works	27/23/0263	SE318008 1700	No	Continuous
Marton Le Moor STW	WRA6820 1	SE353946 8859	No	Continuous
Masham STW	27/22/0063 1	SE230308 0680	No	Continuous
Menwith Hill Station	QR.27/21/0005	SE186045 9041	No	Continuous
Otley STW	27/20/0046 A1	SE223054 6377	No	Continuous
Pool WPC Works	27/20/0069 A1	SE265724 5307	No	Continuous
Ripon WPC Works	27/22/0052/ A1	SE327487 0635	No	Continuous
Ripon WWTW	27/22/0052 /3	SE327007 0600	No	Continuous
Sawley STW	215 1	SE259986 8297	No	Continuous
Shaw Mills STW	27/21/0091 A1	SE276056 1435	No	Continuous
Skelton On Ure WPC Works	27/22/0060 A1	SE355356 8626	No	Continuous
Studley Roger STW	792 1	SE298506 9936	No	Continuous

Name	URN (permit number and schedule)	Outfall NGR	Significant Water Quality Pressure	Intermittent/ Continuous
Swinton Masham STW	27/22/0075 A1	SE2163080160	No	Continuous
Swinton Trout Farm	3391	SE1850080200	Yes	Continuous
Timble STW	1333 1	SE1933552806	No	Continuous

ANNEX 3 - OAK BECK 1 SIGNIFICANT INTERMITTENT WATER QUALITY PRESSURES

Map and table of the significant intermittent water quality pressures on the Oak Beck 1 reach. This is only a portion of the Oak Beck 1 Reach with the full reach shown in Figure A4.5.



Map Number	CSO Name
1	HARROGATE NORTH/STW/6XDWF OVERFLOW
2	HARROGATE NORTH/STW/3XDWF OVERFLOW
3	SKIPTON ROAD 109/CSO
4	SKIPTON ROAD 83/CSO
5	SKIPTON ROAD 33/CSO
6	UNITY GROVE/CSO
7	SKIPTON ROAD 179/CSO
8	JENNY PLAIN BRIDGE/CSO
9	CAMBRIDGE STREET/CSO
10	KINGS ROAD/CSO
11	HOTEL MAJESTIC/CSO
12	STRAWBERRY DALE/CSO
13	HYDE PARK ROAD/CSO
14	CHUDLEIGH ROAD/CSO
15	MONTPELLIER RD27/CSO
16	ALBERT STREET/CSO
17	WEST PARK /CSO
18	COLD BATH ROAD/CSO
19	ST MARYS WALK 112/CSO
20	ST MARYS WALK 29/CSO
21	OAKDALE HARROGATE/CSO
22	OAKDALE AVENUE/CSO

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

The Gustard[8] 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 re-naturalised. Where those abstractions or discharges are YWSL then daily data have been used in the re-naturalisation. For all other identified abstractions or discharges the permitted value has been used in the re-naturalisation. Flow modifications in the catchment of the Assessment Point (AP) are treated similarly. This then provides the following equation:

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

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

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

- Burn 1
- Laver 1

The data used for the transposition approach in each of these reaches is set out below.

Burn 1

Due to data limitations, specifically for the YWSL River Burn/Birk Gill/Spruce Gill intakes, the flow transposition has been restricted to the period 2009-2024

Aspect	Point	Data source
Donor gauge	Ure at Kilgram Bridge	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for naturalisation	90.7Ml/d	Derived from EA dataset for the 1990-2024 period
Naturalisation of donor gauge	• YWSL Ure at Kilgram Bridge intake added to flow series	• YWSL daily abstraction data

[8] 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.

Naturalisation of recipient AP scaling	• Leighton Reservoir catchment removed from flow scaling	• FEH
Post processing of recipient AP (flow)	• YWSL River Burn/Birk Gill/Spruce Gill intakes and catchwaters, located upstream of the Pott Beck confluence removed to flow series • Leighton 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[9] as listed below:

	Area km^2	SAAR mm	SPR-HOST	BFI-HOST
Donor gauge	510.2	1337	46.9	0.386
Naturalised donor gauge	No adjustment of catchment descriptors			
Recipient AP (raw)	60.6	1098	50.8	0.328
Naturalised recipient AP	22.6	1092	52.2	0.294

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
0.067	0.065

Laver 1

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

Aspect	Point	Data source
Donor gauge	Ripon Laver Weir	EA daily mean flow
Summer Q95 at donor gauge for identifying abstractions/ discharges for naturalisation	8.6Ml/d	Derived from EA dataset for the 1990-2024 period
Naturalisation of donor gauge	• Lumley Moor Reservoir catchment removed from flow scaling • Lumley Moor Reservoir outflow removed from flow series	• YWSL daily flow and level data • FEH
Naturalisation of recipient AP scaling	• Lumley Moor Reservoir catchment removed from flow scaling	• FEH
Post processing of recipient AP (flow)	• Lumley Moor Reservoir outflow added to flow series	• 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	87.5	912	39.8	0.420
Naturalised donor gauge	85.1	911	39.8	0.420
Recipient AP (raw)	43.1	987	42.6	0.380

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

Naturalised recipient AP	40.7	989	42.8	0.378

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
0.430	0.558

APPENDIX B – ENVIRONMENTAL RECEPTORS

B1 INTRODUCTION

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

The North Area Reservoirs comprise five drought options as reported in this appendix:

1. Leighton Reservoir drought permit
2. Lumley Moor Reservoir drought permit
3. Haverah Park Reservoirs drought permit
4. Thruscross Reservoir drought permit
5. Lindley Wood Reservoir drought permit

Details regarding the approaches/methodologies used for assessing susceptibility and sensitivity to drought management actions and the assessment of the impacts associated with drought management actions are presented in Sections 3.6 and 3.7 of Yorkshire Water (YWSL)'s Drought Plan 2027 Environmental Assessment Methodology[1].

The environmental conditions 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 figures are those which were agreed with the Environment Agency (EA) having water dependent receptors.

This appendix is set out in the following sections:

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

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

Section B.3 Environmental 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 Environmental Receptors Assessment Summary.

Section B.6 Monitoring and mitigation.

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

[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 2027 Environmental Assessment Methodology[2].

B2.1 POTT BECK 1

B2.1.1 Statutory designated sites

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

No statutory designated sites that are sensitive or susceptible to drought permit impacts have been identified for detailed assessment (see **Table B2-1**).

Table B2-1: Statutory designated sites

Site/Receptor and designation	**Hydrological Impact at Location** *(Major, Moderate, Minor, Negligible)*	**Susceptibility to flow and level impacts**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*	**Further Consideration Required** *(Y/N)*
East Nidderdale Moors SSSI	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
North Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
North Pennine Moors SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No

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

B2.1.2 NERC and Local Wildlife Sites

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

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

Table B2-2: NERC habitats and local wildlife sites

Site/Receptor and designation	Hydrological Impact at Location *(Major, Moderate, Minor, Negligible)*	Susceptibility to flow and level impacts	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*	Further Consideration Required *(Y/N)*
Leighton and Roundhill Reservoirs LWS	Major	The site contains a reservoir on acid sandstone surrounded by acid grassland with patches of oak/birch woodland and also marshy grassland, as well as large tracts of bracken. The site is located upstream of the impacted reach.	Not sensitive	No
NERC habitat-Lowland fens -412219	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. *Filipendula ulmaria–Angelica sylvestris mire, Typha latifolia* swamp*, Glyceria fluitans* water-margin vegetation.	Not sensitive	No

B2.1.3 NERC and other protected species

Table B2-4 summarises the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

Five nationally scarce macroinvertebrate species (see **Table B2-3**) were observed in sampling carried out by the EA and additional YWSL commissioned surveys at the site Leighton (ID 465) between 2010 and 2022. Based on the available information these receptors are considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

Table B2-3: Notable Macroinvertebrate Species Designations

Species name	Conservation status	Reporting category	Conservation status - designation description
Ameletus inopinatus	Nationally scarce	Rare and scarce species (not based on IUCN criteria)	Occurring in 16-100 hectares in Great Britain.
Atherix ibis			
Potamophylax rotundipennis			
Riolus subviolaceus			
Stagnicola palustris/fuscus/corvus			

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 EA and a review of available data from NBN gateway was used to inform the assessment of the receptor in the impacted reach. The data shows no surveys or records have been recorded in the impacted reach. Additionally, white-clawed crayfish surveys carried out by Arup in 2016 (in Pott Beck 1) found no evidence of white-clawed crayfish, however, it is not possible to conclusively rule out their presence. Invasive signal crayfish have been observed within the catchment, so it

is likely that native, white-clawed crayfish will be outcompeted in the catchment. However, discussions with the EA, during the preparation of the 2019 environmental assessments identified that the receptor is present downstream of Leighton Reservoir and macroinvertebrate sampling commissioned by YWSL in 2021 recorded sighting of one individual. Based on the available information this receptor is considered to be susceptible to drought permit impacts and have a **medium**sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-4 identifies the potential for impacts upon otter and water vole in Pott Beck 1, which were identified in the NERC Act Section 41 as species of principal importance. Review of EA records indicated otter were not recorded within Pott Beck 1. However, no information from survey findings is available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit.

Review of EA records indicated water vole were not recorded within the Pott Beck 1. Therefore, absence cannot be confirmed. It is 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 available information these species are considered not to be susceptible to drought permit impacts and have a **low** 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 two notable fish species (bullhead, brook lamprey), and a **high** sensitivity has been identified. Baseline data for these species is detailed in **Section B2.1.4.2**.

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 permit impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Table B2-4: 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* *Ameletus inopinatus* *Potamophylax rotundipennis* *Riolus subviolaceus* *Stagnicola palustris/fuscus/corvus*	Major	Species associated with fast-flowing water, therefore potentially susceptible to drought option impacts. However, they are relatively tolerant of short-term fluctuations in water levels or flow, as their preferred habitats are naturally dynamic. Low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only) and may therefore not markedly detract from the quality of the supporting environment.	Medium	Yes
NERC Species – Crustacea White-clawed crayfish (*Austropotamobius pallipes*)	Major	White-clawed crayfish are sensitive to habitat modification from the management of waterbodies. Therefore, they are considered to be sensitive to hydrological impacts, particularly low flows.	Medium	Yes
NERC Species – Mammals Otter (*Lutra lutra*)	Major	Otters are known to use the reaches downstream. However, they are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought	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)*
NERC Species – Mammals Water vole (*Arvicola amphibious*)	Major	Water vole are known to use the reaches downstream. 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.	Low	Yes
NERC Species – Fish - Brown trout (*Salmo trutta*) - River lamprey (*Lampetra fluviatilis*) - European eel *(Anguilla anguilla)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. 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	High	Yes
Notable Species – Fish -Bullhead (*Cottus gobio*) -Brook lamprey (*Lampetra planeri*)	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. 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	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 severely impacted by 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 (*Hirund rustica*) - Willow tit (*Parus montanus*) - Little Ringed Plover Bird (*Charadrius dutius*) - Redshank (*Tringa tetanus*) - Snipe (*Gallinago gallinago*) - Dipper (*Cinclus cinclus*)	Low	No

B2.1.4 WFD receptors

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

B2.1.4.1 Macroinvertebrates

The WFD waterbody GB104027069270 Leighton Beck from Source to River Burn River is classified as 'good' for macroinvertebrates in 2022, Cycle 3. WFD classification was based on the EA monitoring site ID 465. Baseline macroinvertebrate data is provided by one EA monitoring site, and one site commissioned by Yorkshire Water (YWSL) (**Table B2-7**).

EA site Leighton (ID 465) had baseline survey data for two seasonal (spring and autumn) samples for 2010, 2012-2021 and 2023. Additionally, YWSL commissioned this site to be monitored in spring and summer 2020, spring and autumn 2021, spring, summer, and autumn 2022, as well as spring and autumn 2023.

YWSL site, River Burn Confluence (ID 80) had baseline survey data for six surveys between 2020 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 ranged between 'Moderate' on two occurrences to 'High' on thirteen occurrences. See **Table B2-5** for guidance in interpreting EQR scores for WHPT WFD classification.

Table B2-5: 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		

RICT3 analysis was successfully calculated for Site 465; however, no physical environmental data (such as river depth, width, alkalinity or sediment composition) was available for Site 80. As a result, site-specific EQR values could not be calculated using RICT3 for that site. RICT requires specific environmental parameters to model expected macroinvertebrate community responses under various conditions. Without these key environmental factors, it is not possible to generate accurate EQR predictions or classify the ecological status of the sites using RICT3, limiting the ability to fully assess the observed ecological conditions relative to reference conditions.

Since Site 80 is without physical environmental data, Site 465 is used as a proxy for EQR scores. Though EQR values are presented for these sites, it should be noted that they will likely have reduced confidence, affecting the accuracy of the final classifications.

$WHPT_{ASPT}$ scores ranged between 5.82 - 7.94 with the lowest $WHPT_{ASPT}$ score of 5.82 at Site 465 in Autumn 2021, and the highest score of 7.94 at Site 80 in Spring 2021. $WHPT_{ASPT}$ EQR scores ranged between 0.8 - 1.06 with the lowest $WHPT_{ASPT}$ EQR of 0.8 at Site 465 in Autumn 2021, and the highest EQR of 1.06 at Site 80 in Spring 2021.

The macroinvertebrate community significantly varies in terms of diversity. $WHPT_{NTAXA}$ scores ranged between 13 - 33 with the lowest $WHPT_{NTAXA}$ score of 13 at Site 465 in Autumn 2021, and the highest score of 33 at Site 465 in Spring 2017. $WHPT_{NTAXA}$ EQR scores ranged between 0.62 - 1.57 with the lowest $WHPT_{NTAXA}$ EQR of 0.62 at Site 465 in Autumn 2021, and the highest EQR of 1.57 at Site 465 in Autumn 2018. This suggests that pressures which impair macroinvertebrate diversity such as habitat loss or/and low or high flows may influence the baseline community, specifically, immediately downstream of the reservoir where diversity is most variable.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. See **Table B2-6** for guidance in interpreting raw LIFE scores.

Table B2-6: LIFE score sensitivities

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

$LIFE_{FAMILY}$ scores ranged between 6.84 - 8.18 with the lowest $LIFE_{FAMILY}$ score of 6.84 at Site 465 in Autumn 2023, and the highest score of 8.18 at Site 80 in Spring 2021. $LIFE_{FAMILY}$ EQR scores ranged between 0.87 - 1.04 with the lowest $LIFE_{FAMILY}$ EQR of 0.87 at Site 465 in Autumn 2023, and the highest EQR of 1.04 at Site 80 in Spring 2021. Baseline data indicates that under present conditions, the macroinvertebrate community in Pott Beck 1 is highly sensitive to reduced flows (**Figure B2-1**).

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 51.06 - 90.3 with the lowest PSI_{FAMILY} score of 51.06 at Site 465 in Autumn 2023, and the highest score of 90.3 at Site 465 in Summer 2020. PSI_{FAMILY} EQR scores ranged between 0.67 - 1.2 with the lowest PSI_{FAMILY} EQR of 0.67 at Site 465 in Autumn 2023, and the highest EQR of 1.2 at Site 465 in Summer 2020.

No taxa data was available for samples taken at Site ID 80. However, three INNS including *Potamopyrgus antipodarum*, *Crangonyx pseudogracilis/floridanus* and *Crangonyx pseudogracilis* were recorded as present at Site 465 between 2010 to 2023. A total of five designated/protected species, including *Atherix ibis*, *Riolus subviolaceus, Potamophylax rotundipennis*, *Ameletus inopinatus* and *Austropotamobius pallipes* were recorded as present at Site 465 between 2010 to 2022.

Summary

The WFD status of the macroinvertebrate community in Pott Beck 1 may be impacted by the implementation of this drought permit. However, low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only), and therefore impacts of the drought permit must be considered in the context of environmental drought.

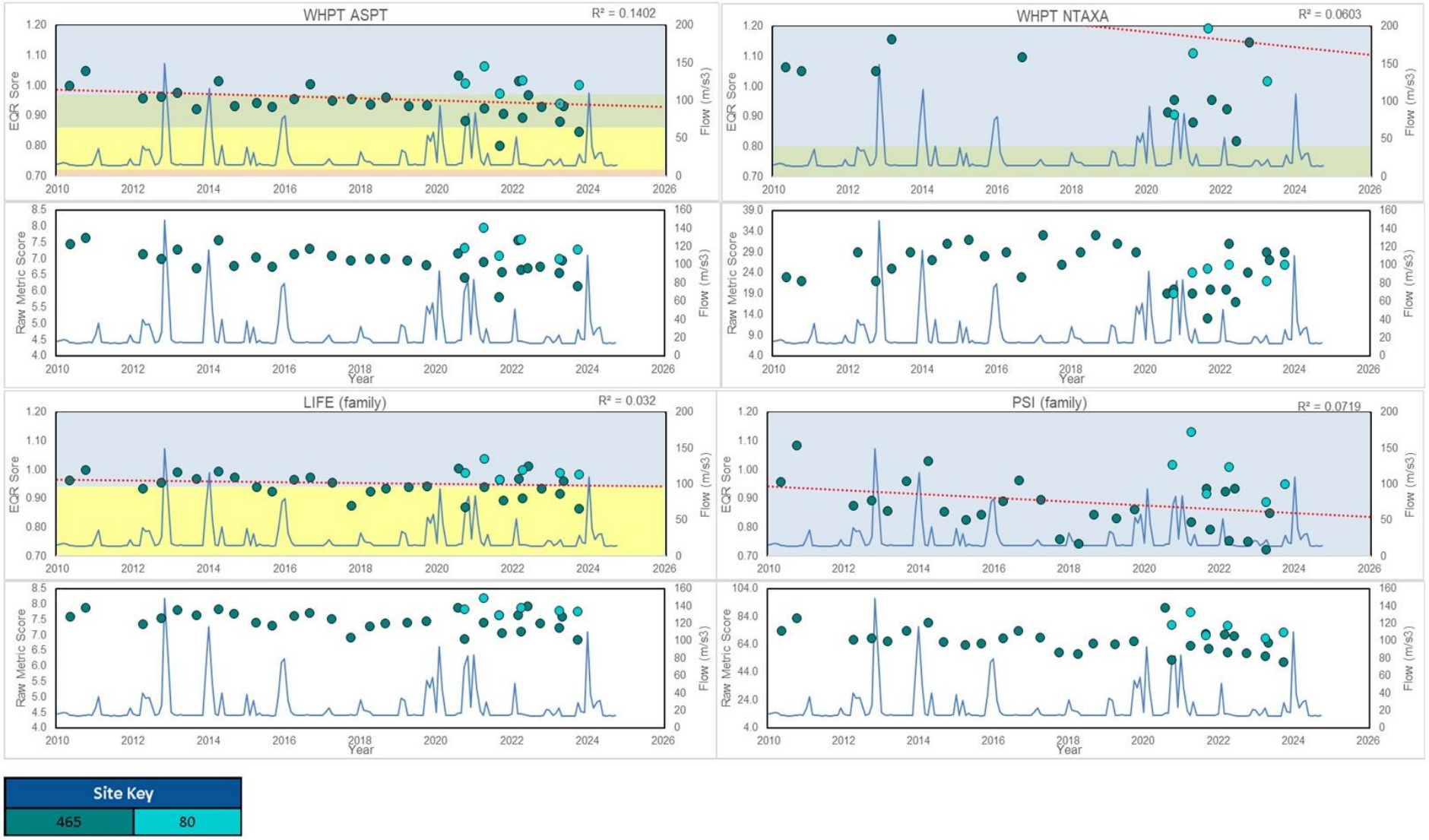
A summary of the above data is presented within **Table B2-7**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-7: Macroinvertebrate Observed and EQR Summary

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{FAMILY}$ EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
465	SE1663679311	33	2010 to 2023	0.87 - 1.01 (0.94)	6.84 - 7.93 (7.44)	0.67 - 1.2 (0.86)	51.06 - 90.3 (66.04)	0.8 - 1.05 (0.94)	M - H (G)	5.82 - 7.63 (6.93)	0.62 - 1.57 (1.19)	M - H (H)	13 - 33 (25)
80	SE1699279668	6	2020 to 2023	0.97 - 1.04 (0.99)	7.64 - 8.18 (7.85)	0.89 - 1.13 (0.98)	68.29 - 86.96 (75.59)	0.94 - 1.06 (1)	G - H (H)	7 - 7.94 (7.37)	0.91 - 1.24 (1.11)	H - H (H)	19 - 26 (24)

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

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



B2.1.4.2 Fish

Waterbody GB104027069270 Leighton Beck from source to River Burn is classified under Cycle 3 (2022) as moderate. This classification is informed by one site in Pott Beck 1; Leighton Beck / Pott Beck, Leighton (ID 26601) surveyed in 2013.

Baseline fish assessment information for the Pott Beck 1 reach is provided by a total of seven sites. Three EA Sites; Leighton Beck/ Pott Beck (ID 26601), WR PB4 (ID 69143) and WR PB5 (ID 69163) and four Yorkshire Water commissioned surveys at additional sites; PB1, PB2, PB3, and PB6. **Table B2-8** sets out the site and survey information for these sites.

As site 26601 has been surveyed only once, it cannot inform long-term trends in fish assemblages. However, it is used here to inform species presence/ absence in the reach. Species presence for all sites is presented in **Table B2-9**.

Species presence and distribution across the EA WFD monitoring sites can be used to provide a classification of community environmental preferences and therefore sensitivity to potential environmental pressures associated with the drought options. **Table B2-9** provides a summary of species presence and distribution across monitoring points, ranked according to species tolerance of environmental disturbance, as defined by the Fisheries Classification Scheme (FCS2)[3] used in WFD classifications for the fish biological quality element. The community sensitivity can broadly be defined by the most sensitive of the fish taxa present (i.e. those with the lowest tolerance of environmental disturbance).

The site Leighton Beck / Pott Beck is individually classified as moderate with a site EQR of 0.3444, based on the FCS2 EQR scores from the 2013 survey. The site has a relatively low diversity, with only two species present from an expected four species. EQR scores for brown trout[4] and bullhead are high, at 0.7503 and 1, respectively. Salmon are not observed in this reach, although they are expected to be present. The species had a high expected prevalence, although the EQR value of 0.3787 is the lowest of all species for this site, which has a significant overall effect on the site EQR value. The absence of stone loach also influences the site EQR as they have an expected prevalence greater than 50%. Although this reduces the EQR, it is not enough to influence the classification not achieving good status.

Additional baseline fish data for Pott Beck 1 from YWSL sites PB1, PB2, PB3 and PB6 showed similar species diversity with the reach. The surveys confirm a relatively stable fish community, with brown trout being the most frequently recorded species across all survey years. The number of brown trout was comparable across most survey sites and years, with the largest catch in 2018 at site 69163.

Additionally, bullhead was recorded in every survey season, with the highest count of 181 at Site PB1 in 2021.

Low numbers of European eel and lamprey sp. were observed across the 2018 and 2021 surveys. River lamprey are seen to be present across the reach, while two ruffe were observed in 2021 at site PB2.

One non-native species (NNS), a single rainbow trout was recorded during the 2019 survey at site PB2. Leighton Reservoir upstream of the impacted reach is stocked with rainbow trout from the nearby Swinton Trout Farm.

All fish counts are available in **Annex 1** to this appendix. The impacts to the bullhead, brown trout, lamprey sp.[5] and European eel populations of the waterbody are detailed in **Section B4.1.1.1.**

[3] UKTAG (2008) Rivers Assessment Methods Fish Fauna (Fisheries Classification Scheme 2 (FCS2)) ISBN:978-1-906934-09-5

[4] 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.

[5] Lamprey ammocetes recorded during surveys were not always identified to species level due to the inherent difficulty of distinguishing between river and brook lamprey in the field. Therefore, unless additional information on barriers or habitat suitability is available to indicate otherwise, it is assumed that both river (*Lampetra fluviatilis*) and brook lamprey *(Lampetra planeri*) are present.

Summary

Overall, the surveys indicate that Pott Beck 1 supports a stable fish community dominated by brown trout and bullhead, despite some species being observed at lower densities compared to the expected densities. The WFD status of the fish community in Pott Beck 1 may be impacted by drought permit implementation. However, low flow impacts of the Leighton Reservoir 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.

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 B2-8: Fish survey site information

Site ID	Site Name	Survey NGR	Survey Method	Survey Count	Min Survey Year	Max Survey Year
26601	Leighton Beck / Pott Beck, Leighton	SE1662379285	Electric Fishing (AC, PDC and DC)	1	2013	2013
69143	WR PB4	SE1671179588	Electric Fishing (AC, PDC and DC)	5	2017	2021
69163	WR PB5	SE1682979589	Electric Fishing (AC, PDC and DC)	5	2017	2021
PB1	d/s Reservoir outfall	SE1661079242	Electric Fishing (AC, PDC and DC)	5	2017	2021
PB2	d/s footbridge on bend	SE1664279351	Electric Fishing (AC, PDC and DC)	5	2017	2021
PB3	corner of opening	SE1654479464	Electric Fishing (AC, PDC and DC)	5	2017	2021
PB6	d/s Island	SE1686979597	Electric Fishing (AC, PDC and DC)	5	2017	2021

Table B2-9: Fish survey results

Tolerance Category[6]	Species Name	2013	2017	2018	2019	2020	2021
High tolerance	European eel				X	X	X
Medium tolerance	Ruffe						X
Low tolerance	Brown trout	X	X	X	X	X	X
Low tolerance	Bullhead	X	X	X	X	X	X
Low tolerance	Lamprey sp.			X	X	X	
Low tolerance	River lamprey				X		X
Low tolerance	Rainbow trout				X		

B2.1.4.3 WFD waterbody status

Table B2-10 summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-10** also displays the objective status for 2027 (Cycle 3) or the predicted status in 2027 where the objective has met good status in 2022. This is displayed for overall, fish and macroinvertebrate elements

[6] Cowx, I.G., Noble, R.A.A., Nunn, A.D., Harvey, J.P., Welcomme, R.L., & Halls, A.S. (2004). Flow and Level Criteria for Coarse Fish and Conservation Species (Science Report SC020112/SR). Bristol, UK: Environment Agency.

and provides a comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-10: WFD classifications

Waterbody ID & Name		**GB104027069270 Leighton Beck**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (*Major, Moderate, Minor, Negligible*)		Major	
WFD Cycle 3 (2022) Status	Overall	Moderate	
	Fish	Moderate	Medium
	Macroinvertebrates	Good	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Moderate	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.1.5 Invasive non-native species (INNS)

Table B2-11 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, as per the UKTAG INNS Alarm List[7] (see **Table B2-11**).

Table B2-11: 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 Signal Crayfish (*Pacifastacus leniusculus*) Northern Crangonyctid (*Crangonyx pseudogracilis*) New Zealand mud snail (*Potamopyrgus antipodarum*)	Major	The implementation of this drought permit is not anticipated to increase the spread of invasive non-native species.	Low	No
INNS – Terrestrial and Aquatic plants Himalayan balsam (*Impatiens glandulifera)* Japanese knotweed *(Fallopia japonica)*	Major	The implementation of this drought permit is not anticipated to increase the spread of invasive non-native species.	Not sensitive	No

[7] 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)*
Canadian pondweed *(Elodea canandensis)*				
Non-native Species – Fish Rainbow trout (*Oncorhynchus mykiss*)	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 B2-12 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 B2-12**).

Table B2-12: 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)*
Nidderdale National Landscape	Minor	The National Landscape comprises certain water dependent habitats which depending on their location will have taken into account through consideration of Statutory designated sites	Not sensitive	No
Earthwork in Magdalen Field –Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Deserted Medieval Village, East Tanfield – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Marmion Tower (former gatehouse of Tanfield Castle fortified manor)	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Tanfield Bridge	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Hutton Hall – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Henge Monument 300m north of Nunwick – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Masham Golf Course	Major	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Ripon City Golf Course	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Ripon Rowel Walk – National Trail	Major	The route of the trail runs alongside the River Ure. The river forms a major part the landscape setting of the trail.	Not sensitive	No
Camp/Caravan Site, West Tanfield	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Camp/Caravan Site, Hutton Conyers	Minor	Unlikely to be impacted over the duration of the	Not sensitive	No

Site/Receptor and designation	**Hydrological Impact at Location** *(Major, Moderate, Minor, Negligible)*	**Susceptibility to flow and level impacts**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*	**Further Consideration Required** *(Y/N)*
		drought options implementation		
Angling on River Burn	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

B2.2 BURN 1

B2.2.1 Statutory designated sites

Table B2-13 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 B2-13**).

Table B2-13: 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)*
East Nidderdale Moors SSSI	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
North Pennine Moors SAC	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No
North Pennine Moors SPA	Major	None. The Moors are upstream of the impacted reach. The gradients between the moor and the valley are sufficiently steep that there would be no hydrodynamic connectivity between channel and the moor, particularly during dry conditions.	Not sensitive	No

B2.2.2 NERC and local wildlife sites

Table B2-14 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 B2-14**).

Table B2-14: 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)*
Leighton and Roundhill Reservoirs LWS	Major	The site contains a reservoir on acid sandstone surrounded by acid grassland with patches of oak/birch woodland and also marshy grassland, as well as large tracts of bracken. Site is located upstream of impacted reach.	Not sensitive	No
NERC habitat-Deciduous woodland -228376 -229820 -230457 -231314 -232349 -233109 -234377 -233546	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

B2.2.3 NERC and other protected species

Table B2-16 summarises the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

Two nationally scarce macroinvertebrate species were observed in sampling carried out by the EA and additional YWSL commissioned surveys across all three macroinvertebrate survey sites between 2013 and 2024 (**Table B2-15**). Based on the available information these receptors are not 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: Notable Macroinvertebrate Species Designations

Species name	Conservation status	Reporting category	Conservation status - designation description
Atherix ibis	Nationally scarce	Rare and scarce species (not based on IUCN criteria)	Occurring in 16-100 hectares in Great Britain.
Capnia atra	Nationally scarce	Rare and scarce species (not based on IUCN criteria)	Occurring in 16-100 hectares in Great Britain.

White-clawed crayfish are sensitive to habitat modification from the management of waterbodies. Data obtained from the EA and a review of available data from NBN gateway is used inform the assessment of the receptor in the impacted reach. The data shows no surveys or records have been recorded in the impacted reach. Discussions with the EA have identified that the receptor is present downstream of Leighton Reservoir. As the presence of the receptor cannot be ruled out within the impacted reach, a precautionary approach has

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

Table B2-16 identifies the potential for impacts associated with drought option implementation upon otter and water vole, which is identified in the NERC Act Section 41 as a species of principal importance.

Review of EA records indicated otter were recorded within the impacted reach. However, no information from survey findings is available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the available information these species are considered not to be susceptible to drought permit impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Review of EA records indicate water vole were not recorded within the impacted reach. However, the distribution of information and survey data for the species is considered to be limited. Therefore, absence cannot be confirmed. It is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the limited available information this receptor is considered to be susceptible to drought permit impacts and have a **low** 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 four NERC Act Section 41 fish species (Atlantic salmon, brown trout, river lamprey and European eel) and two notable fish species (bullhead and brook lamprey). Baseline data for these species is detailed in **Section B2.2.4.2**. As discussed in the sections below, the species richness and densities are as expected for the reach and the fish community is considered susceptible to drought permit impacts and a **high** sensitivity has been identified.

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 permit impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Table B2-16: 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 - *Atherix ibis* - *Capnia atra*	Major	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)*	Major	White-clawed crayfish are sensitive to habitat modification from the management of waterbodies. Therefore, they are considered to be sensitive to hydrological impacts, particularly low flows.	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 – mammals Otter *(Lutra lutra)*	Major	Otters may potentially use the impacted reach. The home ranges of otter can extend over tens of kilometres. However, they are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought.	Low	Yes
NERC Species – mammals Water vole (*Arvicola amphibious)*	Major	Water vole are known to use the reaches downstream. 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.	Low	Yes
NERC Species – Fish - Atlantic salmon (*Salmo salar)* - Brown Trout (*Salmo trutta)* -River lamprey *(Lampetra fluviatilis)* -European eel *(Anguilla anguilla)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. 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	High	Yes
Notable Species – Fish -Bullhead (*Cottus gobio)* -Brook lamprey *(Lampetra planeri)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. 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	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 severely impacted by 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 (*Hirund rustica)* - Willow tit (*Parus montanus)* - Little Ringed Plover Bird (*Charadrius dutius)* - Redshank (*Tringa tetanus)* - Snipe (*Gallinago gallinago)* - Dipper *(Cinclus cinclus)*	Low	No

B2.2.4 WFD receptors

The sensitivity analysis has considered the relationship between macroinvertebrate and/or fish communities and the supporting environmental variables over the baseline period. **Table B2-20** below summarises of the RBMP Cycle 2 Status/ Potential of the WFD waterbody, including WFD receptors for fish and macroinvertebrates. The purpose of the analysis is to establish whether biological metrics/indices respond inter-annually to changes in flow and associated environmental variables including habitat quality and availability.

B2.2.4.1 Macroinvertebrates

The WFD waterbody GB104027069310 Burn from Leighton Beck to River Ure is classified as 'high' for macroinvertebrates in 2022, Cycle 3. WFD classification was based on the EA monitoring site ID 53 surveyed in 2019. Baseline macroinvertebrate data is provided by three EA monitoring sites (**Table B2-17**).

At EA Site Healey (ID 623), baseline surveys were conducted in 2010, 2013, and 2016-2018, with YWSL surveys supplementing data from 2020 to 2024. EA Site 184129 was surveyed in 2016 and 2018, while EA Site 53 was surveyed in 2013 and 2016-2018, with additional YWSL surveys in 2021 and 2024. These sites provide strong temporal coverage within the baseline period, enabling the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors.

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

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Moderate' on two occurrences to 'High' on thirty occurrences. See **Table B2-5** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was successfully calculated for all sites.

$WHPT_{ASPT}$ scores ranged between 6.33 - 7.88 with the lowest $WHPT_{ASPT}$ score of 6.33 at Site 53 in Spring 2021, and the highest score of 7.88 at Site 623 in Autumn 2021. The $WHPT_{ASPT}$ expected scores ranged between 6.65 to 7.19 across the sites, with all samples above the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.89 - 1.19 with the lowest $WHPT_{ASPT}$ EQR of 0.89 at Site 53 in Spring 2021, and the highest EQR of 1.19 at Site 623 in Autumn 2021.

The macroinvertebrate community significantly varies in terms of diversity. $WHPT_{NTAXA}$ scores ranged between 14 - 39 with the lowest $WHPT_{NTAXA}$ score of 14 at Site 623 in Spring 2021, and the highest score of 39 at Site 53 in Spring 2016. The $WHPT_{NTAXA}$ expected scores ranged between 22.04 to 24.78 across the sites, with 2 of the 34 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.58 - 1.63 with the lowest $WHPT_{NTAXA}$ EQR of 0.58 at Site 623 in Spring 2021, and the highest EQR of 1.63 at Site 53 in Autumn 2017.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. $LIFE_{FAMILY}$ scores ranged between 7.4 - 8.5 with the lowest $LIFE_{FAMILY}$ score of 7.4 at Site 53 in Autumn 2017, and the highest score of 8.5 at Site 53 in Spring 2013. The expected scores ranged between 7.59 to 7.83 across the sites, with all samples above the 'Good/Moderate boundary'. $LIFE_{FAMILY}$ EQR scores ranged between 0.96 - 1.09with the lowest $LIFE_{FAMILY}$ EQR of 0.96 at Site 53 in Spring 2018, and the highest EQR of 1.09 at Site 53 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 60 - 89.7 with the lowest PSI_{FAMILY} score of 60 at Site 53 in Spring 2021, and the highest score of 89.7 at Site 623 in Autumn 2021. The PSI_{FAMILY} expected scores ranged between 66.51 to 73.27 across the sites, with 9 of the 34 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.83 - 1.35 with the lowest PSI_{FAMILY} EQR of 0.83 at Site 53 in Spring 2021, and the highest EQR of 1.35 at Site 623 in Autumn 2021.

One invasive, non-native species the New Zealand Mud snail *Potamopyrgus antipodarum,* was recorded as present at all three sites between 2013 and 2024. Two notable species, *Atherix ibis* and *Capnia atra* were recorded as present between 2013 and 2024.

Summary

The WFD status of the macroinvertebrate community in Burn 1 may be impacted by the implementation of this drought permit. However, low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only), and therefore impacts of the drought permit must be considered in the context of environmental drought.

Baseline data indicates that under present conditions, the macroinvertebrate community in Burn 1 is highly sensitive to reduced flows (**Figure B2-2**). See **Table B2-6** for guidance in interpreting raw LIFE scores. $WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for all sites, see **Figure B2-2**.

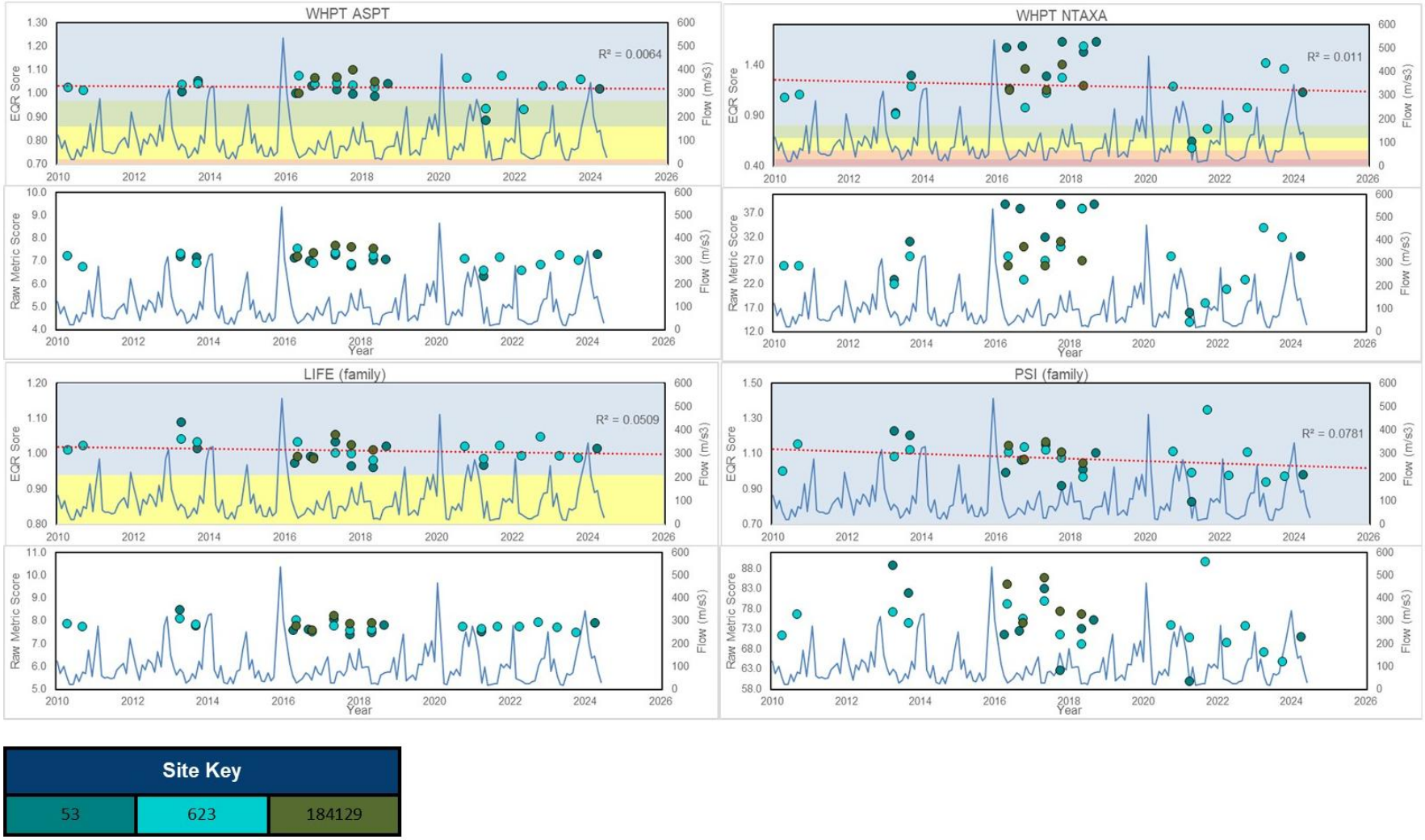
A summary of the above data is presented within **Table B2-17**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-17: Macroinvertebrate Observed and Expected Indices Summary

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{FAMILY}$ EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
623	SE1867780114	19	2010 to 2023	0.98 - 1.08 (1.02)	7.5 - 8.19 (7.82)	0.94 - 1.35 (1.09)	64.91 - 89.7 (75.09)	0.93 - 1.19 (1.04)	G - H (H)	6.58 - 7.88 (7.16)	0.58 - 1.59 (1.12)	M - H (H)	14 - 38 (27)
184129	SE2073980275	5	2016 to 2018	0.99 - 1.05 (1.01)	7.58 - 8.25 (7.88)	1.05 - 1.17 (1.11)	74.47 - 85.71 (79.67)	1 - 1.1 (1.06)	H - H (H)	7.2 - 7.69 (7.49)	1.15 - 1.41 (1.25)	H - H (H)	26 - 31 (28)
53	SE2252279895	10	2013 to 2024	0.96 - 1.09 (1)	7.4 - 8.5 (7.78)	0.83 - 1.23 (1.05)	60 - 88.89 (74.01)	0.89 - 1.05 (1.01)	G - H (H)	6.33 - 7.29 (7.03)	0.65 - 1.63 (1.32)	M - H (H)	16 - 39 (32)

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

Figure B2-2: Macroinvertebrate EQR scores (Top) and observed scores (Bottom) for WHPTNTAXA, WHPTASPT, LIFE$_{FAMILY}$ and PSI$_{FAMILY}$ scores



B2.2.4.2 Fish

The WFD waterbody (GB104027069310) Burn from Leighton Beck to River Ure classified as 'good' for fish in 2022, Cycle 3. The classification for this waterbody was informed by one site, Shaw's Farm, based on the 2021 survey.

Baseline Fish assessment information for the reach is provided by five sites: Shaw's Farm (ID 7065), Badger Farm (ID 26597), Badger Farm (new) (ID 51843), R. Burn U/S Fish Farm Weir (ID 68303) and R. Burn D/S Rigg Bank (ID 68084). **Table B2-18** sets out the site and survey information for these sites.

EA Site 7065 had baseline survey data from 2010 to 2013, 2016 to 2018, and 2021, with a YWSL-commissioned supplementary survey in 2024. EA Sites 51843 and 26597 were both surveyed only in 2013, while EA Site 68303 had baseline surveys from 2016 to 2018, supplemented by YWSL surveys in 2021 and 2024. Similarly, EA Site 68304 had baseline survey data from 2016 to 2018, with a YWSL-commissioned supplementary survey in 2024.

Shaw's Farm was individually classified as Good in 2022, based on survey data collected in 2021. At the time of reporting, no EQR data was available for this site, however, the previous assessment in 2019 recorded an EQR of 0.236.

Badger Farm (New) classified as poor with a EQR score of 0.1432, based on a surveyed completed in 2013. Four species of fish were present, with six predicted by FCS2, indicating a moderate species richness. Salmon was present at this site, although in lower densities than expected, and an EQR score of 0.603. Trout were present at the site in similar densities to expected, with a low number of European eel (3 individuals) recorded at the site.

All sites within the reach showed similar species diversity (see **Table B2-19**).

Atlantic salmon have been recorded across all sites. Surveys from 2016 to 2018 at Shaw's Farm (ID 7065), R. Burn U/S Fish Farm Weir (ID 68303) and R. Burn D/S Rigg Bank (ID 68084) showed that there was a decrease in the number of Atlantic salmon caught in 2016, but the subsequent survey in 2018 showed increased numbers when compared to 2010 to 2013 surveys. However, numbers reduced in the 2021 and 2024 surveys. Lowest salmon catches are recorded at site 68303 (R. Burn U/S Fish Farm Weir), this is potentially due to difficulty navigating the barrier to movement the weir creates.

Brown trout were consistently recorded across all surveys, ranging from 22 to 144 fish, with the highest catch observed in 2024 at site 7065. Lowest observed catch at site 26597 in 2013 could be a result of a difference in survey strategy (see **Annex 1**).

Unidentifiable lamprey ammocoetes were recorded sporadically at site 7065 and 68304 (between 5 to9 individuals). Brook lamprey are present in the reach at varying densities, with a large number (68) recorded at site 68303 in 2024 as well as in small numbers at site 7065 and 68304 in 2016.

Additionally, European eel were recorded in small numbers across the reach (1-4 individuals) in from 2012-2021.

A number of other species have also been found sporadically in small numbers during the surveys including minnow, and stone loach. This drought option is not expected to have any detectable impact upon these species beyond their natural variation within the reach.

Full fish counts are available in **Annex 1** to this appendix.

Summary

Baseline data suggests that the fish communities of Burn 1 comprise of predominantly salmonid and lamprey species.

The WFD status of the fish community in Burn 1 may be impacted by drought permit implementation. However, low flow impacts of the Leighton Reservoir 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.

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 B2-18: Fish survey site information

Site ID	Site Name	Survey NGR	Survey Method	Survey Count	Min Survey Year	Max Survey Year
7065	River Burn (Shaws Farm)	SE2078480322	Electric Fishing (AC, PDC and DC)	9	2010	2024
26597	River Burn, Badger Farm	SE2259879856	Electric Fishing (AC, PDC and DC)	1	2013	2013
51843	Badger Farm (new)	SE2255879880	Electric Fishing (AC, PDC and DC)	1	2013	2013
68303	R. Burn U/S Fish Farm Weir	SE1760480096	Electric Fishing (AC, PDC and DC)	5	2016	2024
68304	R. Burn D/S Rigg Bank	SE1901580036	Electric Fishing (AC, PDC and DC)	4	2016	2021

Table B2-19: Fish survey results

Tolerance Category[6]	Species Name	2010	2011	2012	2013	2016	2017	2018	2021	2024
High tolerance	European eel			X	X	X	X	X	X	X
Medium tolerance	Stone loach				X				X	
Medium tolerance	Minnow				X					X
Low tolerance	Brown trout	X	X	X	X	X	X	X	X	X
Low tolerance	Bullhead	X	X	X	X	X	X	X	X	X
Low tolerance	Atlantic salmon	X	X	X	X	X	X	X	X	X
Low tolerance	Lamprey sp.			X				X	X	
Low tolerance	Brook lamprey					X				X

B2.2.4.3 WFD waterbody status

Table B2-20 summarises the WFD classifications of waterbodies which contain the impacted reach. **Table B2-20** also displays the objective status for 2027 (Cycle 3) or the predicted status in 2027 where the objective has met good status in 2022. This is displayed for overall, fish and macroinvertebrate elements and provides a comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-20: WFD classifications

Waterbody ID & Name		GB104027069310 River Burn	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location *(Major, Moderate, Minor, Neg)*		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Good	Medium
	Macroinvertebrates	High	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Good	
	Fish	Good	
	Macroinvertebrates	High	
Waterbody Measures		None	

B2.2.5 Invasive non-native species (INNS)

Table B2-21 summarises the INNS 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, as per the UKTAG INNS Alarm List [7] (see **Table B2-21**).

Table B2-21: 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 Signal Crayfish (*Pacifastacus leniusculus*) Northern Crangonyctid (*Crangonyx pseudogracilis*) New Zealand mud snail (*Potamopyrgus antipodarum*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Low	No
INNS – Terrestrial and Aquatic plants Himalayan balsam (*Impatiens glandulifera)* Japanese knotweed *(Fallopia japonica)* Canadian pondweed *(Elodea canandensis)*	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Non-Native Species – Fish Rainbow trout (*Oncorhynchus mykiss*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
INNS – Mammals American Mink *(Neovison vison)*	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.2.6 Landscape, navigation, recreation and heritage

Table B2-22 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 B2-22**).

Table B2-22: 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)*
Nidderdale National Landscape	Major	The National Landscape comprises certain water dependent habitats which depending on their location will have taken into account through consideration of Statutory designated sites	Not sensitive	No
Earthwork in Magdalen Field –Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Deserted Medieval Village, East Tanfield – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Marmion Tower (former gatehouse of Tanfield Castle fortified manor)	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Tanfield Bridge	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Hutton Hall – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Henge Monument 300m north of Nunwick – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Masham Golf Course	Major	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Ripon City Golf Course	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No

Site/Receptor and designation	**Hydrological Impact at Location** *(Major, Moderate, Minor, Negligible)*	**Susceptibility to flow and level impacts**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*	**Further Consideration Required** *(Y/N)*
Ripon Rowel Walk – National Trail	Major	The route of the trail runs alongside the River Ure. The river forms a major part the landscape setting of the trail.	Not sensitive	No
Camp/Caravan Site, West Tanfield	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Camp/Caravan Site, Hutton Conyers	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Angling on River Burn	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 HOLBORN BECK 1

B2.3.1 Statutory designated sites

Table B2-23 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 B2-23**).

Table B2-23: 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)*
Cow Myers SSSI	Major	The site is groundwater dependent. River flow/level will not affect the hydrology of the site.	Not sensitive	No
Hell Wath LNR	Major	No water dependent receptors	Not sensitive	No

B2.3.2 NERC and local wildlife sites

Table B2-24 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 B2-24**).

Table B2-24: 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)*
Lumley Moor Reservoir LWS	Major	A reservoir with well-developed littoral flora. Shoreweed extends from the muddy shore into the drawdown zone, which hosts a wide variety of other species. Charophytes are present. Two 'arms' of the reservoir host different vegetation communities to the main reservoir. Site is located upstream of impacted reach.	Not sensitive	No
Laver Banks Wood Complex LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. An area of woodland.	Not sensitive	No

Site/Receptor and designation	**Hydrological Impact at Location** *(Major, Moderate, Minor, Negligible)*	**Susceptibility to flow and level impacts**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*	**Further Consideration Required** *(Y/N)*
NERC habitat- Coastal and floodplain grazing marsh -39728	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Improved permanent grassland, *Phragmites australis* swamp and reed-beds, *Carex acutiformis* swamp, *Carex rostrata–Potentilla palustris* tall-herb fen	Not sensitive	No
NERC habitat- No main habitat but additional habitats present -453047	Major	Potential connectivity for additional habitat. *Lolium perenne–Cynosurus cristatus* grassland, *Phragmites australis* swamp and reed-beds, *Carex acutiformis* swamp, *Phalaris arundinacea* tall-herb fen	Low	No

B2.3.3 NERC and other protected species

Table B2-25 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

The IUCN Red List 'near threatened' species of water beetle *Graptodytes flavipes* has been historically identified as present in Holborn Beck 1. The species was identified during routine sampling carried out by the EA in 2006 at the site D/S Lumley Moor. One specimen was recorded. No further records of this species were noted in the catchment since the individual was observed in 2006. Based on the limited available information this receptor is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

White-clawed crayfish are sensitive to habitat modification from the management of waterbodies. Data obtained from the EA and a review of available data from NBN gateway is used inform the assessment of the receptor in the impacted reach. EA surveys from 2016 and 2018 identified the receptor with the impacted reach, downstream of Lumley Moor Reservoir. Based on the available information this receptor is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-25 identifies the potential for impacts associated with the drought option upon otter and water vole, which is identified in the NERC Act Section 41 as a species of principal importance.

Review of EA records indicate otter were not recorded within the impacted reach. However, no information from survey findings is available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the available information otter are considered not to be susceptible to drought permit impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Review of EA records indicate water vole were not recorded within the impacted reach. However, the distribution of information and survey data for the species is considered to be limited. Therefore, absence cannot be confirmed. It is 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 available information water vole are considered not 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), and a **medium** sensitivity has been identified.

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 permit impacts and have been assessed as **not sensitive** to the physical environment impacts identified in **Appendix A.**

Table B2-25: 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 – invertebrate *Graptodytes flavipes*	Major	Species associated with slow-flowing and standing waters	Medium	Yes
NERC Species – Crustacea White-clawed Crayfish (*Austropotamobius pallipes)*	Major	White-clawed crayfish are sensitive to habitat modification from the management of waterbodies. Therefore, they are considered to be sensitive to hydrological impacts, particularly low flows	Medium	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Major	Otters may potentially use the impacted reach. The home ranges of otter can extend over tens of kilometres. However, they are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought.	Low	Yes
NERC Species – mammals Water vole (*Arvicola amphibious)*	Major	Review of EA records indicate water vole were not recorded within 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. However, low flow impacts of drought option implementation would occur against	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)*
		a baseline of drought conditions (i.e. compensation flow only) and may therefore not markedly detract from the quality of the supporting environment.		
Notable Species – Fish -Bullhead *(Cottus gobio)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. 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.	Medium	No
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 severely impacted by 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 (*Hirund rustica*) - Willow tit (*Parus montanus*) - Little Ringed Plover (*Charadrius dutius*) - Redshank (*Tringa tetanus*) - Snipe (*Gallinago gallinago*) - Dipper (*Cinclus cinclus*)	Not sensitive	No

B2.3.4 WFD receptors

The sensitivity analysis has considered the relationship between macroinvertebrate and/or fish communities and the supporting environmental variables over the baseline period. **Table B2-29** below summarises of the RBMP Cycle 3 Status/ Potential of the WFD waterbody, including WFD receptors for fish and macroinvertebrates. The purpose of the analysis is to establish whether biological metrics/indices respond inter-annually to changes in flow and associated environmental variables including habitat quality and availability.

B2.3.4.1 Macroinvertebrates

The WFD waterbody **GB104027069190** Laver from Carlesmoor Beck to Kex Beck was classified as 'high' for invertebrates in 2022 under Cycle 3. This classification was based on sites 7066 and 49105108, both of which are located outside the impacted reach.

Baseline data was provided from one EA site, ID 77382 which was surveyed in 2010 and 2015. YWSL commissioned additional surveys at this site in 2020-2023.

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

The indicative WFD classifications are based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on 1 occurrence to 'High' on 5 occurrences. See **Table B2-5** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 was successfully calculated for the site.

$WHPT_{ASPT}$ scores ranged between 4.98 - 7.28 with the lowest $WHPT_{ASPT}$ score of 4.98 at Site 77382 in Autumn 2020, and the highest score of 7.28 at Site 77382 in Spring 2010. The $WHPT_{ASPT}$ expected score for this site is 7.29, with 1 of the 10 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.71 - 1.04 with the lowest $WHPT_{ASPT}$ EQR of 0.71 at Site 77382 in Autumn 2020, and the highest EQR of 1.04 at Site 77382 in Autumn 2010.

$WHPT_{NTAXA}$ scores ranged between 9 - 33 with the lowest $WHPT_{NTAXA}$ score of 9 at Site 77382 in Autumn 2020, and the highest score of 33 at Site 77382 in Autumn 2010. The $WHPT_{NTAXA}$ expected score for this site is 23.99, with 1 of the 10 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.39 - 1.42 with the lowest $WHPT_{NTAXA}$ EQR of 0.39 at Site 77382 in Autumn 2020, and the highest EQR of 1.42 at Site 77382 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 7 - 8.27 with the lowest $LIFE_{FAMILY}$ score of 7 at Site 77382 in Autumn 2020, and the highest score of 8.27 at Site 77382 in Spring 2021. The $LIFE_{FAMILY}$ expected score for this site is 7.85, with 2 of the 10 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.9 - 1.05 with the lowest $LIFE_{FAMILY}$ EQR of 0.9 at Site 77382 in Autumn 2020, and the highest EQR of 1.05 at Site 77382 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 63.6 - 83.3 with the lowest PSI_{FAMILY} score of 63.6 at Site 77382 in Autumn 2020, and the highest score of 83.3 at Site 77382 in Spring 2021. The PSI_{FAMILY} expected score for this site is 74.33, with 5 of the 10 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.89 - 1.12 with the lowest PSI_{FAMILY} EQR of 0.89 at Site 77382 in Autumn 2020, and the highest EQR of 1.12 at Site 77382 in Spring 2021.

A single INNS species, *Potamopyrgus antipodarum,* was recorded at Site 77282 in 2010, 2022 and 2023. No designated species were recorded during the monitoring period.

Summary

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

Baseline data indicates that under present conditions, the macroinvertebrate community in the impacted reach is highly sensitive to reduced flows. See **Table B2-6** for guidance in interpreting raw LIFE scores. $WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores were available for the site (**Figure B2-3**).

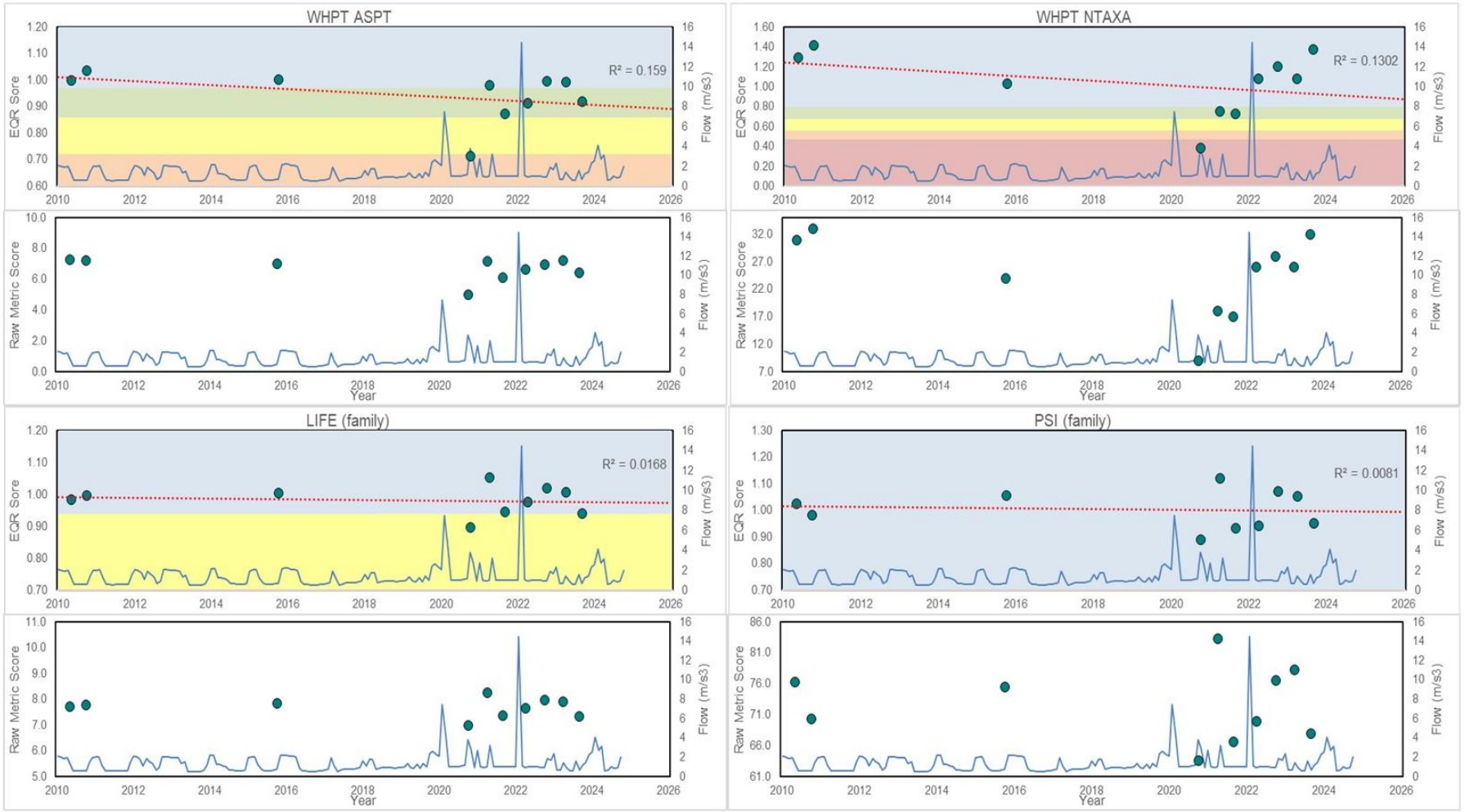
A summary of the above data is presented within **Table B2-26**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and has a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-26: Macroinvertebrate Observed and Expected Indices Summary

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{FAMILY}$ EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
77382	SE2343070704	10	2010 to 2023	0.9 - 1.05 (0.98)	7 - 8.27 (7.69)	0.89 - 1.12 (1)	63.6 - 83.3 (72.86)	0.71 - 1.04 (0.94)	P - H (G)	4.98 - 7.28 (6.71)	0.39 - 1.42 (1.04)	B - H (H)	9 - 33 (24)

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

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



B2.3.4.2 Fish

Waterbody GB104027069190 Laver from Carlesmoor Beck to Kex Beck is classified under Cycle 3 (2022) as moderate. The classification of this waterbody was derived from a single monitoring site, the River Laver at Winksley (Site ID 766), which is located outside of the impacted reach. This site was surveyed in 2021, and the data collected during this survey formed the basis for the current waterbody classification.

The site is not located within the impacted reach, as such FCS2 outputs from this site will be utilised to provide an indication of the ecological status of the fish community within the impacted reach in relation to WFD status and further informed by the sites within the impacted reach; Holborn Bridge Lower (Lumley) (ID 49903), u/s confluence (ID 68464) and Holborn Bridge Upper (Lumley) (ID 19).

EA Site 49903 was initially surveyed in 2013, with YWSL supplementary surveys conducted from 2015 to 2018 and again in 2021, forming the baseline dataset. EA Site 68464 was first surveyed in 2015, with additional YWSL surveys in 2021 and 2024. Additionally, YWSL commissioned Site 19 for surveys from 2015 to 2018 and again in 2021 to provide further insight into fish assemblages within the Holborn Beck 1 reach. **Table B2-27** sets out the site and survey information for these sites.

River Laver, Winskley was individually classified as moderate in 2022, based on survey data collected in 2021. At the time of reporting, no EQR data was available for this site, however, the previous assessment in 2019 recorded an EQR of 0.1392.

The site has a relatively low diversity, with only two species present from an expected five species. Trout had a good EQR score of 0.6753, with a slightly lower observed density than expected. Bullhead are present at a level that meets/exceeds expectations, with an EQR score of 1.

Data from the sites within the zone of influence and the classification sites detailed above were also used to inform the level of certainty applicable to this assessment.

Species presence at the assessed sites is set out in **Table B2-28**. Sites within the impacted reach (Holborn Beck1) showed fish populations similar to the two classification sites, with minnow and stone loach absent, and relatively low counts of brown trout at sites Holborn Bridge Upper, Holborn Bridge Lower and u/s confluence in most samples. However, the numbers recorded increased in 2021, particularly at Holborn Bridge Upper. This is potentially a result in a change in sampling strategy (**Annex 1**)

Bullhead abundance was also relatively constant at each site, with Holborn Bridge Lower having the higher count of 40 in 2021, and Holborn Bridge Upper having the lowest count of 7 individuals in 2015, 2017 and 2018 which increased to 28 in 2021.

One unidentified lamprey ammocoete was recorded at site 68464 (u/s Confluence) in 2021, confirming their presence but suggesting unsuitable habitat.

No Atlantic salmon were observed at monitoring sites within the impacted reach (Holborn Reach 1).

Full fish counts are available in **Annex 1** to this appendix.

Summary

The WFD status of the fish community in Holborn Beck 1 may be impacted by drought permit implementation. However, low flow impacts of the Lumley Moor Reservoir 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.

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 B2-27: Fish survey site information

Site ID	Site Name	Survey NGR	Survey Method	Survey Count	Min Survey Year	Max Survey Year
49903	Holburn Bridge Lower (Lumley)	SE2383270637	Electric Fishing (AC, PDC and DC)	5	2013	2021
68464	u/s Confluence	SE2430070400	Electric Fishing (AC, PDC and DC)	6	2015	2024
19	Holborn Bridge Upper (Lumley)	SE2344670716	Electric Fishing (AC, PDC and DC)	3	2015	2021

Table B2-28: Fish Survey Results

Tolerance Category[6]	Species Name	2013	2015	2016	2017	2018	2021	2024
Low tolerance	Brown trout	X	X	X	X	X	X	X
Low tolerance	Bullhead	X	X	X	X	X	X	X
Low tolerance	Lamprey sp.						X	

B2.3.4.3 WFD waterbody status

Table B2-29 summarises the WFD classifications of waterbodies which contain the impacted reach. **Table B2-29** also displays the objective status for 2027 (Cycle 3) or the predicted status in 2027 where the objective has met good status in 2022. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-29: WFD classifications

Waterbody ID & Name		GB104027069190 Laver from Carlesmoor Beck to Kex Beck	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location *(Major, Moderate, Minor, Negligible)*		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	Medium
	Macroinvertebrates	High	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Good	
	Fish	Moderate	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.3.5 Invasive non-native species (INNS)

Table B2-30 summarises the INNS 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, as per the UKTAG INNS Alarm List [7] (see **Table B2-30**).

Table B2-30: 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 – Terrestrial 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
INNS – macroinvertebrates New Zealand mud snail (*Potamopyrgus antipodarum*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.3.6 Landscape, navigation, recreation and heritage.

Table B2-31 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 B2-31**).

Table B2-31: 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)*
Ailey Hill – Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Ripon Minster Close - Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
St. Anne's Chapel - Scheduled Ancient Monument	Major	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Angling on River Laver	Major	Major hydrological impact will potentially impact upon angling. However, any impact will be short-term and occur against a baseline of drought conditions.	Low	No
Canoeing on River Laver	Major	Drought conditions would not be conducive to canoeing	Low	No

B2.4 LAVER 1

B2.4.1 Statutory designated sites

Table B2-32 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 B2-32)**.

Table B2-32: 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)*
Cow Myers SSSI	Minor	No – the site is groundwater dependent. River flow/level will not affect the hydrology of the site.	Not sensitive	No
LNR - Hell Wath	Minor	No water dependent receptors	Not sensitive	No

B2.4.2 NERC and local wildlife sites

Table B2-33 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 B2-33**).

Table B2-33: 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)*
Laver Banks Wood Complex LWS	Minor	Unlikely to be in connectivity with impacted reach or support aquatic receptors. An area of woodland.	Not sensitive	No
Ellington Banks LWS	Minor	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Predominately semi-natural broad-leaved woodland with many conifers are present, as well as a well-develop shrub layer, diverse herb layer. There are widespread damp zones and areas of calcareous grassland.	Not sensitive	No
NERC habitat-Coastal and	Minor	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Improved permanent	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)*
floodplain grazing marsh. -39728		grassland, *Phragmites australis* swamp and reed-beds, *Carex acutiformis* swamp, *Carex rostrata–Potentilla palustris* tall-herb fen		
NERC habitat-No main habitat but additional habitats present -453047	Minor	Potential connectivity for additional habitat. *Lolium perenne–Cynosurus cristatus* grassland, *Phragmites australis* swamp and reed-beds, *Carex acutiformis* swamp, *Phalaris arundinacea* tall-herb fen	Low	No

B2.4.3 NERC and other protected species

Table B2-35 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

Two nationally scarce macroinvertebrate species were observed in sampling carried out by the EA and additional YWSL commissioned surveys across one macroinvertebrate survey site in 2016 (**Table B2-15**). Based on the available information these receptors are not considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

Table B2-34: Notable Macroinvertebrate Species Designations

Species name	Conservation status	Reporting category	Conservation status - designation description
Hydraena rufipes	Nationally scarce	Rare and scarce species (not based on IUCN criteria)	Occurring in 16-100 hectares in Great Britain.
Paraleptophlebia cincta	Nationally scarce	Rare and scarce species (not based on IUCN criteria)	Occurring in 16-100 hectares in Great Britain.

White-clawed crayfish are sensitive to habitat modification from the management of waterbodies. A review data obtained from the EA and available data from the NBN gateway was used inform the assessment of the receptor in the impacted reach. Surveys carried out by YWSL in 2016 in Holborn Beck 1 and Laver 1 found evidence of white-clawed crayfish in Holborn Beck 1 only, however, it was not possible to conclusively rule out their presence as suitable habitat was observed in both impacted reaches. As the presence of the receptor cannot be ruled out within the impacted reach, a precautionary approach has been adopted. Based on the available information this receptor is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-35 identifies the potential for impacts upon otter and water vole in Laver 1, which were identified in the NERC Act Section 41 as species of principal importance.

Review of EA records indicate otter were recorded within Laver 1. However, no information from survey findings is available and although the home ranges of otter can extend over tens of kilometres it is

considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the available information otter are considered not to be susceptible to drought permit impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Review of EA records indicate water vole were not recorded within the Laver 1. However, the distribution of information and survey data for the species was considered to be limited. Therefore, absence cannot be confirmed. It was considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the available information water vole are considered not to be susceptible to drought permit impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Four NERC Act Section 41 and notable fish species have been identified as present in the impacted reach, including two NERC Act Section 41 fish species (brown trout and rive lamprey) and three notable fish species (bullhead, brook lamprey and grayling), and a **medium** sensitivity has been identified.

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 permit impacts and have a **not sensitive** sensitivity to the physical environment impacts identified in **Appendix A.**

Table B2-35: 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 *-Hydraena rufipes -Paraleptophlebia cincta*	Minor	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	No
NERC Species – Crustacea White-clawed Crayfish (*Austropotamobius pallipes)*	Minor	White Clawed Crayfish is sensitive to habitat modification from the management of waterbodies. Therefore, they are considered to be sensitive to hydrological impacts, particularly low flows.	Medium	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Minor	Otters are known to use the reaches downstream. However, they are not expected to be severely impacted by the implementation of the drought option against a baseline of reduced flows characteristic of drought.	Low	No
NERC Species – mammals Water vole (*Arvicola amphibious)*	Minor	Water vole are known to use the reaches downstream. However, they are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought.	Low	No
NERC Species – Fish - Brown trout (*Salmo trutta)* River lamprey (*Lampetra fluviatilis)*	Minor	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. However, low flow impacts of drought option implementation would occur against a baseline of drought	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)*
		conditions (i.e. compensation flow only) and may therefore not markedly detract from the quality of the supporting environment.		
Notable Species – Fish -Grayling (*Thymallus thymallus* -Bullhead *(Cottus gobio)* - Brook lamprey *(Lampetra planeri)*	Minor	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. 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.	Medium	Yes
NERC and Notable Species – Birds There are many bird species present across the region	Minor	The following bird species to varying extents rely on water dependent habitats. However, they are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought: - Curlew (*Numenius arqauta)* - Grey Wagtail (*Motacilla cinerea)* - House Martin (*Delichon urbica)* - Swallow (*Hirund rustica)* - Willow tit (*Parus montanus)* - Little Ringed Plover Bird (*Charadrius dutius)* - Redshank (*Tringa tetanus)* - Snipe (*Gallinago gallinago)* - Dipper *(Cinclus cinclus)*	Not sensitive	No

B2.4.4 WFD receptors

The sensitivity analysis has considered the relationship between macroinvertebrate and/or fish communities and the supporting environmental variables over the baseline period. **Table B2-39** below summarises of the RBMP Cycle 2 Status/ Potential of the WFD waterbody, including WFD receptors for fish and macroinvertebrates. The purpose of the analysis is to establish whether biological metrics/indices respond inter-annually to changes in flow and associated environmental variables including habitat quality and availability.

B2.4.4.1 Macroinvertebrates

The WFD waterbody GB104027069190 Laver from Carlesmoor Beck to Kex Beck classified as ‘high’ for invertebrates in 2022 under Cycle 3 and GB104027069260 Kex Beck and the Laver classified as ‘good’ for invertebrates in 2022 under Cycle 3. WFD classification was based on the EA monitoring site ID 162702 in 2016.

Baseline macroinvertebrate data was provided by the EA for four sites in Laver 1, D/S Galphay Mill Bridge (ID 162702), D/S Holborn beck Ings Bridge (ID 180965), Nr Clotherholme Farm (ID 184490), Laver/south gill beck (ID 195).

EA Site 162702 was surveyed in 2013, with additional YWSL surveys in spring and autumn 2018. EA Site 180965 had survey data from autumn 2015 and both spring and autumn 2016, while EA Site 184490 was surveyed in spring and autumn 2016. Lastly, EA Site 195 had survey data from spring and autumn 2013.

These sites provide limited temporal coverage within the baseline period, restricting the ability to assess long-term trends and macroinvertebrate community responses to flow variations and other stressors. However, they still offer a valuable snapshot of overall community composition at the time of sampling. The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A**.

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Good' on two occurrences to 'High' on nine occurrences. See **Table B2-5** for guidance in interpreting EQR scores for WHPT WFD classification.

RICT3 analysis was successfully calculated for Sites 162702 and 195; however, no physical environmental data (such as river depth, width, alkalinity or sediment composition) was available for sites 184490 and 180965. As a result, site-specific EQR values could not be calculated using RICT3 for that site.

Since sites 184490 and 180965 are without physical environmental data an average expected score has been derived from those sites within the reach of which expected scores could be calculated. Therefore, though EQR values are presented for all sites, it should be noted that they will likely have reduced confidence, affecting the accuracy of the final classifications.

$WHPT_{ASPT}$ scores ranged between 5.89 - 7.53 with the lowest $WHPT_{ASPT}$ score of 5.89 at Site 184490 in Autumn 2016, and the highest score of 7.53 at Site 162702 in Spring 2013. The $WHPT_{ASPT}$ expected scores ranged between 6.55 to 6.96 across the sites, with all samples above the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.88 - 1.08 with the lowest $WHPT_{ASPT}$ EQR of 0.88 at Site 184490 in Autumn 2016, and the highest EQR of 1.08 at Site 162702 in Spring 2013.

$WHPT_{NTAXA}$ scores ranged between 21 - 36 with the lowest $WHPT_{NTAXA}$ score of 21 at Site 184490 in Autumn 2016, and the highest score of 36 at Site 162702 in Autumn 2018. The $WHPT_{NTAXA}$ expected scores ranged between 25.52 to 26.67 across the sites, with all samples above the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.82 - 1.39 with the lowest $WHPT_{NTAXA}$ EQR of 0.82 at Site 184490 in Autumn 2016, and the highest EQR of 1.39 at Site 162702 in Autumn 2018.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. $LIFE_{FAMILY}$ scores ranged between 7.17 - 8.43 with the lowest $LIFE_{FAMILY}$ score of 7.17 at Site 184490 in Autumn 2016, and the highest score of 8.43 at Site 162702 in Spring 2013. The $LIFE_{FAMILY}$ expected scores ranged between 7.64 to 7.74 across the sites, with 1 of the 11 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.93 - 1.09 with the lowest $LIFE_{FAMILY}$ EQR of 0.93 at Site 184490 in Autumn 2016, and the highest EQR of 1.09 at Site 162702 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 64.62 - 86.67 with the lowest PSI_{FAMILY} score of 64.62 at Site 180965 in Autumn 2016, and the highest score of 86.67 at Site 162702 in Spring 2013. The PSI_{FAMILY} expected scores ranged between 64.78 to 69.99 across the sites, with 1 of the 11 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.96 - 1.26 with the lowest PSI_{FAMILY} EQR of 0.96 at Site 180965 in Autumn 2016, and the highest EQR of 1.26 at Site 195 in Autumn 2013.

One invasive, non-native species *Potamopyrgus antipodarum* was recorded as present at three sites between 2013 to 2016.

Two notable species, including *Hydraena rufipes* and *Paraleptophlebia cincta* were recorded as present at site 180965 in 2016.

Summary

The WFD status of the macroinvertebrate community in Laver 1 may be impacted by the implementation of the drought permit. However, low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only), and therefore impacts of the drought permit must be considered in the context of environmental drought.

Baseline data indicates that under present conditions, the macroinvertebrate community in the impacted reach is highly sensitive to reduced flows. See Table B2.4 for guidance in interpreting raw LIFE scores. $WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores were available for the four sites (**Figure B2-4**).

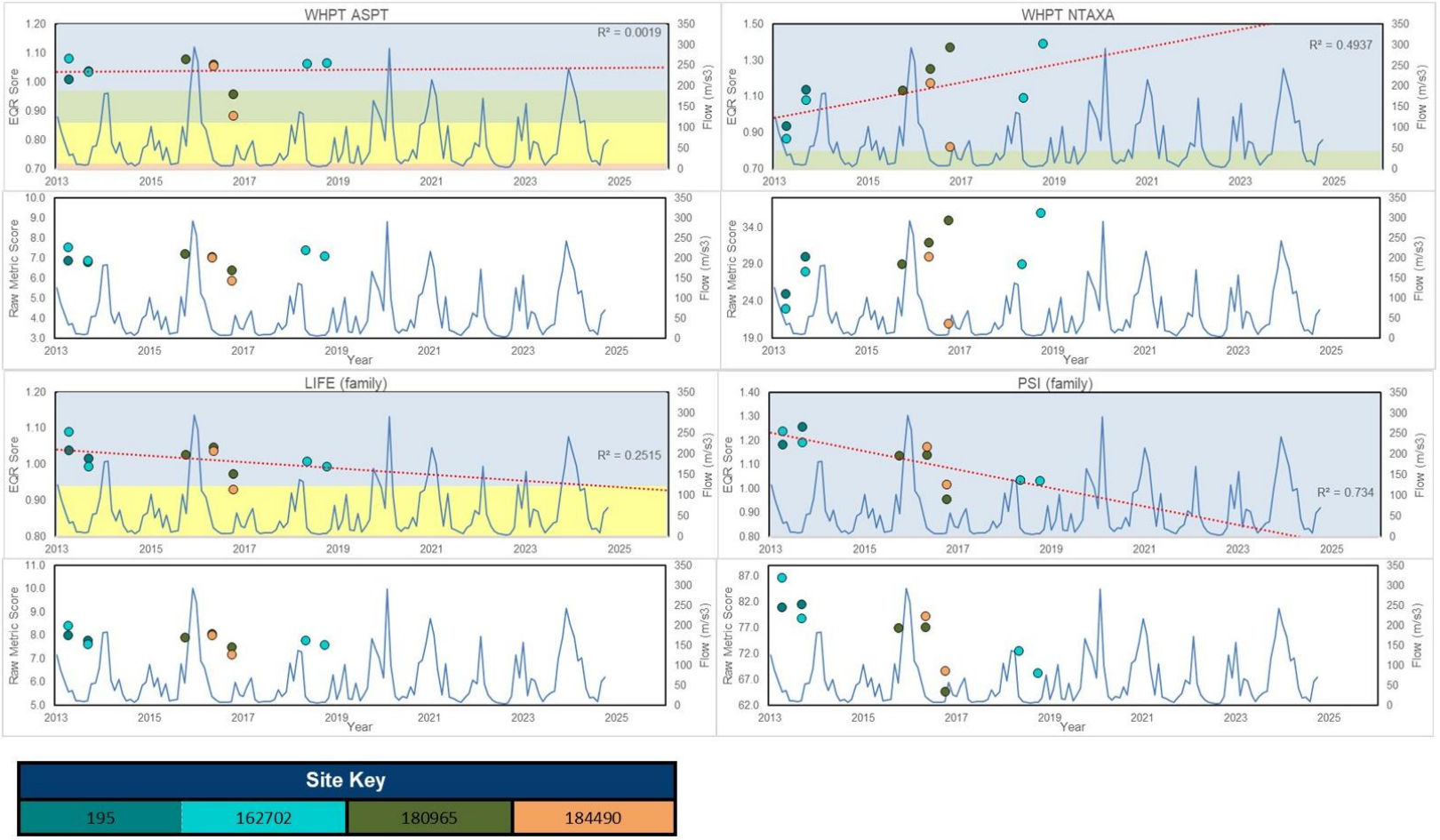
A summary of the above data is presented within **Table B2-36**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

Table B2-36: Macroinvertebrate Observed and Expected Indices Summary

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
195	SE3019071002	2	2013	1.02 - 1.04 (1.03)	7.77 - 8 (7.89)	1.18 - 1.26 (1.22)	80.95 - 81.48 (81.22)	1.01 - 1.04 (1.02)	H - H (H)	6.79 - 6.87 (6.83)	0.94 - 1.14 (1.04)	H - H (H)	25 - 30 (28)
162702	SE2681472070	4	2013 to 2018	0.99 - 1.09 (1.02)	7.61 - 8.43 (7.87)	1.03 - 1.24 (1.13)	68.18 - 86.67 (76.56)	1.04 - 1.08 (1.06)	H - H (H)	6.89 - 7.53 (7.23)	0.87 - 1.39 (1.11)	H - H (H)	23 - 36 (29)
180965	SE2574770559	3	2015 to 2016	0.97 - 1.05 (1.02)	7.5 - 8.07 (7.83)	0.96 - 1.14 (1.08)	64.62 - 77.05 (72.86)	0.96 - 1.08 (1.03)	G - H (H)	6.39 - 7.2 (6.89)	1.14 - 1.37 (1.25)	H - H (H)	29 - 35 (32)
184490	SE2845672061	2	2016	0.93 - 1.04 (0.98)	7.17 - 8 (7.59)	1.02 - 1.17 (1.1)	68.75 - 79.25 (74)	0.88 - 1.06 (0.97)	G - H (G)	5.89 - 7.04 (6.47)	0.82 - 1.18 (1)	H - H (H)	21 - 30 (26)

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

Figure B2-4: Macroinvertebrate EQR scores (Top) and observed scores (Bottom) for $WHPT_{NTAXA}$, $WHPT_{ASPT}$, $LIFE_{FAMILY}$ and PSI_{FAMILY} scores



B2.4.4.2 Fish

Laver 1 spans two waterbodies, Waterbody GB104027069190 Laver from Carlesmoor Beck to Kex Beck and GB104027069260 Kex Beck and the Laver. Both waterbodies are classified under Cycle 3 (2022) as moderate.

The classification of for GB104027069190 Laver from Carlesmoor Beck to Kex Beck was derived from a single monitoring site, the River Laver at Winksley (Site ID 766), which is located outside of the impacted reach. This site was surveyed in 2021, and the data collected during this survey formed the basis for the current waterbody classification.

The classification of for GB104027069260 Kex Beck and the Laver was derived from a three monitoring sites, Kex Beck, Azerley (Site ID 26677), Wreaks Beck, Middle Biggin (Site ID 26710), which are located outside of the impacted reach and R.Laver, Clotherholme Farm (Site ID 26624). This site was surveyed in 2018, and the data collected during these surveys formed the basis for the current waterbody classification.

These sites are not located within the impacted reach, with the exception of R.Laver, Clotherholme Farm (Site ID 26624), as such FCS2 outputs from these sites will be utilised to provide an indication of the ecological status of the fish community within the impacted reach in relation to WFD status and further informed by the sites within the impacted reach; River Laver Clotherhome Farm (ID 26624), d/s Ripon FAS (ID 49904), U/S Ripon FAS (ID 49905), and River Laver The Secret Garden (ID 78565). **Table B2-37** sets out the site and survey information for these sites.

EA Site 26624 was surveyed in 2015 and 2024, with YWSL supplementary surveys from 2015 to 2018 and again in 2021. EA Sites 49904 and 49905 were both surveyed in 2013 and 2015, with YWSL supplementary surveys conducted from 2015 to 2018 and in 2021.

EA site 78565 had survey data for 2023. As the site has been surveyed only once, it cannot inform long-term trends in fish assemblages. However, it is used here to inform species presence/ absence in the reach. Species presence for all sites is presented in **Table B2-38**.

River Laver, Winskley was individually classified as moderate in 2022, based on survey data collected in 2021. At the time of reporting, no EQR data was available for this site, however, the previous assessment in 2019 recorded an EQR of 0.1392.

The site River Laver, Winskley is individually classified as ‘poor’ with a site EQR of 0.1392, based on the FCS2 EQR scores from the 2018 survey. The site has a relatively low diversity, with only two species present from an expected five species. Trout had a good EQR score of 0.6753, with a slightly lower observed density than expected. Bullhead are present at a level that meets/exceeds expectations, with an EQR score of 1.

Additional surveys with the impacted reach (Laver 1) showed fish populations consistent with the two classification sites. Brown trout were recorded in relatively low numbers at several sites, including; R.Laver, Clotherholme Farm, U/S Ripon FAS and D/S Ripon FAS. Despite variation in counts, brown trout were consistently present across all survey years, with numbers ranging from 2 to 100 individuals, with the highest catch recorded in 2015. Difference in survey strategy may have contributed to this variation.

Bullhead were recorded in varying abundances in all surveys, (excluding the 2017 survey at site 49905) with D/S Rippon FAS recording the most consistent numbers of between 19 to 27 individuals. Surveys completed in 2015 had the highest catch across all sites.

Unidentified lamprey ammocoetes were recorded sporadically throughout the impacted reach, with the highest catch of 17 individuals recorded at u/s Ripon FAS in 2015.

Additional species, including grayling, minnow, stone loach, and three-spined stickleback, were recorded in small numbers during the surveys. Their presence reflects the natural diversity of the reach, with different species occupying various ecological niches. This drought option is not expected to have any detectable impact upon these species beyond their natural variation within the reach.

Full fish counts and survey strategies are available in **Annex 1** to this appendix.

Summary

Based on the available information and ease of access to the River Skell downstream watercourses where the fish population is high quality, 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 B2-37: Fish survey site information

Site ID	Site Name	Survey NGR	Survey Method	Survey Count	Min Survey Year	Max Survey Year
26624	R.Laver, Clotherholme Farm	SE2866171996	Electric Fishing (AC, PDC and DC)	5	2015	2024
49904	d/s Ripon FAS	SE2932671507	Electric Fishing (AC, PDC and DC)	7	2013	2021
49905	u/s Ripon FAS	SE2920471537	Electric Fishing (AC, PDC and DC)	7	2013	2021
78565	River Laver The Secret Garden	SE3000971033	Electric Fishing (AC, PDC and DC)	3	2023	2023

Table B2-38: Fish Survey Results

Tolerance Category[6]	Species Name	2013	2015	2016	2017	2018	2021	2023	2024
High tolerance	3-spined stickleback		X				X		
Medium tolerance	Stone loach					X			
Medium tolerance	Minnow				X				
Low tolerance	Brown trout	X	X	X	X	X	X	X	X
Low tolerance	Bullhead	X	X	X	X	X	X	X	X
Low tolerance	Lamprey sp.		X	X	X		X		
Low tolerance	Grayling	X	X					X	

B2.4.4.3 WFD waterbody status

Table B2-39 summarises the WFD classifications of waterbodies which contain the impacted reach. **Table B2-39** also displays the objective status for 2027 (Cycle 3) or the predicted status in 2027 where the objective has met good status in 2022. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-39: WFD classifications

Waterbody ID & Name		GB104027069190 Laver from Carlesmoor Beck to Kex Beck	GB104027069260 Kex Beck and the Laver	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location *(Major, Moderate, Minor, Negligible)*		Major	Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	Moderate	
	Fish	Moderate	Moderate	Medium
	Macroinvertebrates	High	Good	Medium
Hydro-morph designation		Heavily modified	Heavily modified	
RBMP 3 Waterbody Objective	Overall	Good	Good	
	Fish	Moderate	Good	
	Macroinvertebrates	Good	Good	
Waterbody Measures		None	None	

B2.4.5 Invasive non-native species (INNS)

Table B2-40 summarises the INNS 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, as per the UKTAG INNS Alarm List [7] (see **Table B2-40**).

Table B2-40: 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 – Terrestrial plants Himalayan balsam (*Impatiens glandulifera)*	Minor	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
INNS – macroinvertebrates New Zealand mud snail (*Potamopyrgus antipodarum)*	Minor	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.4.6 Landscape, navigation, recreation and heritage

Table B2-41 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 B2-41**).

Table B2-41: 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)*
Nidderdale National Landscape	Major	The National Landscape comprises certain water dependent habitats which depending on their location will have taken into account through consideration of statutory designated sites	Not sensitive	No
Ailey Hill – Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Ripon Minster Close - Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
St. Anne's Chapel - Scheduled Ancient Monument	Minor	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Angling on River Laver	Minor	Minor impacts on flows will not impact angling	Low	No
Canoeing on River Laver	Minor	Drought conditions would not be conducive to canoeing	Low	No

B2.5 OAK BECK 1

B2.5.1 Statutory designated sites

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

B2.5.2 NERC and local wildlife sites

Table B2-42 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 B2-42**).

Table B2-42: 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)*
Beaver Dyke Reservoir LWS	Major	The site hosts areas of coniferous plantation woodland, broadleaved woodland, continuous bracken, semi-improved acid grassland and two reservoirs, the larger one to the east, and small areas of alder carr. At the western end of the western reservoir is a drawdown zone which hosts many aquatic species. The site is located upstream of the impacted reach.	Not sensitive	No
Pot Bank Marsh LWS	Major	Unlikely to be in connectivity with impacted reach. Pot Bank Marsh is a mosaic of dry oak/birch woodland, alder carr, acid grassland, marsh and bracken. Woodland on species-rich acid grassland can be found on the steep valleys. Alongside the beck there are flat, often swampy areas with rich marsh communities and sphagnum. Small areas of heather are present as well as large areas of bracken toward the middle and higher parts of the site, south of the beck.	Not sensitive	No
Birk Crag and Cardale Woodland LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Birk Crag and Cardale Woodland predominately comprises broadleaved semi natural woodland. There is a large area of mixed plantation woodland present, within which is a caravan park that is drained by a polluted ditch.	Not sensitive	No
NERC habitat-lowland fens -413440	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. *Carex echinata–Sphagnum recurvum/auriculatum* mire	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 habitat-Lowland fens -413441 -413448 -413442	Major	Potential connectivity for additional habitat. *Carex echinata–Sphagnum recurvum/auriculatum* mire	Not sensitive	No

B2.5.3 NERC and other protected species

Table B2-43 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

White-clawed crayfish are sensitive to habitat modification from the management of waterbodies. Data obtained from the EA and a review of available data from NBN gateway was used inform the assessment of the receptor in the impacted reach. A review of EA records indicate the presence of white-clawed crayfish within Oak Beck 1. During routine sampling in 2021, eight individuals were recorded across two sites. A targeted survey carried out in 2016 by YWSL in Oak Beck 1 did not find any white-clawed crayfish but identified suitable habitat. Based on the available information this receptor is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-43 identifies the potential for impacts upon otter and water vole in Oak Beck 1, which were identified in the NERC Act Section 41 as species of principal importance.

Review of NBN records indicate otter presence within Oak Beck 1. However, no information from survey findings is available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the available information otter are considered not to be susceptible to drought permit impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Review of EA records indicate water vole were historically recorded within the Oak Beck 1. However, the distribution of information and survey data for the species was considered to be limited. Therefore, absence cannot be confirmed. It was considered appropriate, following the precautionary principle, to consider water vole likely to be present in the reach at the time of the implementation of a drought permit. Based on the 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.**

The IUCN Red List ‘near threatened’ species of water beetle *Hydraena palustris* has been historically identified as being present in Oak Beck 1, presented in **Table B2-43**. The species was identified during routine sampling carried out by the EA in 2010 at the site D/S Beaver Dyke. One specimen was recorded. One specimen was recorded. No further records of this species have been noted in the catchment since the individual was observed in 2010. Based on the limited information available this receptor is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A.**

Several NERC at section 41 and notable fish species have been identified as present in the impacted reach. Fisheries survey information from Oak Beck 1, presented in **Section B2.5.4.2** indicates the presence of a low to moderate abundance of brown trout and bullhead, with the population of both species likely to be moderate.

Table B2-43: 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-Invertebrate *Hydraena palustris* *Rhithrogena germanica* *Strictonectes lepidus*	Major	There is uncertainty surrounding how *Hydraena palustris* might be impacted, as there is limited literature available in regards the life cycle and specific habitat requirements. *Rhithrogena germanica* is associated with fast-flowing water, therefore potentially susceptible to drought option impacts. 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. *Strictonectes lepidus* is associated with slow-flowing and standing waters. Changes in flow dynamics as a result of the drought option are unlikely to impact habitat requirements.	Medium	Yes
NERC Species – Crustacea White-clawed Crayfish (*Austropotamobius pallipes)*	Major	White-clawed crayfish are sensitive to habitat modification from the management of waterbodies. Therefore, they are considered to be sensitive to hydrological impacts, particularly low flows.	Medium	Yes
NERC Species – mammals Otter *(Lutra lutra)*	Major	Otter may potentially make use of the impact reach. However, they are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought.	Low	Yes
NERC Species – mammals Water vole (*Arvicola amphibious)*	Major	Water vole were historically recorded within the impacted reach, survey data is considered to be limited. Therefore, absence cannot be confirmed. 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	Major	Potentially susceptible as duration of impacts could include all seasons,	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)*
- Brown trout (*Salmo trutta)*		and thus could impact spawning, migration, provision of cover etc. 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.	Brown trout are known to be under pressure in this stream due to low flows under normal situations.	
Notable Species – Fish -Bullhead *(Cottus gobio)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. 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.	Medium	Yes
NERC and Notable Species **Birds** - there are a number of 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 severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought: - House Martin (*Delichon urbica)* - Swallow (*Hirundo rustica)* - Curlew (*Numenius arqauta)* - Redshank (*Tringa tetanus)* - Snipe (*Gallingo gallingo)* -Reed Bunting (*Emberiza schoeniclus)* - Dipper *(Cinclus cinclus)*	Low	No

B2.5.4 WFD receptors

The sensitivity analysis has considered the relationship between macroinvertebrate and/or fish communities and the supporting environmental variables over the baseline period. **Table B2-47** below summarises of the RBMP Cycle 2 Status/ Potential of the WFD waterbody, including WFD receptors for fish and macroinvertebrates. The purpose of the analysis is to establish whether biological metrics/indices respond inter-annually to changes in flow and associated environmental variables including habitat quality and availability.

B2.5.4.1 Macroinvertebrates

The WFD waterbody GB104027063760 Oak Beck Catchment (Trib of Nidd) classified as ‘good’ for invertebrates in 2022 under Cycle 3.

Macroinvertebrate surveys were completed at 14 Sites (Detailed in **Table B2-44**) between 2013 and 2024. Baseline data is provided by nine EA sites as well as five YWSL commissioned supplementary sites.

EA Site 231 and EA Site 869 were initially surveyed in 2013-2014, followed by resurveys in 2018, with YWSL surveys supplementing data in 2021-2023 (231) and 2021-2022 (869). EA Site 188037 was surveyed in 2017 and 2018, with additional YWSL surveys in 2021-2022. These sites offer strong temporal coverage within the baseline period, allowing for the assessment of trends and potential macroinvertebrate community responses to flow variations and other stressors.

EA Sites 188035 and 188036 were surveyed only twice, in spring 2017 and 2024 (188035) and spring 2017 and 2018 (188036), respectively. Meanwhile, EA Site 874 was surveyed only once, providing limited opportunitie2 for detailed analysis of macroinvertebrate community responses. However, these single surveys still offer valuable insight into overall community composition at the time of sampling.

YSWL commissioned sites (IDs 50, 37, 49, 66, and 89) were surveyed 2019-2022, site 50 had an additional suite of surveys (Spring and Autumn) in 2023.

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

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on 2 occurrences to 'High' on 18 occurrences. See **Table B2-44** for guidance in interpreting EQR scores for WHPT WFD classification.

RICT3 analysis was successfully calculated at Sites 231, 869, 188037and 66. However, no physical environmental (such as river depth, width, alkalinity or sediment composition)) data was able for the Site(s) 50, 874, 37, 49, 89, 188035 and 188036, 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 EQRs for these sites are presented, it is noted they will likely have a reduced confidence in the final EQRs.

$WHPT_{ASPT}$ scores ranged between 3.39 - 7.42 with the lowest $WHPT_{ASPT}$ score of 3.39 at Site 188037 in Autumn 2018, and the highest score of 7.42 at Site 869 in Spring 2014. The $WHPT_{ASPT}$ expected scores ranged between 6.68 to 7.02 across the sites, with 18 of the 69 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.5 - 1.06 with the lowest $WHPT_{ASPT}$ EQR of 0.5 at Site 188037 in Autumn 2018, and the highest EQR of 1.06 at Site 869 in Spring 2014.

$WHPT_{NTAXA}$ scores ranged between 11 - 42 with the lowest $WHPT_{NTAXA}$ score of 11 at Site 231 in Autumn 2021, and the highest score of 42 at Site 37 in Spring 2022. The $WHPT_{NTAXA}$ expected scores ranged between 24.86 to 25.77 across the sites, with 13 of the 69 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.44 - 1. with the lowest $WHPT_{NTAXA}$ EQR of 0.44 at Site 231 in Autumn 2021, and the highest EQR of 1.69 at Site 37 in Spring 2022.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. $LIFE_{FAMILY}$ scores ranged between 6 - 8. with the lowest $LIFE_{FAMILY}$ score of 6 at Site 188037 in Autumn 2018, and the highest score of 8.23 at Site 231 in Spring 2013. The $LIFE_{FAMILY}$ expected scores ranged between 7.7 to 7.78 across the sites, with 25 of the 69 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.78 - 1.06 with the lowest $LIFE_{FAMILY}$ EQR of 0.78 at Site 188037 in Autumn 2018, and the highest EQR of 1.06 at Site 231 in Spring 2013.

Similarly, PSI EQRs are not used to determine WFD classification but provides an indication of the level of sedimentation and eutrophication at the sites. PSI_{FAMILY} scores ranged between 25 - 86.21 with the lowest PSI_{FAMILY} score of 25 at Site 188037 in Autumn 2021, and the highest score of 86.21 at Site 869 in Spring 2013. The PSI_{FAMILY} expected scores ranged between 66.66 to 70.88 across the sites, with 48 of the 69 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.37 - 1.22 with the lowest PSI_{FAMILY} EQR of 0.37 at Site 188037 in Autumn 2021, and the highest EQR of 1.22 at Site 869 in Spring 2013.

A total of five INNS species, including *Potamopyrgus antipodarum*, *Physella acuta*, *Crangonyx pseudogracilis* and *Chelicorophium curvispinum* were recorded as present at seven sites between 2013 to 2024.

A total of two designated species, including *Stictonectes lepidus,* and *Rhithrogena germanica* were recorded as present at four sites between 2015 to 2024.

Summary

The WFD status of the macroinvertebrate community in Oak Beck 1 may be impacted by the implementation of this drought permit. However, low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only), and therefore impacts of the drought permit must be considered in the context of environmental drought.

Baseline data indicates that under present conditions, the macroinvertebrate community in Oak Beck 1 is highly sensitive to reduced flows. See **Table B2-6** for guidance in interpreting raw LIFE scores. $WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site (**Figure B2-5**).

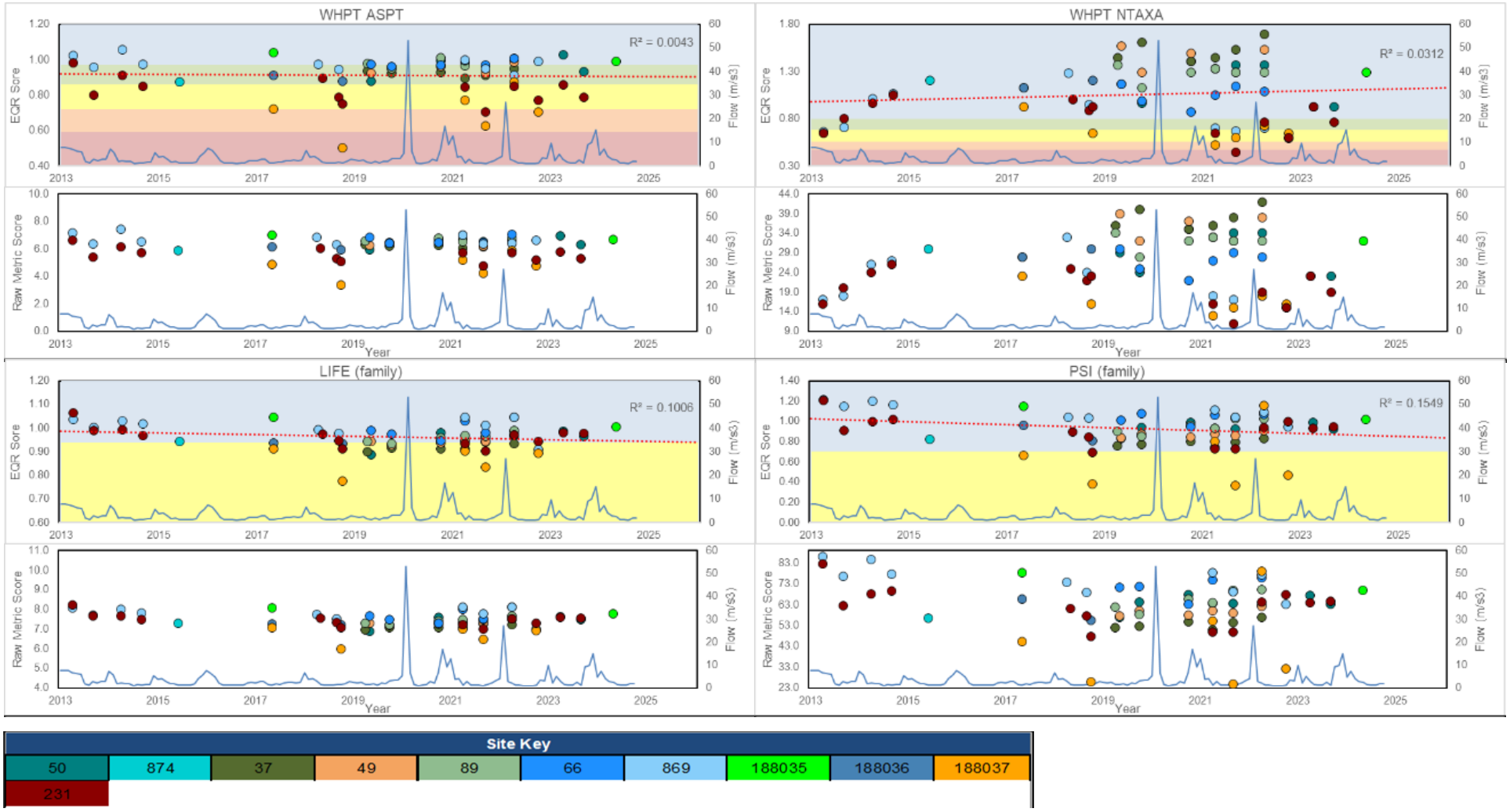
A summary of the above data is presented within **Table B2-44**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-44: Macroinvertebrate Observed and Expected Indices Summary

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{FAMILY}$ EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
50	SE2312953949	8	2019 to 2023	0.89 - 0.99 (0.95)	6.88 - 7.65 (7.37)	0.83 - 0.99 (0.93)	56.82 -67.69 (63.71)	0.88 - 1.03 (0.97)	G - H (G)	5.93 - 6.93 (6.52)	0.93 - 1.41 (1.18)	H - H (H)	23 - 35 (29)
874	SE2311954414	1	2015	0.94	7.29	0.83	56.52	0.87	G	5.89	1.21	H	30
37	SE2310054549	6	2019 to 2022	0.9 - 0.94 (0.92)	6.97 - 7.27 (7.12)	0.74 - 0.83 (0.78)	50.79 - 56.79 (53.55)	0.9 - 0.95 (0.92)	G - G (G)	6.05 - 6.4 (6.23)	1.41 - 1.69 (1.52)	H - H (H)	35 - 42 (38)
49	SE2316854548	6	2019 to 2022	0.93 - 0.99 (0.95)	7.17 - 7.64 (7.33)	0.84 - 0.91 (0.87)	57.53 - 62.34 (59.49)	0.92 - 0.99 (0.95)	G - H (G)	6.23 - 6.65 (6.43)	1.29 - 1.57 (1.41)	H - H (H)	32 - 39 (35)
89	SE2451954597	6	2019 to 2022	0.94 - 0.99 (0.96)	7.24 - 7.67 (7.44)	0.85 - 1.03 (0.95)	58.49 - 70.31 (65.01)	0.95 - 1.01 (0.98)	G - H (H)	6.41 - 6.82 (6.59)	1.13 - 1.37 (1.28)	H - H (H)	28 - 34 (32)
66	SE2690254299	6	2019 to 2022	0.95 - 1.05 (0.99)	7.3 - 8.13 (7.69)	0.95 - 1.08 (1.03)	63.16 - 76 (71.1)	0.96 - 1.01 (0.98)	G - H (H)	6.42 - 7.06 (6.71)	0.87 - 1.16 (1.05)	H - H (H)	22 - 30 (27)
869	SE2690354306	10	2013 to 2022	0.91 - 1.05 (1.01)	7 - 8.14 (7.79)	0.95 - 1.22 (1.1)	63.2 - 86.21 (75.63)	0.91 - 1.06 (0.98)	G - H (H)	6.3 - 7.42 (6.71)	0.59 - 1.28 (0.83)	M - H (H)	15 - 33 (21)
188035	SE2810155093	2	2017 to 2024	1 - 1.05 (1.02)	7.78 - 8.09 (7.94)	1.02 - 1.15 (1.08)	69.81 - 78.43 (74.12)	0.99 - 1.04 (1.01)	H - H (H)	6.67 - 7.01 (6.84)	1.13 - 1.29 (1.21)	H - H (H)	28 - 32 (30)
188036	SE2939656277	2	2017 to 2018	0.93 - 0.94 (0.94)	7.22 - 7.26 (7.24)	0.81 - 0.96 (0.89)	55.56 - 65.85 (60.71)	0.88 - 0.91 (0.9)	G - G (G)	5.93 - 6.16 (6.05)	1.13 - 1.21 (1.17)	H - H (H)	28 - 30 (29)
188037	SE2927856905	6	2017 to 2022	0.78 - 0.97 (0.88)	6 - 7.53 (6.83)	0.37 - 1.16 (0.64)	25 - 79.2 (43.75)	0.5 - 0.87 (0.7)	B - G (P)	3.39 - 5.9 (4.72)	0.52 - 0.93 (0.68)	P - H (M)	13 - 23 (17)
231	SE2946357751	13	2013 to 2023	0.9 - 1.06 (0.97)	7 - 8.23 (7.48)	0.7 - 1.21 (0.91)	47.62 - 82.76 (62.36)	0.71 - 0.98 (0.83)	P - H (M)	4.76 - 6.61 (5.6)	0.44 - 1.05 (0.8)	B - H (H)	11 - 26 (20)

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

Figure B2-5: Macroinvertebrate EQR scores (Top) and observed scores (Bottom) for $WHPT_{NTAXA}$, $WHPT_{ASPT}$, $LIFE_{FAMILY}$ and PSI_{FAMILY} scores



B2.5.4.2 Fish

Waterbody GB104027063760 Oak Beck Catchment (Trib of Nidd) is classified under Cycle 3(2022) as 'moderate'. Classified by Oak Beck - Knox Millis from a 2015 survey. The baseline fisheries data was provided by nine sites. **Table B2-45** sets out the site and survey information for these sites.

At EA Site Oak Beck - Knox Mill (ID 17277), surveys were conducted in 2013, 2015, and 2024, with YWSL supplementary surveys undertaken between 2016-2018 and 2023-2024. At EA Site Oak Beck - Throstle Nest Farm (ID 171278), surveys were carried out in 2015 and 2024.

YSWL also commissioned surveys at several sites, including OB1, OB2, OB5, and OB6 (from 2016 to 2022), OB3 and OB4 (between 2016 and 2021) and D/S Beaverdyke Reservoir (ID YW10005) from 2015 to 2018.

The site Oak Beck - Knox Millis was individually classified as 'good' with a site EQR of 0. 5008, based on the FCS2 EQR scores from the 2015 survey. The site has a relatively good diversity, with four species present from an expected six species. Brown trout had a moderate EQR score of 0.494, with a slightly lower observed density than expected. Bullhead, minnow and stone loach are present at a level that meets/exceeds expectations, with an EQR scores of 1. Atlantic salmon were expected to be present at the site with a high prevalence but were absent in the 2015 survey.

Additional fisheries survey information from Oak Beck 1, presented in **Table B2-46**, indicates fish populations consistent with those at the classification site. Brown trout, bullhead, stoneloach and minnow continued to be recorded across the surveys, reflecting a relatively diverse and stable fish community. Brown trout were recorded in relatively small numbers across all surveys (between 1 and25 fish) with the largest catch at site OB3 in 2021. While numbers are small, their consistent presence suggests the impacted reach provides suitable habitat for trout.

Bullhead densities varied widely, ranging from a single individual at site OB2 in 2019 and 2020, to the highest observed abundance (estimated 100-999) at site 17277 in 2023 and 2024.

Minnow, perch, stone loach and 3-spined stickleback were all found in varying numbers during the surveys, suggesting the impacted reach contains diverse habitat types. This drought option is not expected to have any detectable impact on these species beyond their natural variation within the reach.

Full fish counts and survey strategies are available in **Annex 1** to this appendix.

Summary

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**. However, given the presence of numerous weirs in the system and low number of individuals present in the impacted reach the fish community has an increased sensitivity to the physical environment impacts. Therefore, the fish community is considered to be susceptible to drought permit impacts and have a **high** sensitivity.

Table B2-45: Fish survey site information

Site ID	Site Name	Survey NGR	Survey Method	Survey Count	Min Survey Year	Max Survey Year
17277	Oak Beck - Knox Mill	SE2950057700	Electric Fishing (AC, PDC and DC)	7	2013	2024
17278	Oak Beck - Throstle Nest Farm	SE2580054400	Electric Fishing (AC, PDC and DC)	2	2015	2024
YW10005	D/S Beaverdyke Reservoir	SE2310054549	Electric Fishing (AC, PDC and DC)	4	2015	2018
OB3	Holen House Farm d/s	SE2457754592	Electric Fishing (AC, PDC and DC)	7	2016	2022
OB4	Holen House Farm u/s	SE2443054575	Electric Fishing (AC, PDC and DC)	7	2016	2022

Site ID	Site Name	Survey NGR	Survey Method	Survey Count	Min Survey Year	Max Survey Year
OB1	OB1	SE2578754275	Electric Fishing (AC, PDC and DC)	7	2016	2022
OB2	OB2	SE2551554562	Electric Fishing (AC, PDC and DC)	7	2016	2022
OB5	OB5	SE2384254549	Electric Fishing (AC, PDC and DC)	7	2016	2022
OB6	OB6	SE2318554548	Electric Fishing (AC, PDC and DC)	7	2016	2022

Table B2-46: Fish survey results

Tolerance Category[6]	Species Name	2013	2015	2016	2017	2018	2019	2020	2021	2023	2024
High tolerance	3-spined stickleback		X	X	X	X	X	X	X	X	X
High tolerance	Perch								X		
Medium tolerance	Stone loach		X	X	X	X				X	X
Medium tolerance	Minnow	X	X	X	X	X	X	X	X	X	X
Low tolerance	Brown trout	X	X		X	X	X	X	X	X	X
Low tolerance	Bullhead	X	X	X	X	X	X	X	X	X	X

B2.5.4.3 WFD waterbody status

Table B2-47 summarises the WFD classifications of waterbodies which contain the impacted reach. **Table B2-47** also displays the objective status for 2027 (Cycle 3) or the predicted status in 2027 where the objective has met good status in 2022. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-47: WFD classifications

Waterbody ID & Name		GB104027063760 Oak Beck Catchment (Trib of Nidd)	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (Major, Mod, Minor, Neg)		Moderate	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	Medium
	Macroinvertebrates	Good	Medium
Hydro-morph designation		Heavily modified	
RBMP 3 Waterbody Objective	Overall	Good	
	Fish	Good	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.5.5 Invasive non-native species (INNS)

Table B2-48 summarises the INNS 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, as per the UKTAG INNS Alarm List [7] (see **Table B2-48**).

Table B2-48: 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 – Terrestrial plants Himalayan balsam (*Impatiens glandulifera)* American skunk cabbage (*Lysichiton americanus*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
INNS – macroinvertebrates Northern river amphipod (*Crangonyx pseudogracilis*) Bladder snail (*Physella acuta*) Caspian mud shrimp (*Chelicorophium curvispinum*) New Zealand mud snail (*Potamopyrgus antipodarum*)	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.5.6 Landscape, navigation, recreation and heritage.

Table B2-49 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 B2-49**).

Table B2-49: 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)*
Nidderdale National Landscape	Major	The National Landscape comprises certain water dependent habitats which depending on their location will have taken into account through consideration of Statutory designated sites	Not sensitive	No
Oakdale Golf Course	Major	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No

B2.6 WASHBURN 1

B2.6.1 Statutory designated sites

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

B2.6.2 NERC and local wildlife sites

Table B2-50 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

One potential NERC Section 41 habitat, classified as Lowland Fens, has been identified near Washburn 1. Although direct hydrological connectivity is uncertain, some habitat features within the surrounding area may be partially dependent on water levels. These include rush-pasture, swamp, and water-margin vegetation communities. Consequently, this receptor has been flagged for further consideration due to the major flow change predicted for the associated reach (see **Table B2-50**).

Table B2-50: 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)*
Thruscross Reservoir LWS	Major	Areas of grassland, flowering rush marsh and marshy grassland are present. Conifer plantations line the reservoir banks. There is little vegetation in the actual reservoir, which is located upstream of the impacted reach.	Not sensitive	No
Fewston / Swinsty Reservoir LWS	Major	Fewston/ Swinsty Reservoirs is host to a very wide range of flora and habitats. Fewston Reservoir A has over 180 species of marginal vegetation. Wet woodland, oak woodland and birch woodland are present. There is a large inundation zone, fen areas, scrub areas, grassland and open water. The site is located downstream of the impacted reach and is not considered within the zone of influence of the drought permit (see Appendix A).	Not sensitive	No
NERC habitat-Lowland fens -412935	Major	Potential connectivity for additional habitat. *Lolium perenne–Cynosurus cristatus grassland, Holcus lanatus–Deschampsia cespitosa grassland, Holcus lanatus–Juncus effusus rush-pasture, Glyceria fluitans water-margin vegetation, Phalaris arundinacea tall-herb fen, Glyceria maxima swamp, Typha latifolia swamp*	Low	Yes
NERC habitat-Lowland fens -412939 -412938	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. *Lolium perenne–Cynosurus cristatus grassland, Holcus lanatus–Deschampsia cespitosa grassland, Holcus lanatus–Juncus effusus rush-pasture, Glyceria fluitans water-margin vegetation, Phalaris arundinacea*	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)*
		tall-herb fen, Glyceria maxima swamp, Typha latifolia swamp		
NERC habitat-Deciduous woodland -319869 -319872 -319870	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. *Lolium perenne–Cynosurus cristatus grassland, Holcus lanatus–Deschampsia cespitosa grassland, Holcus lanatus–Juncus effusus rush-pasture, Glyceria fluitans water-margin vegetation, Phalaris arundinacea tall-herb fen, Glyceria maxima swamp, Typha latifolia swamp*	Not sensitive	No
NERC habitat-Lowland fens -412262 -412263	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. *Eriophorum angustifolium* bog pool community, *Holcus lanatus–Deschampsia cespitosa* grassland, *Lolium perenne–Cynosurus cristatus* grassland, *Narthecium ossifragum–Sphagnum papillosum* valley mire	Not sensitive	No

B2.6.3 NERC and other protected species

Table B2-51 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

Table B2-51 identifies the potential for impacts upon otter and water vole in Washburn 1, which were identified in the NERC Act Section 41 as species of principal importance.

Data obtained from the EA 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, although historic data does identify the receptor to have been present in the impacted reach. However, no information from any current survey findings were available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the available information otter are considered not 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 EA and a review of available data from NBN gateway was used inform the assessment of water vole in the impacted reach. The data showed no surveys or records have been recorded in the impacted, although historic data does identify the receptor to have been present in the impacted reach. However, the distribution of information and survey data for the species was considered to be limited. Therefore, absence cannot be confirmed. It was considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought 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.**

Several 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 brook lamprey). Baseline data for these species is detailed in **Section B2.6.4.2**.

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 permit impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Table B2-51: 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 – mammals Otter *(Lutra lutra)*	Major	Limited data is available for the impacted reach. However, they are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought.	Low	Yes
NERC Species – mammals Water vole (*Arvicola amphibious)*	Major	Limited data is available for the impacted reach. Changes in water level are the most important factor influencing water vole populations, with species readily inhabiting areas of slow flowing and standing water. As such hydrological and associated impacts as a result of this drought 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. 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.	High	Yes
Notable Species – Fish -Bullhead *(Cottus gobio)* - Brook Lamprey (*Lampetra planeri*)	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. However, low flow impacts	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)*
		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		
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 severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought: - Curlew (*Numenius* arqauta*)* - Redshank (*Tringa* tetanus*)* - Little Ringed Plover Bird (*Charadrius dutius)* - Water Rail (*Rallus aquaticus)* - Dipper *(Cinclus cinclus)*	Low	No

B2.6.4 WFD receptors

The sensitivity analysis has considered the relationship between macroinvertebrate and/or fish communities and the supporting environmental variables over the baseline period. **Table B2-55** below summarises of the RBMP Cycle 2 Status/ Potential of the WFD waterbody, including WFD receptors for fish and macroinvertebrates. The purpose of the analysis is to establish whether biological metrics/indices respond inter-annually to changes in flow and associated environmental variables including habitat quality and availability.

B2.6.4.1 Macroinvertebrates

The WFD waterbody GB104027064070 Washburn Source to Spinksburn Brook is classified as 'good' for macroinvertebrates in 2019, Cycle 3. WFD classification was based on the EA monitoring site ID 562 surveyed in 2019. Baseline macroinvertebrate data is provided by one EA monitoring site, and three sites commissioned by Yorkshire Water (YWSL) (**Table B2-52**).

EA Site 562 had baseline survey data from 2010, 2012-2014, and 2016, with additional monitoring by YWSL in 2020 and 2022. YWSL Sites 55, 46, and 29 had baseline survey data collected in spring and autumn 2022.

EA Site 562 provides strong temporal coverage within the baseline period, enabling the assessment of long-term trends and macroinvertebrate community responses to flow variations and other stressors. In contrast, the YWSL sites surveyed exclusively in 2022 do not support long-term trend analysis but still provide a valuable snapshot of community composition at the time of sampling. The flow series used in each macroinvertebrate figure is that described for each individual reach in **Appendix A.**

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on one occurrence to 'High' on seven occurrences. See **Table B2.5** for guidance in interpreting EQR scores for WHPT WFD classification. RICT3 analysis was successfully calculated for all sites.

$WHPT_{ASPT}$ scores ranged between 6.15-7.46 with the lowest $WHPT_{ASPT}$ score of 6.15 at Site 55 in Spring 2022, and the highest score of 7.46 at Site 562 in Spring 2014. The $WHPT_{ASPT}$ expected scores ranged between 6.54 to 7.4 across the sites, with all samples above the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.86 - 1.13 with the lowest $WHPT_{ASPT}$ EQR of 0.86 at Site 562 in Spring 2013, and the highest EQR of 1.13 at Site 46 in Spring 2022.

The macroinvertebrate community varies in terms of diversity. $WHPT_{NTAXA}$ scores ranged between 11-25 with the lowest $WHPT_{NTAXA}$ score of 11 at Site 55 in Spring 2022, and the highest score of 25 at Site 562 in Spring 2014. The $WHPT_{NTAXA}$ expected scores ranged between 17.31 to 24.83 across the sites, with 6 of the 19 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.48 - 1.08 with the lowest $WHPT_{NTAXA}$ EQR of 0.48 at Site 562 in Spring 2013, and the highest EQR of 1.08 at Site 46 in Spring 2022.

$LIFE_{FAMILY}$ EQRs are not used to determine WFD classification but provides an indication of the flow preferences of the macroinvertebrate communities at the sites. $LIFE_{FAMILY}$ scores ranged between 7.36 - 8.56 with the lowest $LIFE_{FAMILY}$ score of 7.36 at Site 562 in Autumn 2020, and the highest score of 8.56 at Site 55 in Spring 2022. The expected scores ranged between 7.31 to 7.86 across the sites, with all samples above the 'Good/Moderate boundary'. $LIFE_{FAMILY}$ EQR scores ranged between 0.94 - 1.15 with the lowest $LIFE_{FAMILY}$ EQR of 0.94 at Site 562 in Autumn 2020, and the highest EQR of 1.15at Site 55 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 69-90 with the lowest PSI_{FAMILY} score of 69 at Site 562 in Autumn 2020, and the highest score of 90 at Site 562 in Spring 2022. The PSI_{FAMILY} expected scores ranged between 67.17 to 75.11 across the sites, with 2 of the 19 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.93-1.32 with the lowest PSI_{FAMILY} EQR of 0.93 at Site 562 in Spring 2013, and the highest EQR of 1.32 at Site 46 in Spring 2022.

One invasive, non-native species, the Northern Crangonyctid (*Crangonyx pseudogracilis/ floridanus),* was recorded as present between 2010 and 2013. No designated species were recorded.

Summary

The WFD status of the macroinvertebrate community in Washburn 1 may be impacted by the implementation of this drought permit. However, low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only), and therefore impacts of the drought permit must be considered in the context of environmental drought.

Baseline data indicates that under present conditions, the macroinvertebrate community in Washburn 1 is highly sensitive to reduced flows. See **Table B2-6** for guidance in interpreting raw LIFE scores. $WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for the site (**Figure B2-6**).

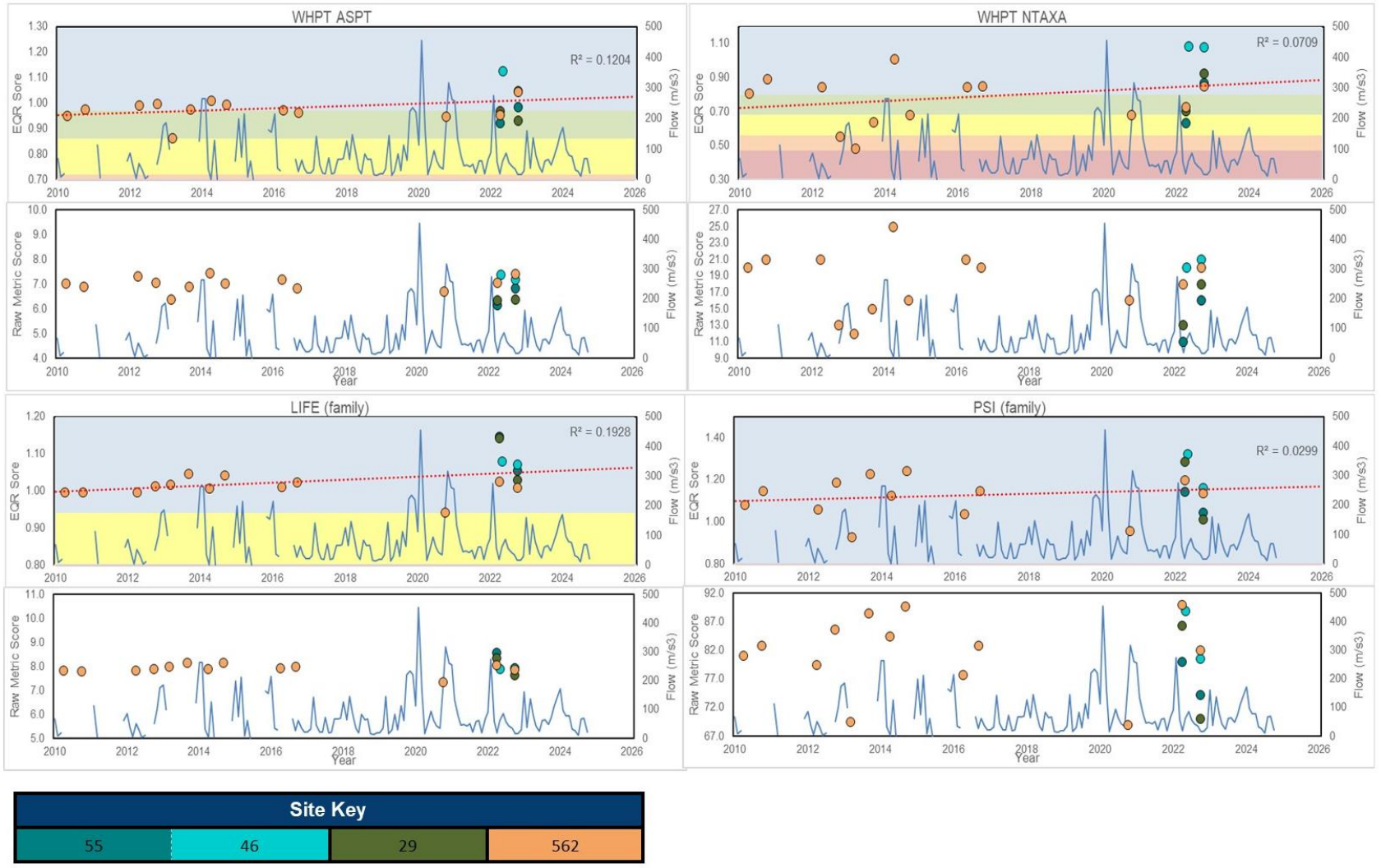
A summary of the above data is presented within **Table B2-52**. Based on the available information the macroinvertebrate community is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-52: Macroinvertebrate Observed and Expected Indices Summary

Site ID	Site NGR	Survey count	Survey Range	$LIFE_{FAMILY}$ EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
55	SE1566657059	2	2022	1.05 - 1.15 (1.1)	7.93 - 8.56 (8.25)	1.04 - 1.14 (1.09)	74.2 - 80 (77.1)	0.92 - 0.99 (0.95)	G - H (G)	6.15 - 6.82 (6.49)	0.64 - 0.87 (0.75)	M - H (G)	11 - 16 (14)
46	SE1581156562	2	2022	1.07 - 1.08 (1.08)	7.89 - 7.94 (7.92)	1.16 - 1.32 (1.24)	80.5 - 88.9 (84.7)	1.05 - 1.13 (1.09)	H - H (H)	7.2 - 7.37 (7.29)	1.08 - 1.08 (1.08)	H - H (H)	20 - 21 (21)
29	SE1633756246	2	2022	1.03 - 1.14 (1.09)	7.63 - 8.36 (8)	1.01 - 1.29 (1.15)	70 - 86.4 (78.2)	0.93 - 0.97 (0.95)	G - G (G)	6.34 - 6.39 (6.37)	0.7 - 0.92 (0.81)	G - H (H)	13 - 18 (16)
562	SE1678255439	13	2010 to 2022	0.94 - 1.05 (1.01)	7.36 - 8.17 (7.91)	0.93 - 1.24 (1.11)	69 - 90 (81.76)	0.86 - 1.04 (0.97)	G - H (H)	6.39 - 7.46 (7.02)	0.48 - 1.01 (0.76)	P - H (G)	12 - 25 (18)

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

Figure B2-6: Macroinvertebrate EQR scores (Top) and observed scores (Bottom) for $WHPT_{NTAXA}$, $WHPT_{ASPT}$, $LIFE_{FAMILY}$ and PSI_{FAMILY} scores



B2.6.4.2 Fish

Waterbody GB104027064070 Washburn Source to Spinksburn Beck is classified under Cycle 3(2019) as moderate. Classification was informed by two sites: D/S Thruscross Reservoir (ID 3836) and U/S of Fewston Reservoir (ID 3837) with surveys in 2014.

Baseline Fish assessment information for the reach is provided by seven sites: D/S Thruscross Reservoir (ID 3836), U/S of Fewston Reservoir (ID 3837), U/S Ford (ID T2), D/S Weir/Redshaw Gill Beck (ID T3), Low Dam (ID T4), U/S Cricket Ground (ID T5) and Cricket Ground (ID T6). **Table B2-53** sets out the available site and survey information from these sites.

EA site 3836 had baseline survey data for 2010 and 2014, with a supplementary survey commissioned by YWSL in 2019 and 2021-2023.EA sites 3837 had survey data for 2010 and 2014 only. YWSL commissioned surveys at sites T2, T3, T4, T5 and T6 in 2019.

The site D/S Thruscross is individually classified as bad with a site EQR of 0.0114, based on the FCS2 EQR scores from the 2014 survey. The site has a relatively poor diversity, with only one species present from an expected four species. Brown trout had a poor EQR score of 0.1903, with a significantly lower observed density than expected. Stone loach and bullhead were listed with an expected prevalence of greater than 50%, being more likely to occur at the site than not but were absent. The notably lower EQR score as a result of the low observed abundance of trout and bullhead at the site had a significant effect in the overall site classification. The poor diversity of the site significantly contributed to the 'bad' overall site classification.

The site U/S of Fewston Reservoir is individually classified as good with a site EQR of 0.4436, based on the FCS2 EQR scores from the 2014 survey. The site has a relatively good diversity, with five species present from an expected five species. Brown trout had a significantly lower observed density than expected, with a poor EQR score of 0.1907. Bullhead, Stone loach, and minnow were all present at a level that meets/exceeds expectations, with an EQR scores of 1. The relatively high diversity of the site significantly contributed to the 'good overall site classification, even though the number of brown trout were below expected.

Species presence within the reach is detailed in **Table B2-54** Data provided by YWSL for sites T2 to T6, monitored in 2019, provides further evidence for a fish population which is consistent with the available Environment Agency (EA) data. The impacted reach primarily salmonid-dominated, with limited representation of other species. The surveys indicate a strong dominance of brown trout across all sites, reinforcing the idea that this section of the river provides a suitable habitat for the species.

At sites T2 and T3, brown trout were the only fish recorded, suggesting that environmental conditions, such as water quality, flow, and habitat structure are particularly favourable for trout but may be less suitable for other species.

At site T4, only a single stone loach was recorded, indicating that while some additional species may be present, their numbers are very low. This could suggest localised habitat limitations or natural variability in species distribution.

Bullhead and stone loach were found in small numbers at sites T5 and T6, indicating that conditions in these areas may support a slightly more diverse fish community. Their presence suggests the availability of suitable habitats. This drought option is not expected to have any detectable impact on these species beyond their natural variation within the reach.

Additionally, adult and juvenile brook lamprey were recorded at site 3837 in small numbers in 2010 and 2014, suggesting suitable burrowing habitat. Significant barriers downstream appear to have limited any upstream migration by river lamprey. Full fish counts are available in **Annex 1** to this appendix.

Summary

The WFD status of the macroinvertebrate community in Washburn 1 may be impacted by the implementation of the 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.

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 B2-53: Fish survey site information

Site ID	Site Name	Survey NGR	Survey Method	Survey Count	Min Survey Year	Max Survey Year
3836	D/S Thruscross Reservoir	SE1550057300	Electric Fishing (AC, PDC and DC)	6	2010	2023
3837	U/S of Fewston Reservoir	SE1690055400	Electric Fishing (AC, PDC and DC)	2	2010	2014
T2	U/S Ford	SE1571956858	Electric Fishing (AC, PDC and DC)	1	2019	2019
T3	D/S Weir/Redshaw Gill Beck	SE1597856494	Electric Fishing (AC, PDC and DC)	1	2019	2019
T4	Low Dam	SE1613256373	Electric Fishing (AC, PDC and DC)	1	2019	2019
T5	U/S Cricket Ground	SE1665655603	Electric Fishing (AC, PDC and DC)	1	2019	2019
T6	Cricket Ground	SE1670155458	Electric Fishing (AC, PDC and DC)	1	2019	2019

Table B2-54: Fish Survey Results

Tolerance Category[6]	Species Name	2010	2014	2019	2021	2022	2023
High tolerance	Perch			X			
Medium tolerance	Stone loach	X	X	X			
Medium tolerance	Minnow		X				
Low tolerance	Brown trout	X	X	X	X	X	X
Low tolerance	Bullhead		X	X			
Low tolerance	Brook lamprey	X	X				

B2.6.4.3 WFD waterbody status

Table B2-55 summarises the WFD classifications of waterbodies which contain the impacted reach. **Table B2-55** also displays the objective status for 2027 (Cycle 3) or the predicted status in 2027 where the objective has met good status in 2022. This is displayed for overall, fish and macroinvertebrate elements and provides a comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-55: WFD classifications

Waterbody ID & Name		**GB104027064070 Washburn Source to Spinksburn Bk**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location *(Major, Moderate, Minor, Negligible)*		Major	
WFD Cycle 3 (2022) Status	Overall	Moderate	
	Fish	Moderate	Medium
	Macroinvertebrates	Good	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Moderate	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.6.5 Invasive non-native species (INNS)

Table B2-56 summarises the INNS 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, as per the UKTAG INNS Alarm List [7] (see **Table B2-56**).

Table B2-56: 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)* New Zealand mud snail *(Potamopyrgus antipodarum)*	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Non-native species – Fish Rainbow trout *(Oncorhynchus mykiss)*	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
INNS – Terrestrial 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

B2.6.6 Landscape, navigation, recreation and heritage

Table B2-57 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 B2-57**).

Table B2-57: 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)*
Recreation - Canoeing	Major	Unlikely to be impacted over the duration of the drought permit, canoeing events rely on specific high volume releases, although these may reduce during a drought the reduction will occur under baseline drought conditions and is not related to the drought permit for Thruscross Reservoir.	Not sensitive	No

B2.7 WASHBURN 2

B2.7.1 Statutory designated sites

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

B2.7.2 NERC and local wildlife sites

Table B2-58 summaries the NERC Act Section 41 and other notable and/or protected habitats (e.g. LWS) which are located on or within 500m of the impacted reach.

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 B2-58**).

Table B2-58: NERC habitats and local wildlife sites

Site/Receptor and designation	**Hydrological Impact at Location** *(Major, Moderate, Minor, Negligible)*	**Susceptibility to flow and level impacts**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*	**Further Consideration Required** *(Y/N)*
Lindley Wood Reservoir Complex LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Areas of grassland, flowering rush marsh and marshy grassland are present. Conifer plantations line the reservoir banks. There is little vegetation in the actual reservoir which is located upstream of the impacted reach.	Not sensitive	No
Farnley Lake LWS	Major	Unlikely to be in connectivity with impacted reach. Silted artificial lake surrounded by broadleaved and coniferous plantation. The lake hosts an array of submerged and marginal vegetation.	Not sensitive	No
River Wharfe, Otley & Mid-Wharfedale/Whetherby LWS	Major	Likely to be in connectivity with impacted reach and support aquatic receptors. A typical lowland river.	Low	No
Knotford Nook LWS	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. Knotford Nook. An area of grassland, marsh, scrub and large ponds.	Not sensitive	No
NERC habitat-Lowland fens -453066 -413657	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. *Lolium perenne–Cynosurus cristatus grassland, Holcus lanatus–Juncus effusus rush-pasture, Lowland Fen, Phragmites australis–Urtica dioica tall-herb fen*	Not sensitive	No

Site/Receptor and designation	**Hydrological Impact at Location** *(Major, Moderate, Minor, Negligible)*	**Susceptibility to flow and level impacts**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*	**Further Consideration Required** *(Y/N)*
NERC habitat-Deciduous woodland -319944	Major	Unlikely to be in connectivity with impacted reach or support aquatic receptors. *Lolium perenne–Cynosurus cristatus grassland, Holcus lanatus–Juncus effusus rush-pasture, Lowland Fen, Phragmites australis–Urtica dioica tall-herb fen*	Not sensitive	No

B2.7.3 NERC and other protected species

Table B2-60 summaries the NERC Act Section 41 and other protected species which are located on or within 500m of the impacted reach.

Six nationally scarce macroinvertebrate species (see **Table B2-59**) have been identified as being present in the impacted reach between 2015 and 2023. Based on the limited information available this receptor is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

White-clawed crayfish are sensitive to habitat modification from the management of waterbodies. Data obtained from the EA and a review of available data from NBN gateway is used inform the assessment of the receptor in the impacted reach. Review of EA records indicates the presence of white-clawed crayfish within Washburn 2. A single specimen was observed during routine sampling at a site downstream on Lindley Wood reservoir (EA Site ID 151950) in 2022. Based on the available information this receptor is considered to be susceptible to drought permit impacts and have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B2-60 identifies the potential for impacts upon otter and water vole in Washburn 2, which were identified in the NERC Act Section 41 as species of principal importance.

Data obtained from the EA 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, although historic data does identify the receptor to have been present in the impacted reach. Recent survey records from adjacent reaches show otter to be present in the catchment. However, no information from any current survey findings were available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the available information otter are considered not 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 EA and a review of available data from NBN gateway was used inform the assessment of water vole in the impacted reach. The data showed no surveys or records have been recorded in the impacted reach, although historic data does identify the receptor to have been present in the impacted reach. However, the distribution of information and survey data for the species was considered to be limited. Therefore, absence cannot be confirmed. It was considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought permit. Based on the 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.**

Six nationally scarce macroinvertebrate species have been identified as being present in the impacted reach between. Based on the limited information available this receptor 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: Notable Macroinvertebrate Species Designations

Species Name	Conservation status	Reporting category	Conservation status - designation description
Potamophylax rotundipennis	Nationally scarce	Rare and scarce species (not based on IUCN criteria)	Occurring in 16-100 hectares in Great Britain.
Psychomyia fragilis			
Wormaldia subnigra			
Rhyacophila fasciata/ septentrionis			
Atherix ibis			
Paraleptophlebia cincta			

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, Atlantic salmon and European eel) and three notable fish species (bullhead, brook lamprey and grayling). Baseline data for these species is detailed in **Section B2.7.4.2**.

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 permit impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Table B2-60: NERC Act Section 41 and other protected species

Site/Receptor and designation	**Hydrological Impact at Location** *(Major, Moderate, Minor, Negligible)*	**Susceptibility to flow and level impacts**	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*	**Further Consideration Required** *(Y/N)*
NERC Species – Crustacea White-clawed Crayfish (*Austropotamobius pallipes)*	Major	White-clawed crayfish are sensitive to habitat modification from the management of waterbodies. Therefore, they are considered to be sensitive to hydrological impacts, particularly low flows.	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 – mammals Otter *(Lutra lutra)*	Major	Limited data is available for the impacted reach. Historically present in the impacted reach. However, they are not expected to be severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought.	Low	Yes
NERC Species – mammals Water vole (*Arvicola amphibious)*	Major	Limited data is available for the impacted reach. Changes in water level are the most important factor influencing water vole populations, with species readily inhabiting areas of slow flowing and standing water. As such hydrological and associated impacts as a result of this drought permit may reduce habitat availability and alter the species food supply.	Uncertain	Yes
Notable Species-Invertebrate *-Potamophylax rotundipennis* *-Psychomyia fragilis* *-Wormaldia subnigra* *-Rhyacophila septentrionis* *-Atherix ibis* *-Paraleptophlebia concta*	Major	There is uncertainty surrounding how this species might be impacted, as there is limited literature available in regards the life cycle and specific habitat requirements. 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 – Fish - Brown trout (*Salmo trutta)* -Atlantic salmon *(Salmo salar)* -European Eel *(Anguilla anguilla)* River lamprey (*Lampetra fluviatilis)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. 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	High*	Yes
Notable Species – Fish -Bullhead *(Cottus gobio)* -Grayling (*Thymallus thymallus)* -Brook lamprey *(Lampetra planeri)*	Major	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. 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	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)*
		markedly detract from the quality of the supporting environment		
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 severely impacted by implementation of the drought option against a baseline of reduced flows characteristic of drought: - Curlew (*Numenius arqauta)* - Redshank (*Tringa tetanus)* - Little Ringed Plover Bird (*Charadrius dutius)* - Water Rail (*Rallus aquaticus)* - Dipper *(Cinclus cinclus)*	Low	No

*Reach is highly flow dependant. Problems could arise if fish drop out of the Washburn into the River Wharfe as habitat may not be suitable and may lead to increased predation.

B2.7.4 WFD receptors

B2.7.4.1 Macroinvertebrates

The WFD waterbody GB104027064020 Washburn Spinksburn Brook is classified as 'high' for macroinvertebrates in 2022, Cycle 3. WFD classification was based on the EA monitoring site ID(s) 152682 (upstream of reservoir), 151950, and 324. Baseline macroinvertebrate data is provided by four EA monitoring sites **(Table B2-61).**

EA Site 151950 and EA Site 324 had baseline survey data from 2010, 2012-2021, and 2023, with additional monitoring by YWSL in 2021. EA Site 183446 was surveyed in summer and autumn 2016, with YWSL commissioning further monitoring from 2020 to 2022. In contrast, EA Site 184087 had survey data collected only in summer and autumn 2016.

EA Site 151950 and 324 provided strong temporal coverage within the baseline period, enabling the assessment of long-term trends and macroinvertebrate community responses to flow variations and other stressors. In contrast, the **EA Site 184087** surveyed exclusively in 2016 do not support long-term trend analysis but still provided a valuable snapshot of community composition at the time of sampling. The flow series used in each macroinvertebrate figure is described for each individual reach in **Appendix A.**

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between 'Bad' on one occurrence to 'High' on 25 occurrences. See **Table B2-5** for guidance in interpreting EQR scores for WHPT WFD classification.

RICT3 analysis was successfully calculated for Sites 183446, 151950 and 324; however, no physical environmental data (such as river depth, width, alkalinity or sediment composition) was available for 184087. As a result, site-specific EQR values could not be calculated using RICT3 for that site.

Since site 184087 is without physical environmental data an average expected score has been derived from those sites within the reach which expected scores could be calculated. Therefore, though EQR

values are presented for all sites, it should be noted that they will likely have reduced confidence, affecting the accuracy of the final classifications.

$WHPT_{ASPT}$ scores ranged between 5.64 - 8.08 with the lowest $WHPT_{ASPT}$ score of 5.64 at Site 151950 in Spring 2013, and the highest score of 8.08 at Site 324 in Spring 2013. The $WHPT_{ASPT}$ expected scores ranged between 5.89 to 7.06 across the sites, with 6 of the 65 samples below the 'Good/Moderate boundary'. $WHPT_{ASPT}$ EQR scores ranged between 0.8 - 1.16 with the lowest $WHPT_{ASPT}$ EQR of 0.8 at Site 151950 in Spring 2013, and the highest EQR of 1.16 at Site 324 in Spring 2013.

The macroinvertebrate community significantly varies in terms of diversity. $WHPT_{NTAXA}$ scores ranged between 11 - 38 with the lowest $WHPT_{NTAXA}$ score of 11 at Site 183446 in Summer 2022, and the highest score of 38 at Site 151950 in Autumn 2010. The $WHPT_{NTAXA}$ expected scores ranged between 15.18 to 26.88 across the sites, with 3of the 65 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.6 - 1.98 with the lowest $WHPT_{NTAXA}$ EQR of 0.6at Site 324 in Spring 2013, and the highest EQR of 1.98 at Site 183446 in Summer 2020.

$LIFE_{FAMILY}$ 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 - 8.38 with the lowest $LIFE_{FAMILY}$ score of 6.86 at Site 183446 in Autumn 2022, and the highest score of 8.38 at Site 324 in Spring 2013. The $LIFE_{FAMILY}$ expected scores ranged between 7.31 to 7.78 across the sites, with 14 of the 65 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.89 - 1.08 with the lowest $LIFE_{FAMILY}$ EQR of 0.89 at Site 151950 in Spring 2024, and the highest EQR of 1.08 at Site 324 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 43.6 - 83.87 with the lowest PSI_{FAMILY} score of 43.6 at Site 183446 in Autumn 2022, and the highest score of 83.87 at Site 324 in Spring 2013. The PSI_{FAMILY} expected scores ranged between 65.85 to 71.49 across the sites, with 40 of the 65 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.63 - 1.23 with the lowest PSI_{FAMILY} EQR of 0.63 at Site 183446 in Autumn 2022, and the highest EQR of 1.23 at Site 324 in Autumn 2016.

Three invasive, non-native species including *Potamopyrgus antipodarum*, *Crangonyx pseudogracilis* and *Crangonyx pseudogracilis* were recorded as present at all four sites between 2010 to 2023. A total of six notable species, including *Atherix ibis*, *Wormaldia subnigra, Potamophylax rotundipennis*, *Rhyacophila septentrionis*, *Psychomyia fragilis* and *Paraleptophlebia cincta* were recorded as present between 2015 to 2023 at sites 324 and 151950.

Summary

The WFD status of the macroinvertebrate community in Washburn 2 may be impacted by the implementation of this drought permit. However, low flow impacts of drought option implementation would occur against a baseline of drought conditions (i.e. compensation flow only), and therefore impacts of the drought permit must be considered in the context of environmental drought.

Baseline data indicates that under present conditions, the macroinvertebrate community in Washburn 2 is highly sensitive to reduced flows. See **Table B2-6** for guidance in interpreting raw LIFE scores. $WHPT_{ASPT}$ and $WHPT_{NTAXA}$ scores are available for all sites **(Figure B2-7**).

A summary of the above data is presented within **Table B2-61**. 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 B2-61: Macroinvertebrate Observed and Expected Indices Summary

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	$LIFE_{FAMILY}$ Score Min - Max (AVG.)	PSI_{FAMILY} EQR Score Min - Max (AVG.)	PSI_{FAMILY} Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Score Min - Max (AVG.)	$WHPT_{ASPT}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{ASPT}$ Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Score Min - Max (AVG.)	$WHPT_{NTAXA}$ EQR Class Min - Max (AVG.) *B/P/M/G/H*	$WHPT_{NTAXA}$ Score Min - Max (AVG.)
151950	SE2247348302	26	2010 to 2024	0.89 - 1.01 (0.94)	6.96 - 7.83 (7.32)	0.67 - 1.14 (0.89)	48 - 77.27 (62.09)	0.8 - 1.03 (0.92)	M - H (G)	5.64 - 7.28 (6.39)	0.62 - 1.52 (1.11)	M - H (H)	16 - 38 (28)
183446	SE2289048104	10	2016 to 2022	0.93 - 1.05 (0.98)	6.86 - 7.67 (7.29)	0.63 - 1.05 (0.84)	43.6 - 70.45 (57.83)	0.83 - 1.08 (0.95)	M - H (G)	5.68 - 7.04 (6.16)	0.72 - 1.98 (1.41)	G - H (H)	11 - 33 (26)
184087	SE2308847662	2	2016	0.95 - 0.99 (0.97)	7.29 - 7.59 (7.44)	0.96 - 1.02 (0.99)	66.07 - 70.18 (68.13)	0.96 - 1.03 (1)	G - H (H)	6.47 - 6.91 (6.69)	1.28 - 1.32 (1.3)	H - H (H)	31 - 32 (32)
324	SE2311346457	27	2010 to 2023	0.93 - 1.08 (1)	7.09 - 8.38 (7.65)	0.82 - 1.23 (1.03)	54 - 83.87 (70.07)	0.92 - 1.16 (1)	G - H (H)	6.09 - 8.08 (6.82)	0.6 - 1.41 (1.06)	M - H (H)	16 - 38 (28)

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

Figure B2-7: Macroinvertebrate EQR scores (Top) and observed scores (Bottom) for $WHPT_{NTAXA}$, $WHPT_{ASPT}$, $LIFE_{FAMILY}$ and PSI_{FAMILY} scores

B2.7.4.2 Fish

The waterbody GB104027064020 Washburn Spinksburn BK (Swinsty Res) to Wharfe has an overall fish classification of 'moderate' for 2022 (Cycle 3). This classification is formed by two sites, D/S of Swinsty Reservoir (ID 3838) and U/S Leathley bridge (ID 34049). Swinsty Reservoir is located upstream of Lindley Wood Reservoir and as such, will be unaffected by the drought permit.

Baseline Fish assessment information for the reach is provided by six sites; U/S Leathley Bridge (ID 34049), u/s Lindley Bridge (ID RWL1), d/s Lindley Bridge (ID RWL2), d/s Fish Farm (ID RWL3), Fishpool (ID RWL4) and d/s Weir (ID RWL6).

EA site 34049 had baseline fisheries data from 2011 and 2015 with supplementary surveys commissioned by YWSL in 2015-2017 and 2020-21.

YWSL commissioned surveys at site RWL1, RWL3 and RWL6 in 2020 and 2021, at site RWL2 in 2015-2017 and 2020-2021 and at site RWL4 in 2015-2017 and 2020-2022.

Table B2-62 sets out the site and survey information for these sites.

The individual classification for D/S Swinsty Reservoir is poor for 2019 (Cycle 3) with a site EQR of 0.1118, based on the FCS2 EQR scores from the 2014 survey. Trout had a significantly lower observed density than expected, with a poor EQR score of 0.1067. The notably lower EQR score as a result of the low observed abundance of trout at the site had a significant effect in the overall site classification. Bullhead and stone loach are present at a level that meets/exceeds expectations, with an EQR scores of 1. Perch and 3-spine stickleback were observed at the site though both were not expected, with expected prevalence of less than 50%, being less likely to occur at the site than not. Both grayling and minnow were expected to be present with an expected prevalence of greater than 50%, though were absent from the 2014 survey. Though species richness was good, with five species observed, the absence of trout, to a lesser extent grayling and minnow, significantly affected the overall site status.

The individual classification for U/S Leathley bridge is good with a site EQR of 0.582, based on the FCS2 EQR scores from the 2015 survey. Seven species of fish were present, with seven predicted by FCS2, indicating good species richness. Trout had a slightly lower observed density than expected, with an EQR score of 0.5853. Similarly, grayling had a slightly lower observed density than expected, with an EQR score of 0.62. Bullhead, stone loach and minnow are present at a level that meets/exceeds expectations, with an EQR scores of 1. Both European eel and salmon were expected to be present, though at a medium prevalence (50-60%), though were absent from the 2015 survey. Minor species such as gudgeon and chub were also observed adding to the site's overall species richness. The relatively high diversity of the site significantly contributed to the 'good' overall site classification, even though the number of trout were below expected.

Data provided by YWSL provides further evidence for a fish population which is consistent with the available EA data. Fish presence in the reach is detailed in **Table B2-63**.

Bullhead was among the most frequently observed species across all surveyed sites, with counts ranging from moderate to very high. Sites like d/s Lindley Bridge in 2017 recorded the highest count of 167 individuals. Other sites, such as U/S Leathley Bridge, consistently recorded significant numbers of bullheads, with counts ranging from 60 to 81 over the survey years.

Atlantic salmon were observed in small numbers. Their presence was typically limited to one or two individuals at a few sites, such as Fishpool and d/s Lindley Bridge. This low abundance might reflect a limited habitat suitability for spawning or migration challenges in these areas.

Two categories of lamprey were recorded: unspecified Lamprey sp. and River Lamprey. Counts for these species were generally low, with Lamprey sp. seen sporadically at Fishpool (2 individuals in 2020) and d/s Weir (14 individuals in 2022). River lamprey were recorded even less frequently, with a few individuals recorded across scattered sites in 2021 only. These results suggest either a low abundance or specific habitat preferences not fully supported at the surveyed sites. It is likely that the Lamprey sp. recorded are all river lamprey, as there is no evidence of brook lamprey from any surveys conducted over the years. Notably, past surveys have either reported river lamprey or Lamprey sp., which may indicate a limitation in survey methodology rather than the confirmed presence of multiple lamprey

species. However, following the precautionary principle, the unspecified individuals remain classified as Lamprey sp. to account for the possibility that Brook Lamprey may also be present but undetected.

Grayling was sporadically present in limited numbers, typically fewer than 10 individuals per site. They were most frequently recorded at Fishpool and d/s Lindley Bridge, suggesting localised populations.

Gudgeon populations showed moderate abundance in some locations, with numbers occasionally exceeding 20 individuals, such as at Fishpool in 2022. While not as widespread as minnows or stone loach, their presence was notable at certain key sites.

Stone loach, minnow, and chub were recorded in varying numbers. Minnows showed particularly high abundance in some years, with 108 individuals recorded at d/s Weir in 2022. Stone loach were similarly abundant, reaching counts as high as 52 individuals at Fishpool. Chub, while less abundant than minnows and stone loach, were consistently present in moderate numbers across most sites.

Three-spined stickleback and perch were observed in small numbers intermittently across survey years. Sticklebacks with counts between one and three individuals. This drought option is not expected to have any detectable impact upon these minor species beyond their natural variation within the reach.

Full fish counts are available in **Annex 1** to this appendix.

Summary

The WFD status of the fish population in River Washburn 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.

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

Table B2-62: Fish survey site information

Site ID	Site Name	Survey NGR	Survey Method	Survey Count	Min Survey Year	Max Survey Year
34049	U/S Leathley Bridge (YW HMWB site 8)	SE2312046550	Electric Fishing (AC, PDC and DC)	6	2011	2021
RWL4	Fishpool	SE2308547286	Electric Fishing (AC, PDC and DC)	6	2015	2022
RWL2	d/s Lindley Bridge	SE2247348303	Electric Fishing (AC, PDC and DC)	5	2015	2021
RWL1	u/s Lindley Bridge	SE2243248327	Electric Fishing (AC, PDC and DC)	2	2020	2021
RWL3	d/s Fish Farm	SE2294848102	Electric Fishing (AC, PDC and DC)	2	2020	2021
RWL6	d/s Weir	SE2309646252	Electric Fishing (AC, PDC and DC)	2	2020	2021

Table B2-63: Fish survey results

Tolerance Category[6]	Species Name	2011	2015	2016	2017	2020	2021	2022
High tolerance	European eel	X	X	X	X	X	X	X
High tolerance	3-spined stickleback		X	X		X	X	
High tolerance	Perch		X	X		X	X	
Medium tolerance	Stone loach	X	X	X	X	X	X	X

Tolerance Category[6]	Species Name	2011	2015	2016	2017	2020	2021	2022
Medium tolerance	Minnow	X	X	X	X	X	X	X
Medium tolerance	Chub		X			X		X
Medium tolerance	Gudgeon		X		X	X	X	X
Low tolerance	Brown trout	X	X	X	X	X	X	X
Low tolerance	Bullhead	X	X	X	X	X	X	X
Low tolerance	Atlantic salmon				X	X	X	
Low tolerance	Lamprey sp.		X	X		X		X
Low tolerance	River lamprey						X	
Low tolerance	Grayling		X			X		

B2.7.4.3 WFD waterbody status

Table B2-64 summarises the WFD classifications of waterbodies which contain the impacted reach. **Table B2-64** also displays the objective status for 2027 (Cycle 3) or the predicted status in 2027 where the objective has met good status in 2022. This is displayed for overall, fish and macroinvertebrate elements and provides a comparison with 2022 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

Table B2-64: WFD classifications

Waterbody ID & Name		GB104027064020 Washburn Spinksburn Bk	**Sensitivity** *(Uncertain, High, Medium, Low, Not sensitive)*
Physical Environment Impact at Location (*Major, Moderate, Minor, Negligible*)		Major	
RBMP Cycle 3 Status/ Potential	Overall	Moderate	
	Fish	Moderate	Medium
	Macroinvertebrates	High	Medium
Hydro-morph designation		Heavily modified	
RBMP3 Waterbody Objective	Overall	Moderate	
	Fish	Moderate	
	Macroinvertebrates	Good	
Waterbody Measures		None	

B2.7.5 Invasive non-native species (INNS)

Table B2-65 summarises the INNS 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, as per the UKTAG INNS Alarm List [7] (see **Table B2-65**).

Table B2-65: 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)* New Zealand mud snail *(Potamopyrgus antipodarum)*	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
INNS – Terrestrial 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
Non-native Species – Fish Rainbow trout *(Oncorhynchus mykiss)*	Major	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No

B2.7.6 Landscape, navigation, recreation and heritage

Table B2-66 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 B2-66**).

Table B2-66: 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)*
Nidderdale National Landscape	Major	The National Landscape comprises certain water dependent habitats which depending on their location will have taken into account through consideration of Statutory designated sites	Not sensitive	No
Angling on River Wharfe	Major	Subject to review of water quality impacts	Minor	No

B3 ENVIRONMENTAL RECEPTORS SCREENING SUMMARY

Table B3-1: Environmental Receptors Summary of the North Area

Reach	Pott Beck 1	Burn 1	Holborn Beck 1	Laver 1	Oak Beck 1	Washburn 1	Washburn 2
Hydrological Impact	**Major**	**Major**	**Major**	**Minor (summer) Negligible (winter)**	**Major**	**Major**	**Major**
Associated Drought Options	**Leighton Reservoir**	**Leighton Reservoir**	**Lumley Moor Reservoir**	**Lumley Moor Reservoir**	**Haverah Park**	**Thruscross Reservoir**	**Lindley Wood Reservoir**
WFD Waterbody	GB104027069270 Leighton Beck from source to River Burn	GB104027069310 Burn from Leighton Beck to River Ure	GB104027069190 Laver from Carlesmoor Beck to Kex Beck	GB104027069190 Laver from Carlesmoor Beck to Kex Beck GB104027069260 Kex Beck and the Laver	GB104027063760 Oak Beck Catchment (Trib of Nidd)	GB104027064070 Washburn Source to Spinksburn Bk	GB104027064020 Washburn Spinksburn Bk
Statutory designated sites							
SSSI	X	X	X	X	X	X	X
SAC	X	X	X	X	X	X	X
SPA	X	X	X	X	X	X	X
NERC and Local Wildlife Sites							
NERC Habitat	X	X	X	X	X	✓	X
Local Wildlife Sites	X	X	X	X	X	X	X
NERC and other protected species							
Notable Macroinvertebrates	✓	✓	✓	X	✓	X	✓
White-clawed crayfish	✓	✓	✓	✓	✓	X	✓
Otter	✓	✓	✓	X	✓	✓	✓
Water vole	✓	✓	✓	X	✓	✓	✓
Atlantic salmon	X	✓	X	X	X	X	✓
Barbel	X	X	X	X	X	X	X
Brook lamprey	✓	✓	X	✓	X	✓	✓
Brown trout	✓	✓	✓	✓	✓	✓	✓

Reach	Pott Beck 1	Burn 1	Holborn Beck 1	Laver 1	Oak Beck 1	Washburn 1	Washburn 2
Hydrological Impact	**Major**	**Major**	**Major**	**Minor (summer) Negligible (winter)**	**Major**	**Major**	**Major**
Associated Drought Options	**Leighton Reservoir**	**Leighton Reservoir**	**Lumley Moor Reservoir**	**Lumley Moor Reservoir**	**Haverah Park**	**Thruscross Reservoir**	**Lindley Wood Reservoir**
WFD Waterbody	GB104027069270 Leighton Beck from source to River Burn	GB104027069310 Burn from Leighton Beck to River Ure	GB104027069190 Laver from Carlesmoor Beck to Kex Beck	GB104027069190 Laver from Carlesmoor Beck to Kex Beck GB104027069260 Kex Beck and the Laver	GB104027063760 Oak Beck Catchment (Trib of Nidd)	GB104027064070 Washburn Source to Spinksburn Bk	GB104027064020 Washburn Spinksburn Bk
Bullhead	✓	✓	✓	✓	✓	✓	✓
European eel	✓	✓	X	X	X	X	✓
Grayling	X	X	X	✓	X	X	✓
River lamprey	✓	✓	X	✓	X	X	✓
Birds	X	X	X	X	X	X	X
WFD Waterbody WFD Status Receptors							
Fish	✓	✓	✓	✓	✓	✓	✓
Macroinvertebrates	✓	✓	✓	✓	✓	✓	✓
Invasive non-native species (INNS)							
INNS – macroinvertebrates	X	X	X	X	X	X	X
INNS – plants	X	X	X	X	X	X	X
INNS – Fish	X	X	X	X	X	X	X
Landscape, navigation, recreation and heritage							
Receptors	X	X	X	X	X	X	X

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

B4 RECEPTOR ASSESSMENT, MONITORING & MITIGATION

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 2027 Environmental Assessment Methodology[8]. The potential changes to the physical environment as a result of drought option implementation are described in **Appendix A**.

An overall summary of the impacts on environmental receptors is provided in Section B.5 (see **Table B5-1**).

B4.1 POTT BECK 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 low due to the small number of surveys completed where the species were observed.

Table B4-1: Impacts on notable macroinvertebrates in Pott Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Ameletus inopinatus	• The species is associated with rapid 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	Low	Moderate
Atherix ibis	• The species is 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	Low	Moderate
Potamophylax rotundipennis	• The species is associated with slow flowing /standing water, any reduction is flow is unlikely to impact upon habitat availability. • There will be no likely impacts on the species as a result of water quality pressures	County	Low	Minor
Riolus subviolaceus	• The species is 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	Low	Moderate
Stagnicola palustris/ fuscus/ corvus	• The species is associated with slow flowing /standing water, any reduction is flow is unlikely to impact upon habitat availability. • There will be no likely impacts on the species as a result of water quality pressures.	County	Low	Minor

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

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Pott Beck 1 as a result of the implementation of the drought option is not feasible. However, as suitable habitat is present within the reach, in particular suitable habitat in the banks, it is possible that individuals will become stranded as river levels reduce and habitats become exposed.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-2.** The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are considered to be short-term and reversible. The overall confidence in the white-clawed crayfish data and subsequent assessment has been classed as low due to the low number of surveys and the age of the most recent surveys completed.

Table B4-2: Impacts on White-clawed crayfish in Pott Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
White–clawed crayfish	• Stranding and mortality as a result of a reduction in velocity, depth and/or wetted width. • Increased mortality (density dependant) as a result of increased predation. • Increased competition for resources as habitat availability reduces. • Water quality risks are considered minor and water quality related impacts are considered unlikely.	National	Low	Moderate

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-3**. The overall confidence in the data and subsequent assessment has been classed as low due to the lack of observations in the impacted reach-.

Table B4-3: Impacts on otter in Pott Beck 1

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

Water vole

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

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-4.** The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are considered to be short-term and reversible. The overall confidence in the water vole data and subsequent assessment has been classed as low due to the small number of surveys and the age of the most recent surveys completed where the species was observed.

Table B4-4: Impacts on water vole in Pott Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as minor and will not impact on this receptor. • Species has a preference for waterbodies that do not have extreme fluctuations in water level. • Increased predation as a result of decreased water width and exposure of burrows. • Reduction in wetted width could result in an increased distance between food sources and burrows. • Impacts could occur throughout the breeding season. • Altered food supply is possible, though increased density of crayfish could improve predation efficiency[9] . • Although spatially restricted, increased predation could have long-term effects. • Presence of this species within the reach is uncertain.	National	Medium	Moderate

Fish

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-5**. 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 B4-5: Impacts on NERC and notable fish species in Pott Beck 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• Minor risk of siltation of spawning gravels. • Potential exposure/loss of spawning, nursery, and resting habitats due to reduced flow and wetted width. • Risk of impeded migration during key life stages due to flow reduction at any time of year. • Increased competition, stress, and altered feeding or growth. • Stranding unlikely due to maintained connectivity. • Increased mortality risk from predation.	National	Medium	Moderate
European eel	• Potential loss of marginal and wetland habitats due to reduced flow. • Increased risk of predation and delayed migration.	National	Low	Moderate
River lamprey	• Potential habitat degradation due to reduced flow and sediment dynamics. • Minor risk of impaired movement.	National	Medium	Moderate
Brook lamprey	• Risk of habitat loss due to reduced flow and sedimentation. • Potential impacts to juvenile development.	Regional	Medium	Moderate
Bullhead	• It is noted that the depth of water is not critical to bullhead[10] and the species is also widespread within the catchment. • Potential localised impacts from flow reduction, particularly on foraging and breeding sites.	Regional	Low	Minor

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

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

B4.1.1.2 WFD features

The implementation of the drought option is expected to result in changes to the physical environment within Pott Beck 1, a 1.7km stretch of Pott Beck from Leighton Reservoir to the confluence with the River Burn**.** These predicted changes include:

- A **major** reduction in river flows of up to 67%, potentially occurring at any time of year (**Appendix A**);
- A **moderate** risk to river habitat from altered flow energy, reduced wetted area, and disruption to longitudinal connectivity;
- A **minor** risk to water quality, primarily due to reduced dilution capacity for diffuse inputs of ammonia, phosphate, and dissolved oxygen;
- No existing flow-depleted reaches or significant pressures from abstractions or discharges.

Despite the scale of change within this localised reach, its limited length and minor contribution to the wider water body and catchment mean that the potential influence on overall WFD classification outcomes is considered low.

The current WFD classification status for this water body reflects Good status for macroinvertebrates and Moderate status for fish (Cycles 2 and 3, 2013–2022).

Macroinvertebrates

The macroinvertebrate community in Pott Beck 1 shows good to high diversity, with evidence of sensitivity to both hydraulic and water quality pressures based on WHPT NTAXA, ASPT and LIFE scores. The predicted reduction in flow is likely to reduce wetted width and depth, resulting in some loss of available habitat and a reduction in flow velocity.

Although the drought option may result in substantial short-term impacts to the macroinvertebrate community, the overall risk of deterioration in WFD status is considered **moderate**, as identified in **Table B4-6**. This reflects the temporary and seasonal nature of the pressure, the community's ability to recover through effective recolonisation[11'12], and the resilience demonstrated in recent monitoring data. Confidence in this assessment is **high** based on the number and quality of available surveys.

Table B4-6: Impacts on macroinvertebrate communities.

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Moderate	High

Fish

The one classification site lies within the impacted reach, and the waterbody has remained at 'moderate' status since 2013. The predicted physical changes (**Appendix A**) may directly affect habitat availability and present a minor risk to longitudinal connectivity due to one weir located high within the reach.

No point-source water quality pressures are present within the reach and no flow depleted reaches. As such the drought option is predicted to present a **moderate risk** to the fish component of the water body and has potential to influence the overall classification outcome. Confidence in this assessment is **high** based on recent and spatially comprehensive fisheries data. The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-7.**

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

12 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 B4-7: 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.	Medium	Moderate	High

B4.1.2 Summary of Impacts

Table B4-8 summarises the outcomes of the Environmental receptors assessment and includes deterioration to fish and macroinvertebrate 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 Pott Beck 1's environmental receptors assessment.

Reach	Pott Beck 1	
	Significance of Impact/ Risk of Deterioration	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Ameletus inopinatus	Moderate	Yes
Atherix ibis	Moderate	Yes
Potamophylax rotundipennis	Minor	No
Riolus subviolaceus	Moderate	Yes
Stagnicola palustris/fuscus/corvus	Minor	No
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brook lamprey	Moderate	Yes
Brown trout	Moderate	Yes
Bullhead	Minor	No
European eel	Moderate	Yes
River lamprey	Moderate	Yes
WFD Status Receptors - GB104027069270 Leighton Beck from source to River Burn		
Invertebrates	Moderate	Yes
Fish	Moderate	Yes

B4.2 BURN 1

B4.2.1 Receptor assessment

B4.2.1.1 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 B4-9**. These impacts are evaluated using species' LIFE score categories, which classify invertebrates based on their reliance on specific flow conditions and their ability to tolerate changes in flow regimes. The overall confidence in the notable macroinvertebrate data and subsequent assessment has been classed as low due to the small number of surveys completed where the species were observed.

Table B4-9: Impacts on notable macroinvertebrates in Burn 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. However, reductions in flow will be temporary and will occur against a baseline of drought conditions. • Water quality risks are considered major. There is a risk of impacts on the species as a result of water quality pressures.	County	Low	Moderate
Capnia atra	• The species is associated with standing water therefore any reduction in flow in unlikely to impact habitat availability. • Water quality risks are considered major. There is a risk of impacts on the species as a result of water quality pressures.	County	Low	Minor

White-clawed crayfish

In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of the impact in Burn 1 as a result of the implementation of the drought option is not feasible.

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 overall confidence in the data and subsequent assessment has been classed as low due to the lack of quantitative data.

Table B4-10: Impacts on White-clawed crayfish in Burn 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 due to reduced suitability of habitat. • Water quality risks are considered major	National	Low	Moderate

Otter

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-11**. The overall confidence in the data and subsequent assessment has been classed as low due to the lack of quantitative data.

Table B4-11: Impacts on otter in Burn 1

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

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of impact in Burn 1 as a result of the implementation of the drought option is not feasible. The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are considered to be short-term and reversible.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-12.** The overall confidence in the data and subsequent assessment has been classed as low due to the lack of quantitative data.

Table B4-12: Impacts on water vole in Burn 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. • The reduction in wetted width would increase the distance between burrows and food sources. • Water vole are also known to use water to escape predators. • 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[13] and the potentially increased density of this species could lead to increased predation efficiency. • Although the impacts are restricted to the reach, the effects of increased predation upon the species could have long-term impacts. • There are uncertainties relating to the presence of this species with the impacted reach	National	Medium	Moderate

Fish

The hydrological and water quality impacts associated with the implementation of the drought option are identified in **Appendix A**, however the impact on individual fish species will vary.

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

Appendix A details the potential impact of the implementation of the associated drought option on ~520m of Burn 1 between the abstraction offtake and discharge of a fish farm. The overall confidence in the fisheries data and subsequent assessment has been classed as medium due to the number of surveys and the age of the most recent surveys completed.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-13.**

Table B4-13: Impacts on NERC and notable fish species in Burn 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Atlantic salmon	• Disrupted upstream/downstream migration due to reduced flows and barriers. • Loss of spawning and nursery habitat. • Risk of stranding and increased mortality from low dissolved oxygen and ammonia. • Siltation of gravels and reduced feeding/growth.	National	High	Major
Brown trout	• Loss of flow-dependent habitat and pool connectivity. • Increased competition for juvenile habitat. • Risk of siltation and thermal stress.	National	High	Major
River lamprey	• Migration potentially hindered by reduced flow and increased significance of barriers. • Risk of habitat loss and oxygen stress.	National	High	Major
Brook lamprey	• Sediment-dwelling juveniles at risk from habitat drying and siltation. • Reduced habitat availability.	Regional	High	Major
Bullhead	• Localised flow and habitat pressures. • Potential reduction in suitable substrate and shelter.	Regional	Medium	Moderate
European eel	• Fragmentation of habitats and disrupted upstream migration. • Increased sensitivity to low dissolved oxygen and barriers.	National	High	Major

B4.2.1.2 WFD features

The implementation of the drought option is expected to result in changes to the physical environment within Burn 1, a 7.3km stretch of the River Burn from the confluence with Pott Beck to the confluence with the River Ure**.** These predicted changes include:

- A **major** reduction in river flows of up to 60%, potentially occurring at any time of year (**Appendix A**);
- A **major** risk to river habitat from altered flow energy, reduced wetted area, and disruption to longitudinal connectivity;
- A **major** risk to water quality, primarily due to reduced dilution capacity for diffuse inputs of ammonia, phosphate, and dissolved oxygen;
- Approximately 520m of flow-depleted reaches with potential for periods of time with zero flow without mitigation

Given the scale of change within this localised reach and flow presence of flow-depleted reaches, the potential influence on overall WFD classification outcomes is considered high.

The current WFD classification status for this water body reflects High status for macroinvertebrates (Cycles 2 and 3, 2014–2022) and an improvement from Poor to Good status for fish from Cycle 2 to Cycle 3 (2022), respectively.

Macroinvertebrates

The macroinvertebrate community in Burn 1 shows good to high diversity and high sensitivity to both hydraulic and water quality pressures, as indicated by WHPT NTAXA, ASPT and LIFE scores. The predicted reduction in flow is expected to reduce wetted width, depth and flow velocity, leading to a loss of available habitat and temporary unsuitability for taxa requiring faster flows. Additionally, the presence of a ~520m flow-depleted reach and a major risk of water quality deterioration (due to reduced dilution of diffuse pollutants) may further impact sensitive taxa.

Given the scale and severity of predicted short-term pressures, the overall risk of deterioration in WFD status for macroinvertebrates is considered **major,** as identified in **Table B4-14**. This reflects the reach-scale habitat changes, the presence of a flow-depleted section, and the magnitude of water quality risks. Confidence in this assessment is **high**, based on the number and recency of available survey data.

Table B4-14: Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities. • Mortality as a result of water quality deterioration (oxygen stress).	Medium	Major	High

Fish

The fish community in Burn 1 is likely to be highly sensitive to the predicted physical changes, including reduced flows, degraded water quality, and impaired connectivity. Two in-channel structures and fords within the reach present a major risk to longitudinal connectivity under low-flow conditions, while the ~520m flow-depleted section has the potential to fragment habitat entirely during periods of no flow. In combination with a major risk of water quality deterioration (due to elevated ammonia and low dissolved oxygen), these changes could reduce fish resilience, hinder recovery, and increase mortality.

Although the fish population has shown recent improvement, the current ecological condition may be vulnerable to disturbance. The overall risk of deterioration in WFD status is considered **major**, reflecting the scale of hydrological and habitat pressures and the sensitivity of the fish community, as identified in **Table B4-15**. Confidence in this assessment is high, based on recent and spatially comprehensive survey data.

Table B4-15: Impacts on fish communities.

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows and reduction in longitudinal connectivity. • Reduction in salmonid spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of major risk of water quality deterioration (oxygen stress, ammonia toxicity).	High	Major	High

B4.2.2 Summary of Impacts

Table B4-16 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and macroinvertebrate receptors within WFD waterbodies and significance of impacts to Statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-16: Summary of Impacts identified in Burn 1's environmental receptors assessment.

Reach	Burn 1	
	Significance of Impact/ Risk of Deterioration	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Atherix ibis	Moderate	Yes
Capnia atra	Minor	No
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Atlantic salmon	Major	Yes
Brook lamprey	Major	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes
European eel	Major	Yes
River lamprey	Major	Yes
WFD Status Receptors - GB104027069310 Burn from Leighton Beck to River Ure		
Invertebrates	Major	Yes
Fish	Major	Yes

B4.3 HOLBORN BECK 1

B4.3.1 Receptor assessment

B4.3.1.1 NERC and other protected species

Notable Macroinvertebrates

The likely impacts on *Graptodytes flavipes* and their magnitude are identified in **Table B4-17**. There is uncertainty surrounding how this species might be impacted, as there is limited literature available in regards the life cycle and specific habitat requirements.

Table B4-17: Impacts on *Graptodytes flavipes* in Holborn Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Graptodytes flavipes	Reductions in wetted width and depth unlikely to reduce habitat availability for the species as the species has preference for slow flowing/ standing water. The species is considered moderately sensitive to water quality changes and water quality risks have been identified as minor.	Regional	Low	Minor

White-clawed crayfish

The likely impacts, and their magnitude are identified in **Table B4-18**. In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Holborn Beck 1 as a result of the implementation of the drought option is not feasible. These impacts are, however, considered to be small-scale and short-term as recolonisation could occur.

Table B4-18: Impacts on white-clawed crayfish in Holborn Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
White–clawed crayfish	• Stranding and mortality as a result of a reduction in velocity, depth and/or wetted width. • Increased mortality (density dependant) as a result of increased predation. • Increased competition for resources due to reduced habitat and food availability • Water quality risks are considered minor and water quality related impacts are considered unlikely.	National	Medium	Moderate

Otter

The likely impacts on otter and their magnitude are identified in **Table B4-19.**

Table B4-19: Impacts on otter in Holborn Beck 1

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

Water vole

The likely impacts and their magnitude are identified in **Table B4-20**. In the absence of quantitative data on populations of water vole a detailed assessment of impact in Holborn Beck 1 as a result of the implementation of the drought option is not feasible.

Table B4-20: Impacts on water vole in Holborn Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as minor and will not impact on this receptor. • Species has a preference for waterbodies that do not have extreme fluctuations in water level. • It should be noted that the risk to decreased wetted width is minor in this reach. • Alteration to food supply although the species has been known to feed upon crayfish at times and the potentially increased density of this species could lead to increased predation efficiency. • Although the impacts are restricted to the reach, the effects of increased predation upon the species could have long-term impacts. • There are uncertainties relating to the presence of this species with the impacted reach.	National	Low	Moderate

Fish

The likely impacts on notable fish species, and their magnitude are identified in **Table B4-21**. The hydrological and water quality impacts associated with the implementation of the drought option are identified in **Appendix A**, however the impact on individual fish species will vary.

Table B4-21: Impacts on NERC and notable fish species in Holborn Beck 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• Exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) due to moderate risk to loss of longitudinal connectivity and reduced flows and wetted width. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration. • Fragmentation of habitats and increased significance of obstacles/barriers due to risk to longitudinal connectivity. • Stranding of individuals as a result of a loss of connectivity. • Increased mortality (density-dependent) as a result of increased predation. • Reduced flow during downstream and upstream migration could impede movement between spawning and nursery areas at any life stage. • Minor risk of siltation of spawning gravels.	National	Medium	Moderate
Bullhead	• An increased risk of fine sediment deposition and reduced prey availability due to low flows and habitat alteration. • Exposure to thermal and predation stress may increase slightly under prolonged low flows. • However, the species' tolerance to depth and its widespread distribution within the catchment suggest a minor overall impact.	Regional	Low	Minor

B4.3.1.2 WFD features

The implementation of the drought option is expected to result in changes to the physical environment within Holborn Beck 1, comprises a 2.2km stretch of Holborn Beck from Lumley Moor Reservoir to the confluence with the River Laver**.** These predicted changes include:

- A **major** reduction in river flows of up to 67%, potentially occurring at any time of year (**Appendix A**);
- A **moderate** risk to river habitat from altered flow energy, reduced wetted area, and disruption to longitudinal connectivity;
- A **minor** risk to water quality, primarily due to reduced dilution capacity for diffuse inputs of ammonia, phosphate, and dissolved oxygen;
- No existing flow-depleted reaches or significant pressures from abstractions or discharges.

Despite the scale of change within this localised reach, with no flow depleted reaches and limited water quality pressures, the potential influence on overall WFD classification outcomes is considered low.

Water body GB104027069190 has consistently achieved High status for macroinvertebrates between Cycle 2 and Cycle 3 (2014–2022). The fish component declined from Good status in 2013 to Moderate from 2014-2022.

Macroinvertebrates

The macroinvertebrate community in Holborn Beck 1 shows moderate diversity and high sensitivity to hydraulic and water quality pressures, as indicated by WHPT NTAXA, ASPT and LIFE scores. The predicted reduction in flow is likely to reduce wetted width and depth, resulting in some loss of available habitat and a reduction in flow velocity. This may temporarily affect species reliant on faster-flowing conditions.

Although the drought option may result in short-term physical habitat changes, the overall risk of deterioration in WFD status is considered **minor**, as identified in **Table B4-22**. This reflects the localised scale of the pressure, the community's resilience, and its ability to recover through effective recolonisation. Confidence in this assessment is **medium** due to the limited number of surveys completed within the reach.

Table B4-22: Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities.	Medium	Minor	Medium

Fish

No classification sites are within the impacted reach, and the waterbody has remained at 'moderate' status since 2013. The predicted physical changes (**Appendix A**) may directly affect habitat availability and present a moderate risk to longitudinal connectivity due to the steep nature of the channel.

No point-source water quality pressures are present within the reach and no flow depleted reaches. As such the drought option is predicted to present a **minor risk** to the fish component of the water body and is unlikely to influence the overall classification outcome. Confidence in this assessment is **high** based on recent and spatially comprehensive fisheries data. The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-23.**

Table B4-23: Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation.	Medium	Minor	Medium

B4.3.2 Summary of Impacts

Table B4-24 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and macroinvertebrate receptors within WFD waterbodies and significance of impacts to Statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-24: Summary of Impacts identified in Holborn Beck 1's environmental receptors assessment

Reach	Holborn Beck 1	
	Significance of Impact/ Risk of Deterioration	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Graptodytes flavipes	Minor	No
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Moderate	Yes
Bullhead	Minor	No
WFD Status Receptors - GB104027069190 Laver from Carlesmoor Beck to Kex Beck		
Invertebrates	Minor	No
Fish	Minor	No

B4.4 LAVER 1

B4.4.1 Receptor assessment

B4.4.1.1 NERC and other protected species

White-clawed Crayfish

The likely impacts and their magnitude are identified in **Table B4-25**. In the absence of quantitative data on populations of white-clawed crayfish a full/detailed assessment of impact in Laver 1 as a result of the implementation of the drought option is not feasible. The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are considered to be short-term and reversible.

The overall confidence in the white-clawed crayfish data and subsequent assessment has been classed as medium due to the low number of surveys and the age of the most recent surveys completed.

Table B4-25: Impacts on white-clawed crayfish in Laver 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
White–clawed crayfish	The limited impacts on the foraging habitat and food source in this reach will likely result in negligible impacts on this receptor	National	Negligible	Negligible

Fish

The likely impacts and their magnitude are identified in **Table B4-26**. Although a precautionary approach has been adopted due to some uncertainty around the timing and duration of implementation, the predicted flow reductions are minor, limited to the summer months, and of short duration. The absence of flow-depleted reaches, limited risk to longitudinal connectivity, and low sensitivity of the reach to water quality pressures reduce the likelihood of significant ecological effects. As such, impacts to NERC and other notable fish species are assessed as **negligible**. The overall confidence in the fisheries data and subsequent assessment has been classed as **medium**, reflecting the number and age of the available surveys.

Table B4-26: Impacts on NERC and notable fish species in Laver 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	The limited impacts on the habitat availability and quality in this reach will likely result in negligible impacts on this receptor.	National	Negligible	Negligible
Brook Lamprey		Regional	Negligible	Negligible
Grayling		Regional	Negligible	Negligible
Bullhead		Regional	Negligible	Negligible
River Lamprey		National	Negligible	Negligible

B4.4.1.2 WFD features

The implementation of the drought option is expected to result in changes to the physical environment within Laver 1, a 10.4km stretch of the River Laver from Holborn Beck to the confluence with the River Skell**.** These predicted changes include:

- A **minor** reduction in river flows of up to 13% in summer, and potentially **negligible** impact during winter months (**Appendix A**);
- A **minor** risk to river habitat from altered flow energy, reduced wetted area, and disruption to longitudinal connectivity;

- A **minor** risk to water quality, primarily due to reduced dilution capacity for diffuse inputs of ammonia, phosphate, and dissolved oxygen;
- No existing flow-depleted reaches or significant pressures from abstractions or discharges.

Despite seasonal flow changes within this localised reach, with no flow depleted reaches and limited water quality pressures, the potential influence on overall WFD classification outcomes is considered low.

Water body GB104027069260 has consistently achieved Good status for macroinvertebrates between Cycle 2 and Cycle 3 (2014–2022). The fish component improved from Poor status from 2013-2014, Good from 2015-2016, and Moderate from 2019-2022.

Water body GB104027069190 has consistently achieved High status for macroinvertebrates between Cycle 2 and Cycle 3 (2014–2022). The fish component declined from Good status in 2013 to Moderate from 2014-2022.

Macroinvertebrates

The macroinvertebrate community in Laver 1 shows good to high diversity, with sensitivity to both hydraulic and water quality pressures based on WHPT and LIFE scores. Predicted changes are limited to the summer period, during which minor reductions in flow may slightly reduce wetted area and flow velocity, temporarily affecting species reliant on faster-flowing conditions. Water quality risks are also minor and restricted to this seasonal window, driven by reduced dilution capacity for diffuse inputs.

Although the drought option may cause short-term changes during summer, the overall risk of deterioration in WFD status is considered **negligible**, as identified in **Table B4-27**. This reflects the seasonal and limited nature of the pressure, the absence of significant environmental constraints, and the community's potential for recovery. Confidence in this assessment is **medium** due to gaps in recent monitoring data.

Table B4-27 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
Negligible impacts on the community	Negligible	Negligible	Medium

Fish

No classification sites are within the impacted reach, and both WFD waterbodies has remained at 'moderate' status since 2015. The predicted physical changes (**Appendix A**) may directly affect habitat availability and present a minor risk to longitudinal connectivity due to five in-channel structures.

No point-source water quality pressures are present within the reach and no flow depleted reaches. As such the drought option is predicted to present a **minor risk** to the fish component of the water body and is unlikely to influence the overall classification outcome. Confidence in this assessment is **high** based on recent and spatially comprehensive fisheries data. The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-28.**

Table B4-28 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
Negligible impact of fish communities	Negligible	Negligible	Medium

B4.4.2 Summary of Impacts

Table B4-29 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and macroinvertebrate receptors within WFD waterbodies and significance of impacts to Statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-29: Summary of Impacts identified in Laver 1's environmental receptors assessment

Reach	Laver 1	
	Significance of Impact/ Risk of Deterioration	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
White-clawed crayfish	Negligible	No
Brown trout	Negligible	No
Bullhead	Negligible	No
Brook Lamprey	Negligible	No
Grayling	Negligible	No
River Lamprey	Negligible	No
WFD Status Receptors: **GB104027069190 Laver from Carlesmoor Beck to Kex Beck** **GB104027069260 Kex Beck and the Laver**		
Invertebrates	Negligible	No
Fish	Negligible	No

B4.5 OAK BECK 1

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 B4-30**.These impacts are evaluated using species' LIFE score categories, which classify invertebrates based on their reliance on specific flow conditions and their ability to tolerate changes in flow regimes.

The overall confidence in the notable macroinvertebrate data and subsequent assessment has been classed as low due to the small number of surveys completed where the species were observed.

Table B4-30: Impacts on *Hydraena palustris* in Oak Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Hydraena palustris	• There is uncertainty surrounding how this species might be impacted, as there is limited literature available in regards the life cycle and specific habitat requirements. Possible mortality as a result of water quality deterioration	Regional	Low	Minor
Rhithrogena germanica	• The species is associated with rapid 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 possible impacts on the species as a result of moderate risk of water quality pressures.	County	Low	Moderate
Strictonectes lepidus	• Reductions in wetted width and depth unlikely to reduce habitat availability for the species as the species has preference for slow flowing/ standing water. • Possible mortality as a result of moderate risk of water quality deterioration	Regional	Medium	Moderate

White-clawed Crayfish

The likely impacts and their magnitude are identified in **Table B4-31**. In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Oak Beck 1 as a result of the implementation of the drought option is not feasible. However, as suitable habitat is present within the reach, in particular suitable habitat in the banks, it is possible that individuals will become stranded as river levels reduce and habitats become exposed. The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are considered to be short-term and reversible.

The overall confidence in the white-clawed crayfish data and subsequent assessment has been classed as medium due to the low number of surveys and the age of the most recent surveys completed.

Table B4-31: Impacts on White-clawed Crayfish in Oak Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
White-clawed crayfish	• Stranding and mortality as a result of a reduction in velocity, depth and/or wetted width. • Mortality as a result of water quality deterioration (especially oxygen stress) due to moderate risk to water quality. • Increased mortality (density dependant) as a result of increased predation. • Increased competition due to reduction in habitat availability and food source.	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 B4-32**.

The overall confidence in the data and subsequent assessment has been classed as low due to the lack of quantitative data.

Table B4-32: Impacts on otter in Oak Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Otter	• Increased efficiency in predation as a result of higher densities of prey species (fish and white-clawed crayfish) • Species likely to remain in the reach longer due to increased prey availability. • Otter likely to move to unaffected reaches in catchment.	International	Negligible	Negligible

Water vole

The likely impacts and their magnitude are identified in **Table B4-33**. In the absence of quantitative data on populations of water vole a detailed assessment of impact in Oak Beck 1 as a result of the implementation of the drought option is not feasible.

Considering the ecological value of the species the significance of impact is considered to be **moderate** on a precautionary basis**.** However, there are uncertainties relating to the presence of this species with the impacted reach, and therefore the overall confidence in the water vole data and subsequent assessment has been classed as low.

Table B4-33: Impacts on water vole in Oak Beck 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as moderate but will not impact on this receptor. • Species has a preference for waterbodies that do not have extreme fluctuations in water level. • The reduction in wetted with will increase the distance from burrows and food sources. • Increased predation as a result of decreased water width and exposure of burrows.	National	Medium	Moderate

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• Alteration to food supply although the species has been known to feed upon crayfish at times[14] and the potentially increased density of this species could lead to increased predation efficiency. • Although the impacts are restricted to the reach, the effects of increased predation upon the species could have long-term impacts. • There are uncertainties relating to the presence of this species with the impacted reach.			

Fish

The likely impacts and their magnitude are identified in **Table B4-34.** The hydrological and water quality impacts of the drought option, as identified in **Appendix A**, however the impact on individual fish species will vary.

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 B4-34: Impacts on NERC and notable fish species in Oak Beck 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• Exposure/loss of important habitats (spawning gravels, nursery habitat, resting pools) due to moderate risk to loss of longitudinal connectivity and reduced flows and wetted width. • Increased stress and competition could result in decreased growth, morphological change and/or alteration to feeding and migration. • Fragmentation of habitats and increased significance of obstacles/barriers due to risk to longitudinal connectivity. • Stranding of individuals as a result of a loss of connectivity. • Increased mortality (density-dependent) as a result of increased predation. • Reduced flow during downstream and upstream migration could impede movement between spawning and nursery areas at any life stage. • Minor risk of siltation of spawning gravels.	National	High	Major
Bullhead	• An increased risk of fine sediment deposition and reduced prey availability due to low flows and habitat alteration. • Exposure to thermal and predation stress may increase slightly under prolonged low flows. • However, the species' tolerance to depth and its widespread distribution within the catchment suggest a minor overall impact.	Regional	Medium	Moderate

B4.5.1.2 WFD features

The implementation of the drought option is expected to result in changes to the physical environment within Oak Beck 1, a 11.8km stretch of Oak Beck from the confluence between Beaver Dyke and Scargill Beck to the confluence with the River Nidd These predicted changes include:

- A **major** reduction in river flows of up to 67%, potentially occurring at any time of year (**Appendix A**);
- A **major** risk to river habitat from altered flow energy, reduced wetted area, and disruption to longitudinal connectivity;

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

- A **moderate** risk to water quality, primarily short term acute, infrequent, temporary water quality pressures to ammonia and dissolved oxygen locally downstream of 22 listed CSOs during rainfall events.
- No existing flow-depleted reaches or significant pressures from abstractions or discharges.

Given the scale of change within this localised reach and no continuous water quality pressures, the potential influence on overall WFD classification outcomes is considered low.

Water body GB104027063760 has consistently achieved Good status for macroinvertebrates and Moderate status for fish between Cycle 2 and Cycle 3 (2014–2022).

Macroinvertebrates

The macroinvertebrate community in Oak Beck 1 shows good to high diversity, with sensitivity to both hydraulic and water quality pressures based on WHPT NTAXA, ASPT and LIFE scores. Predicted reductions in flow may reduce wetted area and flow velocity, temporarily affecting species reliant on faster-flowing conditions. The community shows some impairment from existing water quality pressures, and short-term water quality deterioration may occur locally downstream of CSOs during rainfall events, increasing the risk of ammonia toxicity or oxygen sags.

Although the drought option may result in substantial short-term impacts to the macroinvertebrate community, the overall risk of deterioration in WFD status is considered **moderate**, as identified in **Table B4-35**. . This reflects the temporary and seasonal nature of the pressure, the community's ability to recover through effective recolonisation, and the resilience demonstrated in recent monitoring data. Confidence in this assessment is b based on the number and spatial coverage of available surveys.

Table B4-35 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities. • Mortality as a result of water quality deterioration (oxygen stress).	Medium	Moderate	High

Fish

The classification site lies within the impacted reach, and the waterbody has remained at 'moderate' status since 2013. The predicted physical changes (**Appendix A**) may directly affect habitat availability and present a major risk to longitudinal connectivity due to three in-channel structures within the reach.

There are no flow depleted reaches within Oak Beck 1, however, a moderate risk to water quality from acute ammonia toxicity and dissolved oxygen sags associated with the CSOs may reduce fish resilience. As such the drought option is predicted to present a **major risk** to the fish component of the water body and has potential to influence the overall classification outcome. Confidence in this assessment is **high** based on recent and spatially comprehensive fisheries data. The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-36.**

Table B4-36 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows and reduction in longitudinal connectivity. • Reduction in salmonid spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of major risk of water quality deterioration (acute ammonia toxicity and oxygen sags).	High	Major	High

B4.5.2 Summary of Impacts

Table B4-37 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and macroinvertebrate receptors within WFD waterbodies and significance of impacts to Statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-37: Summary of Impacts identified in Oak Beck 1's environmental receptors assessment.

Reach	**Oak Beck 1**	
	Significance of Impact/ Risk of Deterioration	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Hydraena palustris	Minor	No
Rhithrogena germanica	Moderate	Yes
Stictonectes lepidus	Moderate	Yes
White-clawed crayfish	Moderate	Yes
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes
WFD Status Receptors - GB104027063760 Oak Beck Catchment (Trib of Nidd)		
Invertebrates	Moderate	Yes
Fish	Major	Yes

B4.6 WASHBURN 1

B4.6.1 Receptor assessment

B4.6.1.1 NERC and Local Wildlife Sites

NERC Habitat

The likely impacts on NERC habitat and their magnitude are identified in **Table B4-38**

Table B4-38: Impacts on NERC habitats in Washburn 1

Receptor	Impact	Ecological Value of Feature	Impact Magnitude	Significance of Impact
NERC Habitat - 412935	• Habitat degradation as a result of decreased river flows in the impacted reach • Impacts are likely to be associated with a loss in connectivity with habitats, but there remains some uncertainty regarding the current connectivity. • However, impacts due to loss of connectivity with the impacted reach, are not expected to be significantly increased by implementation of the drought option against a baseline of reduced flows characteristic of drought	County	Low	Minor

B4.6.1.2 NERC and other protected species

Otter

The likely impacts and their magnitude are identified in **Table B4-39**. The hydrological and water quality impacts of the drought option, as identified in **Appendix A**, are considered likely to have a limited impact upon otter in the identified reach. However, this impact is unlikely to have any real effect on otter, with the exception of them possibly remaining within the reach longer than normal, with the impact magnitude considered to be **negligible**.

Table B4-39: Impacts on otter in Washburn 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Otter	• Species likely to remain in the reach longer due to increased prey availability. • Otter likely to move to unaffected reaches in catchment	International	Negligible	Negligible

Water vole

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-40**. In the absence of quantitative data on populations of water vole a detailed assessment of impact in Washburn 1 as a result of the implementation of the drought option is not feasible.

Table B4-40: Impacts on water vole in Washburn 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.	National	Medium	Moderate

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
	• There is a major risk that wetted width could decrease resulting in an increase in the distance from 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[15] and the potentially increased density of this species could lead to increased predation efficiency.			

Fish

The likely impacts and their magnitude are identified in **Table B4-41**. The hydrological and water quality impacts of the drought permit are identified in **Appendix A**. The fish population recorded in the available dataset reflects the original compensation regime in the waterbody (pre-2016) and as such the fish population was known to be subjected to flow pressure associated periods of low flow due to the lack of compensation from the reservoir and very high flows from releases for canoe events and seasonal overtopping. Since 2016 the flow regime is expected to reflect reduced severity of high and low flows and as such is expected to support an improved fish population.

Table B4-41: Impacts on NERC and notable fish species in Washburn 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Brown trout	• Exposure or loss of critical habitats (spawning gravels, nursery areas, resting pools) due to reduced flows and wetted width. • Increased risk of stranding in isolated pools, particularly in flow-depleted sections. • Migration routes may be impeded by reduced flow and the presence of in-channel barriers (e.g. weirs). • Elevated stress and density-dependent effects (e.g. predation, competition). • Risk of reduced growth or altered behaviour during prolonged low flow.	National	High	Major
Brook lamprey	• Potential loss of fine sediment habitats required for ammocoete larvae due to reduced wetted width. • Reduced connectivity and available microhabitats may hinder dispersal and development. • Risk to larval survival during prolonged low flow periods.	Regional	High	Major
Bullhead	• Tolerant of shallow, variable conditions and widely distributed in the catchment. • Some localised loss of habitat may occur due to reduced wetted area and velocity, but population-level impacts are unlikely. • Low risk of stranding or barriers due to behavioural plasticity and habitat resilience.	Regional	Medium	Moderate

B4.6.1.3 WFD features

The implementation of the drought option is expected to result in changes to the physical environment within Washburn 1, a 2.9km stretch of the River Washburn from Thruscross Reservoir to the next impounding reservoir, Fewston Reservoir**.** These predicted changes include:

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

- A **major** reduction in river flows of up to 67%, potentially occurring at any time of year, with the lowest remaining flow period between mid-May to mid-October (**Appendix A**);
- A **moderate** risk to river habitat from altered flow energy, reduced wetted area, and disruption to longitudinal connectivity;
- A **minor** risk to water quality, primarily due to reduced dilution capacity for diffuse inputs of ammonia, phosphate, and dissolved oxygen;
- No existing flow-depleted reaches or significant pressures from abstractions or discharges.

Despite the scale of change within this localised reach, the minor contribution to the wider water body and catchment mean that the potential influence on overall WFD classification outcomes is considered low.

Water body GB104027064070 has consistently achieved Good status for macroinvertebrates, with the exception of 2016 (Moderate status), between Cycle 2 and Cycle 3 (2014–2019). The fish component improved from Poor status (2013-2014) to Moderate (2015-2019) between Cycle 2 and Cycle 3.

Macroinvertebrates

The macroinvertebrate community in Washburn 1 has shown improvement since the introduction of a seasonal compensation flow in 2016, with WHPT scores reflecting recovery from previous flow pressures. The community demonstrates sensitivity to both low and high flow conditions and benefits from stable wetted habitat. Predicted reductions in flow during the drought permit period may temporarily hinder this recovery by reducing flow velocity, wetted area, and habitat quality. Recolonisation potential is limited due to the upstream reservoir, reducing opportunities for downstream drift.

Although the drought option may result in substantial short-term impacts to the macroinvertebrate community, the overall risk of deterioration in WFD status is considered **moderate**, as identified in **Table B4-42**. This reflects the temporary and seasonal nature of the pressure, the partial recovery already observed under the existing flow regime, and the limited but not absent recolonisation potential. Confidence in this assessment is **medium** based on the number and recency of available surveys.

Table B4-42 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities. • Mortality as a result of water quality deterioration (oxygen stress).	Medium	Moderate	Medium

Fish

The fish community in Washburn 1 has remained at Moderate status since 2015, following an improvement from Poor between 2013 and 2014. Both classification sites lie within the impacted reach, and predicted reductions in flow may reduce habitat availability and present a major risk to longitudinal connectivity due to the presence of in-channel structures. Although there are no flow-depleted reaches or continuous point-source pressures, reduced flows could impair movement and resilience, particularly for trout, bullhead, and brook lamprey.

Impacts to the fish population of the waterbody has been and are assessed as having a major impact magnitude for trout and moderate impact magnitude for bullhead and brook lamprey

Based on predicted hydrological changes and sensitivity of species, the potential impact magnitude is considered major for trout and moderate for bullhead and brook lamprey, detailed above in **Section B4.6.1**. Although baseline status is already Moderate, the drought option presents a **major** risk to the fish component due to the potential for habitat fragmentation and reduced ecological function, as identified in **Table B4-43**. Confidence in this assessment is **medium**, reflecting spatially comprehensive but infrequently repeated surveys, most recently undertaken in 2019.

Table B4-43 Impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows and reduction in longitudinal connectivity. • Reduction in salmonid spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation.	High	Major	Medium

B4.6.2 Summary of Impacts

Table B4-44 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and invertebrate features within WFD waterbodies and significance of impacts to Statutory designated sites, NERC Act Section 41 features and other significant receptors.

Table B4-44: Summary of Impacts identified in River Washburn 1's environmental receptors assessment.

Reach	Washburn 1	
	Significance of Impact/ Risk of Deterioration	**Mitigation Required** *(Y/N)*
NERC and Local Wildlife Sites		
NERC habitat lowland fen - 412935	Minor	No
NERC and Notable Species Receptors		
Otter	Negligible	No
Water vole	Moderate	Yes
Brown trout	Major	Yes
Brook lamprey	Major	Yes
Bullhead	Moderate	Yes
WFD Status Receptors GB104027064070 Washburn Source to Spinksburn Bk		
Invertebrates	Moderate	Yes
Fish	Major	Yes

B4.7 WASHBURN 2

B4.7.1 Receptor assessment

B4.7.1.1 NERC and other protected species

Notable Macroinvertebrates

The likely impacts arising from the hydrological changes as a result of the drought options associated with Washburn 2 are identified in **Table B4-45.** The hydrological impacts in Washburn 2 of the associated drought permit will manifest as reductions in wetted width and depth for the duration of the drought permit. This will reduce availability of habitat for the species.

Table B4-45: Impacts on notable macroinvertebrates in River Washburn 2

Notable 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. • Risk of flow depleted reach would result in mortality • There is a major risk of impacts on the species as a result of water quality pressures	County	High	Moderate
Paraleptophlebia cincta	• The species is associated with moderate/fast flows therefore any reduction in flow could potentially impact habitat availability. • Risk of flow depleted reach would result in mortality • There is a major risk of impacts on the species as a result of water quality pressures	County	High	Moderate
Potamophylax rotundipennis	• The species is associated with slow flowing /standing water, any reduction is flow with the exception of flow depleted reaches is unlikely to impact upon habitat availability	County	Low	Minor
Psychomyia fragilis	• The species is associated with moderate/fast flows therefore reductions in wetted width and depth will reduce habitat availability for the species • Mortality as a result of water quality deterioration	County	High	Moderate
Rhyacophila fasciata/ septentrionis	• Reductions in wetted width and depth could reduce habitat availability for the species as species has a preference for rapid flows. • The species is sensitive to water quality changes, there is a major risk of impacts on the species as a result of water quality pressures	County	High	Moderate
Wormaldia subnigra	• Species associated with rapid flows, The combined major physical environment (River flows, river habitat and water quality) impacts on the reach are likely to lead to mortality. • There is a major risk of impacts on the species as a result of water quality pressures	County	High	Moderate

White-clawed Crayfish

The likely impacts and their magnitude are identified in **Table B4-46**. In the absence of quantitative data on populations of white-clawed crayfish a detailed assessment of impact in Washburn 2 as a result of the implementation of the drought option is not feasible. These impacts are considered to be of **major** significance.

Table B4-46: Impacts on White-clawed Crayfish in Washburn 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. • Mortality as a result of water quality deterioration (especially oxygen stress) • Increased mortality (density dependant) as a result of increased predation	National	High	Major

Otter

The likely impacts and their magnitude are identified in **Table B4-47**. The hydrological and water quality impacts of the drought option, as identified in **Appendix A**, are considered likely to have a low impact upon otter in the identified reach. However, this impact is unlikely to have any real effect on otter, with the exception of them possibly remaining within the reach longer than normal, with the impact magnitude considered to be **negligible**.

Table B4-47: Impacts on otter in Washburn 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) • Species likely to remain in the reach longer due to increased prey availability • Otter likely to move to unaffected reaches in catchment	International	Negligible	Negligible

Water vole

The likely impacts and their magnitude are identified in **Table B4-48**. In the absence of quantitative data on populations of water vole a detailed assessment of impact in Washburn 2 as a result of the implementation of the drought option is not feasible. The potential reduction in flow may impact water vole, as burrow located along the banks on the ~670m potentially depleted reach without mitigation within Washburn 2. There are uncertainties relating to the presence of this species with the impacted reach.

Table B4-48: Impacts on water vole in Washburn 2

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Water vole	• Risk of deterioration in water quality has been identified as major but is unlikely to directly impact on the receptor. • Species has a preference for waterbodies that do not have extreme fluctuations in water level. • 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

Fish

The likely impacts and their magnitude are identified in **Table B4-49**. The hydrological and water quality impacts of the drought option, as identified in **Appendix A**, are considered to have a varying impact upon fish species in Washburn 2. Targeted survey information for brook lamprey was not available, and thus the population size is unlikely to be accurately represented. **Appendix A** also details the potential impact of the

implementation of the associated drought option on ~670m depleted reach with potential for zero flow without mitigation within Washburn 2.

Table B4-49: Impacts on NERC and notable fish species in Washburn 2

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Atlantic salmon	• Likely downstream relocation under drought conditions. • Major risk of impaired migration due to potential flow-depleted reach and loss of longitudinal connectivity. • Risk of delay or failure of smolt outmigration and adult return. • Loss of spawning, nursery and resting habitats. • Increased mortality from predation and poor water quality (e.g. oxygen stress, gill clogging).	National	High	Major
Brown trout	• Exposure/loss of key habitats due to reduced flows and wetted width. • Risk of stranding and increased competition. • Migration may be delayed or impeded by barriers and low flows. • Increased mortality from predation and degraded water quality. • Sensitive to flow and oxygen conditions.	National	High	Major
Grayling	• Sensitive to flow and oxygen conditions. • Risk of habitat loss during spawning and juvenile stages. • Moderate risk of oxygen stress in low flow conditions.	Regional	Medium	Moderate
Brook lamprey	• Loss of fine sediment larval habitat due to reduced wetted area. • Flow changes may hinder larval development and dispersal. • Sensitive to hydrological instability.	Regional	Medium	Major
Bullhead	• Some habitat loss expected, but species tolerant of shallow water and flow variation. • Low sensitivity to reduced depth. • Localised impacts likely but population-level risk is moderate.	Regional	Medium	Moderate
European eel	• Loss of marginal and wetland habitats may affect juveniles and adults. • Moderate risk of barrier significance and stranding. • Sensitive to reduced dissolved oxygen levels.	National	Medium	Moderate
River lamprey	• Migration may be delayed by barriers and low flow. • Risk of habitat fragmentation and larval habitat loss. • Increased stress from reduced flow and water quality.	National	High	Major

B4.7.1.2 WFD features

The implementation of the drought option is expected to result in changes to the physical environment within Washburn 2 comprises a 4.3km stretch of the River Washburn from Lindley Wood Reservoir to the confluence with the River Wharfe**.** These predicted changes include:

- A **major** reduction in river flows of up to 67%, potentially occurring at any time of year
- A **major** risk to river habitat from altered flow energy, reduced wetted area, and disruption to longitudinal connectivity;
- A **major** risk to water quality, primarily due to reduced dilution capacity for diffuse inputs of ammonia, phosphate, and dissolved oxygen without mitigation
- ~670m flow-depleted reaches with potential for zero flow without mitigation.

The scale of change in river flow and water quality pressures including potential total ammonia discharge into flow depleted reaches indicate that the potential influence on overall WFD classification outcomes is considered high.

Water body GB104027064020 achieved Good to High status in Cycle 2 (2014-2016) and High status in Cycle 3 (2019-2022). The fish component status declined from Moderate in early Cycle 2, to Poor in 2015-2016, returning to Moderate in Cycle 3 (2019-2022).

Macroinvertebrates

The macroinvertebrate community in Washburn 2 demonstrates good to high diversity, as reflected by WHPT $_{NTAXA}$ EQRs, and shows sensitivity to both hydraulic and water quality pressures, indicated by high LIFE and WHPT $_{ASPT}$ scores. Predicted reductions in flow may significantly reduce wetted width and depth, limiting available habitat and decreasing flow velocities. This could temporarily reduce the suitability of habitat for taxa requiring higher-energy conditions.

A major risk to water quality has also been identified, particularly in relation to diffuse pollutants such as ammonia, phosphate, and low dissolved oxygen, exacerbated by the potential for approximately 670 m of flow-depleted channel where zero flow may occur without mitigation. Although no major abstraction or discharge pressures are present under baseline conditions, uncertainty remains around the influence of Lindley Wood trout hatchery. Its permit conditions for total ammonia are aligned with Moderate status, and discharge into a zero-flow reach could result in acute deterioration of water quality and associated biological impacts.

Although the drought option may result in substantial short-term impacts to the macroinvertebrate community, the overall risk of deterioration in WFD status is considered **moderate,** as identified in **Table B4-50**. This reflects the temporary nature of the pressure, the potential for effective recolonisation, and the precautionary principle applied due to uncertainty in hatchery-related discharges. Confidence in this assessment is **medium**, based on the number and recency of survey data.

Table B4-50 Impacts on macroinvertebrate communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Reduction in species diversity due to loss of flow-sensitive taxa. • Loss of marginal habitats, leading to a decrease in the abundance and distribution of species that rely on these habitats. • Reduction in species diversity and abundance resulting from decreased recruitment opportunities. • Mortality as a result of water quality deterioration (oxygen stress).	Medium	Moderate	Medium

Fish

No classification sites lie within the impacted reach and the waterbody has remained at 'moderate' status since 2013. The predicted physical changes (**Appendix A**) may directly affect habitat availability and present a major risk to longitudinal connectivity due to one weir within the reach.

There is potential for one flow depleted reach within Washburn 2 with the potential for zero flow without mitigation, with a major risk to water quality in the flow depleted reach from effluent from the fish farm discharging into the depleted reach, posing a risk of ammonia toxicity to fish. As such the drought option is predicted to present a **major risk** to the fish component of the water body and has the potential to influence the overall classification outcome. Confidence in this assessment is **high** based on the recent and spatially comprehensive fisheries data. The likely impacts arising from the hydrological changes as a result of the drought permit are identified in in **Table B4-51**.

Table B4-51: Impacts on fish communities.

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows and reduction in longitudinal connectivity. • Reduction in salmonid spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of major risk of water quality deterioration (ammonia toxicity).	High	Major	Medium

B4.7.2 Summary of Impacts

Table B4-52 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and macroinvertebrate receptors within WFD waterbodies and significance of impacts to Statutory designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-52: Summary of Impacts identified in Washburn 2's environmental receptors assessment.

Reach	Washburn 2	
	Significance of Impact/Risk of Deterioration	**Mitigation Required** *(Y/N)*
NERC and Notable Species Receptors		
Atherix ibis	Moderate	Yes
Paraleptophlebia cincta	Moderate	Yes
Potamophylax rotundipennis	Minor	No
Psychomyia fragilis	Moderate	Yes
Rhyacophila fasciata/ septentrionis	Moderate	Yes
Wormaldia subnigra	Moderate	Yes
White-clawed crayfish	Major	Yes
Otter	Negligible	No
Water vole	Major	Yes
Atlantic salmon	Major	Yes
Brook lamprey	Major	Yes
Brown trout	Major	Yes
Bullhead	Moderate	Yes
European eel	Moderate	Yes
Grayling	Moderate	Yes
River lamprey	Major	Yes
WFD Status Receptors - GB104027064020 Washburn Spinksburn Bk		
Invertebrates	Moderate	Yes
Fish	Major	Yes

B5 ENVIRONMENTAL RECEPTORS ASSESSMENT SUMMARY

Table B5-1: Environmental Receptors Assessment Summary of the North Area

Reach	Pott Beck 1	Burn 1	Holborn Beck 1	Laver 1	Oak Beck 1	Washburn 1	Washburn 2
Hydrological Impact	**Major**	**Major**	**Major**	**Minor (summer) Negligible (winter)**	**Major**	**Major**	**Major**
Associated Drought Options	**Leighton Reservoir**	**Leighton Reservoir**	**Lumley Moor Reservoir**	**Lumley Moor Reservoir**	**Haverah Park**	**Thruscross Reservoir**	**Lindley Wood Reservoir**
WFD Waterbody	GB104027069270 Leighton Beck from source to River Burn	GB104027069310 Burn from Leighton Beck to River Ure	GB104027069190 Laver from Carlesmoor Beck to Kex Beck	GB104027069190 Laver from Carlesmoor Beck to Kex Beck GB104027069260 Kex Beck and the Laver	GB104027063760 Oak Beck Catchment (Trib of Nidd)	GB104027064070 Washburn Source to Spinksburn Bk	GB104027064020 Washburn Spinksburn Bk
NERC and Notable Habitat Receptors (including Local Wildlife Sites)							
NERC habitat- Lowland fens -412935	N/A	N/A	N/A	N/A	N/A	Minor	N/A
NERC and Notable Species Receptors							
Ameletus inopinatus	Moderate	N/A	N/A	N/A	N/A	N/A	N/A
Atherix ibis	Moderate	Moderate	N/A	N/A	N/A	N/A	Moderate
Capnia atra	N/A	Minor	N/A	N/A	N/A	N/A	N/A
Graptodytes flavipes	N/A	N/A	Minor	N/A	N/A	N/A	N/A
Hydraena palustris	N/A	N/A	N/A	N/A	Minor	N/A	N/A
Hydraena rufipes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paraleptophlebia cincta	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
Potamophylax rotundipennis	Minor	N/A	N/A	N/A	N/A	N/A	Minor
Psychomyia fragilis	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
Rhithrogena germanica	N/A	N/A	N/A	N/A	Moderate	N/A	N/A
Rhyacophila fasciata/ septentrionis	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
Riolus subviolaceus	Moderate	N/A	N/A	N/A	N/A	N/A	N/A
Stagnicola palustris/fuscus/corvus	Minor	N/A	N/A	N/A	N/A	N/A	N/A
Stictonectes lepidus	N/A	N/A	N/A	N/A	Moderate	N/A	N/A
Wormaldia subnigra	N/A	N/A	N/A	N/A	N/A	N/A	Moderate
White-clawed crayfish	Moderate	Moderate	Moderate	Negligible	Moderate	N/A	Major
Otter	Negligible	Negligible	Negligible	N/A	Negligible	Negligible	Negligible
Water vole	Moderate	Moderate	Moderate	N/A	Moderate	Moderate	Major
Atlantic salmon	N/A	Major	N/A	N/A	N/A	N/A	Major
Brook lamprey	Moderate	Major	N/A	Negligible	N/A	Major	Major
Brown trout	Moderate	Major	Moderate	Negligible	Major	Major	Major
Bullhead	Minor	Moderate	Minor	Negligible	Moderate	Moderate	Moderate
Grayling	N/A	N/A	N/A	Negligible	N/A	N/A	Moderate
European eel	Moderate	Major	N/A	N/A	N/A	N/A	Moderate
River lamprey	Moderate	Major	N/A	Negligible	N/A	N/A	Major
WFD Status Receptors							
Invertebrates	Moderate	Major	Minor	Negligible	Moderate	Moderate	Moderate
Fish	Moderate	Major	Minor	Negligible	Major	Major	Major

B6 MONITORING AND MITIGATION

Onset of drought, in-drought and post-drought monitoring and mitigation has been specified for all impacted reaches following identification of environmental receptors within in the reaches susceptible to the drought option(s) implementation. The baseline monitoring programme to inform the susceptibility, sensitivity and assessment of environmental receptors has also been reviewed; On the assumption that otter and water vole can be potentially present in all impact reaches, no further baseline monitoring surveys have been included for these species. Mitigation measures and protection for sensitive species such as brown trout which are screened in should provide adequate protection where required of water levels and flows to ensure that riparian species such as water vole and otter are adequately protected for the duration of the drought permits in the impacted reaches.

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

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

Full details of monitoring and mitigation requirements for all impacted reaches can be found in Appendix A-1 of YWSL's Drought Plan EMP and a summary is provided in the main EAR Section 6.2.

Further reach specific actions needed are listed below:

- **Burn 1**, the assessment has identified the return of water abstracted by the non-consumptive fish farm abstraction will potentially exert a local water quality pressure on oxygen balance and ammonia concentration which may be exacerbated by implementation of the drought option. YWSL will liaise with the fish farm operator to understand likely operation during low flow and to agree potential mitigation measures with the operator. Meetings were held during early summer 2020 and YWSL will continue engage with the operator and keep the EA informed of agreements and outcomes. The suite of potential mitigation measures for Burn 1 include aeration of the fish farm discharge and additional flow management measures.

- **Burn 1** YWSL will also actively consult with local angling groups to identify potential impacts and appropriate mitigation during a drought onset period. These groups include the Yorkshire Dales Rivers Trust, Ure Salmon Group and the Swinton Estate.

- **Washburn 2**, the assessment has identified the return of water abstracted by the non-consumptive fish farm abstraction will potentially exert a local water quality pressure on oxygen balance and ammonia concentration which may be exacerbated by implementation of the drought option. YWSL will liaise with the fish farm operator to understand likely operation during low flow and to agree potential mitigation measures with the operator. Meetings were held during early summer 2020 and YWSL will continue engage with the operator and keep the EA informed of agreements and outcomes. The suite of potential mitigation measures for Washburn 2 include aeration of the fish farm discharge and additional flow management measures.

WwTW optimisation plan[16] provides details on enhancement for WwTW that discharge into rivers where compensation flows may be reduced under drought permit implementation. During any future on-set of drought periods (14 weeks before drought control lines are crossed) YWSL will consult with the EA regarding any WwTWs not identified as significant water quality pressures at the time of the writing of this EAR, but which may be a cause for concern. Additional sites will be added to the priority list of sites for optimisation as required.

A 'Combined Sewer Overflows Optimisation and Maintenance for Drought Plan' has also been developed by YWSL, which identifies all significant intermittent water quality pressures identified in this EAR. During any

[16] YWSL (2025) Wastewater Treatment Works Optimisation & Maintenance,for Drought Plan 2027.

future drought onset period YWSL will also consult with the EA and additional sites could be identified as required.

B7 ANNEX 1 FULL FISH SURVEY COUNTS

						Low Tolerance								Medium Tolerance					High Tolerance		
Reach	Site ID	Site Name	Survey NGR	Year	Survey Strategy	Bullhead	Brown / sea trout	Grayling	Brook lamprey	Lamprey sp.	Atlantic salmon	River lamprey	Rainbow trout	Stone loach	Minnow	Chub	Gudgeon	Ruffe	Perch	3-spined stickleback	European eel
Pott Beck 1	26601	Leighton Beck / Pott Beck, Leighton	SE1662379285	2013	Single Catch Sample	33	47														
Pott Beck 1	69143	WR PB4	SE1671179588	2017	Catch Depletion Sample	31	42														
Pott Beck 1	69143	WR PB4	SE1671179588	2018	Catch Depletion Sample	50	48														
Pott Beck 1	69143	WR PB4	SE1671179588	2019	Catch Depletion Sample	28	28														
Pott Beck 1	69143	WR PB4	SE1671179588	2020	Catch Depletion Sample	36	27														
Pott Beck 1	69143	WR PB4	SE1671179588	2021	Catch Depletion Sample	72	59														1
Pott Beck 1	69163	WR PB5	SE1682979589	2017	Catch Depletion Sample	53	64														
Pott Beck 1	69163	WR PB5	SE1682979589	2018	Catch Depletion Sample	108	176			2											
Pott Beck 1	69163	WR PB5	SE1682979589	2019	Catch Depletion Sample	38	85			1											
Pott Beck 1	69163	WR PB5	SE1682979589	2020	Catch Depletion Sample	30	53														
Pott Beck 1	69163	WR PB5	SE1682979589	2021	Catch Depletion Sample	100	88					2									
Pott Beck 1	PB1	d/s Reservoir outfall	SE1661079242	2017	Catch Depletion Sample	66	28														
Pott Beck 1	PB1	d/s Reservoir outfall	SE1661079242	2018	Catch Depletion Sample	83	40														
Pott Beck 1	PB1	d/s Reservoir outfall	SE1661079242	2019	Catch Depletion Sample	42	41					1									1
Pott Beck 1	PB1	d/s Reservoir outfall	SE1661079242	2020	Catch Depletion Sample	73	59														
Pott Beck 1	PB1	d/s Reservoir outfall	SE1661079242	2021	Catch Depletion Sample	181	56														1
Pott Beck 1	PB2	d/s footbridge on bend	SE1664279351	2017	Catch Depletion Sample	35	29														
Pott Beck 1	PB2	d/s footbridge on bend	SE1664279351	2018	Catch Depletion Sample	47	29														
Pott Beck 1	PB2	d/s footbridge on bend	SE1664279351	2019	Catch Depletion Sample	22	23						1								
Pott Beck 1	PB2	d/s footbridge on bend	SE1664279351	2020	Catch Depletion Sample	26	34														1
Pott Beck 1	PB2	d/s footbridge on bend	SE1664279351	2021	Catch Depletion Sample	47	56					2						2			4
Pott Beck 1	PB3	corner of opening	SE1654479464	2017	Catch Depletion Sample	30	47														
Pott Beck 1	PB3	corner of opening	SE1654479464	2018	Catch Depletion Sample	32	27														
Pott Beck 1	PB3	corner of opening	SE1654479464	2019	Catch Depletion Sample	45	40					1									
Pott Beck 1	PB3	corner of opening	SE1654479464	2020	Catch Depletion Sample	56	39														
Pott Beck 1	PB3	corner of opening	SE1654479464	2021	Catch Depletion Sample	37	76					3									
Pott Beck 1	PB6	d/s Island	SE1686979597	2017	Catch Depletion Sample	45	41														
Pott Beck 1	PB6	d/s Island	SE1686979597	2018	Catch Depletion Sample	33	33														
Pott Beck 1	PB6	d/s Island	SE1686979597	2019	Catch Depletion Sample	28	26														
Pott Beck 1	PB6	d/s Island	SE1686979597	2020	Catch Depletion Sample	25	30			1											
Pott Beck 1	PB6	d/s Island	SE1686979597	2021	Catch Depletion Sample	50	75					3									
Burn 1	7065	River Burn (Shaws Farm)	SE2078480322	2010	Single Catch Sample	99*	36				51										
Burn 1	7065	River Burn (Shaws Farm)	SE2078480322	2011	Single Catch Sample	61	74				70										
Burn 1	7065	River Burn (Shaws Farm)	SE2078480322	2012	Single Catch Sample	54	59			9†	16										3
Burn 1	7065	River Burn (Shaws Farm)	SE2078480322	2013	Single Catch Sample	47	59				21										1
Burn 1	7065	River Burn (Shaws Farm)	SE2078480322	2016	Catch Depletion Sample	43	60		4		33										1
Burn 1	7065	River Burn (Shaws Farm)	SE2078480322	2017	Catch Depletion Sample	75	65				5										2
Burn 1	7065	River Burn (Shaws Farm)	SE2078480322	2018	Catch Depletion Sample	69	104				108										1

						Low Tolerance								Medium Tolerance					High Tolerance		
Reach	Site ID	Site Name	Survey NGR	Year	Survey Strategy	Bullhead	Brown / sea trout	Grayling	Brook lamprey	Lamprey sp.	Atlantic salmon	River lamprey	Rainbow trout	Stone loach	Minnow	Chub	Gudgeon	Ruffe	Perch	3-spined stickleback	European eel
Burn 1	7065	River Burn (Shaws Farm)	SE2078480322	2021	Single Catch Sample	40	89			9†	50			9†							
Burn 1	7065	River Burn (Shaws Farm)	SE2078480322	2024	Catch Depletion Sample	134	144				36										4
Burn 1	26597	River Burn, Badger Farm	SE2259879856	2013	Single Catch Sample	20	22				40			9*	99†						
Burn 1	51843	Badger Farm (new)	SE2255879880	2013	Single Catch Sample	44	32				52										3
Burn 1	68303	R. Burn U/S Fish Farm Weir	SE1760480096	2016	Catch Depletion Sample	45	38				8										
Burn 1	68303	R. Burn U/S Fish Farm Weir	SE1760480096	2017	Catch Depletion Sample	65	73														
Burn 1	68303	R. Burn U/S Fish Farm Weir	SE1760480096	2018	Catch Depletion Sample	51	66														
Burn 1	68303	R. Burn U/S Fish Farm Weir	SE1760480096	2021	Catch Depletion Sample	71	35														
Burn 1	68303	R. Burn U/S Fish Farm Weir	SE1760480096	2024	Catch Depletion Sample	28	122		68						22						
Burn 1	68304	R. Burn D/S Rigg Bank	SE1901580036	2016	Catch Depletion Sample	65	60		2		8										
Burn 1	68304	R. Burn D/S Rigg Bank	SE1901580036	2017	Catch Depletion Sample	74	50				6										
Burn 1	68304	R. Burn D/S Rigg Bank	SE1901580036	2018	Catch Depletion Sample	40	92			5	78										1
Burn 1	68304	R. Burn D/S Rigg Bank	SE1901580036	2021	Catch Depletion Sample	177	71				6										2
Holborn Beck 1	49903	Holburn Bridge Lower (Lumley)	SE2383270637	2013	Single Catch Sample	12	51														
Holborn Beck 1	49903	Holburn Bridge Lower (Lumley)	SE2383270637	2015	Single Catch Sample	26	12														
Holborn Beck 1	49903	Holburn Bridge Lower (Lumley)	SE2383270637	2016	Single Catch Sample	17	12														
Holborn Beck 1	49903	Holburn Bridge Lower (Lumley)	SE2383270637	2017	Single Catch Sample	36	29														
Holborn Beck 1	49903	Holburn Bridge Lower (Lumley)	SE2383270637	2018	Single Catch Sample	13	4														
Holborn Beck 1	49903	Holburn Bridge Lower (Lumley)	SE2383270637	2021	Catch Depletion Sample	40	32														
Holborn Beck 1	68464	u/s Confluence	SE2430070400	2015	Catch Depletion Sample	15	18														
Holborn Beck 1	68464	u/s Confluence	SE2430070400	2021	Catch Depletion Sample	33	51			1											
Holborn Beck 1	68464	u/s Confluence	SE2430070400	2024	Catch Depletion Sample	72	30														
Holborn Beck 1	19	Holborn Bridge Upper (Lumley)	SE2344670716	2015	Single Catch Sample	7	13														
Holborn Beck 1	19	Holborn Bridge Upper (Lumley)	SE2344670716	2016	Single Catch Sample	12	10														
Holborn Beck 1	19	Holborn Bridge Upper (Lumley)	SE2344670716	2017	Single Catch Sample	7	8														
Holborn Beck 1	19	Holborn Bridge Upper (Lumley)	SE2344670716	2018	Single Catch Sample	7	15														
Holborn Beck 1	19	Holborn Bridge Upper (Lumley)	SE2344670716	2021	Catch Depletion Sample	28	47														
Laver 1	26624	R.Laver, Clotherholme Farm	SE2866171996	2015	Single Catch Sample	90	80	8													
Laver 1	26624	R.Laver, Clotherholme Farm	SE2866171996	2016	Catch Depletion Sample	67	33			3											
Laver 1	26624	R.Laver, Clotherholme Farm	SE2866171996	2017	Catch Depletion Sample	34	18			1											
Laver 1	26624	R.Laver, Clotherholme Farm	SE2866171996	2018	Single Catch Sample	20	27														
Laver 1	26624	R.Laver, Clotherholme Farm	SE2866171996	2021	Catch Depletion Sample	231	80			10											
Laver 1	26624	R.Laver, Clotherholme Farm	SE2866171996	2024	Single Catch Sample	999†	12														
Laver 1	49904	d/s Ripon FAS	SE2932671507	2013	Single Catch Sample	22	26	2													
Laver 1	49904	d/s Ripon FAS	SE2932671507	2015	Single Catch Sample	42	86	6		2											
Laver 1	49904	d/s Ripon FAS	SE2932671507	2016	Single Catch Sample	19	2			1											
Laver 1	49904	d/s Ripon FAS	SE2932671507	2017	Single Catch Sample	27	10								1						
Laver 1	49904	d/s Ripon FAS	SE2932671507	2018	Catch Depletion Sample	19	24							1							
Laver 1	49904	d/s Ripon FAS	SE2932671507	2021	Catch Depletion Sample	225	40														
Laver 1	49905	u/s Ripon FAS	SE2920471537	2013	Single Catch Sample	172	24	2													
Laver 1	49905	u/s Ripon FAS	SE2920471537	2015	Catch Depletion Sample	16	100	8		34										6	
Laver 1	49905	u/s Ripon FAS	SE2920471537	2016	Single Catch Sample	2	5			4											

						Low Tolerance								Medium Tolerance					High Tolerance		
Reach	Site ID	Site Name	Survey NGR	Year	Survey Strategy	Bullhead	Brown / sea trout	Grayling	Brook lamprey	Lamprey sp.	Atlantic salmon	River lamprey	Rainbow trout	Stone loach	Minnow	Chub	Gudgeon	Ruffe	Perch	3-spined stickleback	European eel
Laver 1	49905	u/s Ripon FAS	SE2920471537	2017	Single Catch Sample		10														
Laver 1	49905	u/s Ripon FAS	SE2920471537	2018	Single Catch Sample	9	11														
Laver 1	49905	u/s Ripon FAS	SE2920471537	2021	Catch Depletion Sample	187	25			3										1	
Laver 1	78565	River Laver The Secret Garden	SE3000971033	2023	Single Catch Sample	9†	27	1													
Oak Beck 1	17277	Oak Beck - Knox Mill	SE2950057700	2013	Single Catch Sample	25	10								6						
Oak Beck 1	17277	Oak Beck - Knox Mill	SE2950057700	2015	Single Catch Sample	11	10							12	15						
Oak Beck 1	17277	Oak Beck - Knox Mill	SE2950057700	2016	Single Catch Sample	18	1							1	5						
Oak Beck 1	17277	Oak Beck - Knox Mill	SE2950057700	2017	Single Catch Sample	18	1							2	7					1	
Oak Beck 1	17277	Oak Beck - Knox Mill	SE2950057700	2018	Single Catch Sample	66								3	71						
Oak Beck 1	17277	Oak Beck - Knox Mill	SE2950057700	2023	Catch Depletion Sample	186	12							19	74					10	
Oak Beck 1	17277	Oak Beck - Knox Mill	SE2950057700	2024	Catch Depletion Sample	100	10							28	100						
Oak Beck 1	17277	Oak Beck - Knox Mill	SE2950057700	2024	Single Catch Sample	999†	2							9*	99†					9*	
Oak Beck 1	17278	Oak Beck - Throstle Nest Farm	SE2580054400	2015	Single Catch Sample		1								2						
Oak Beck 1	17278	Oak Beck - Throstle Nest Farm	SE2580054400	2024	Single Catch Sample	99†	1								999†						
Oak Beck 1	YW10005	D/S Beaverdyke Reservoir	SE2310054549	2015	Catch Depletion Sample	15									103					3	
Oak Beck 1	YW10005	D/S Beaverdyke Reservoir	SE2310054549	2016	Catch Depletion Sample	15									101					2	
Oak Beck 1	YW10005	D/S Beaverdyke Reservoir	SE2310054549	2017	Catch Depletion Sample	25	21								120					3	
Oak Beck 1	YW10005	D/S Beaverdyke Reservoir	SE2310054549	2018	Catch Depletion Sample	31	1								102					1	
Oak Beck 1	OB3	Holen House Farm d/s	SE2457754592	2016	Catch Depletion Sample	18	6								6						
Oak Beck 1	OB3	Holen House Farm d/s	SE2457754592	2017	Catch Depletion Sample	15	9								31						
Oak Beck 1	OB3	Holen House Farm d/s	SE2457754592	2018	Catch Depletion Sample	29									66						
Oak Beck 1	OB3	Holen House Farm d/s	SE2457754592	2019	Catch Depletion Sample	21	2								63						
Oak Beck 1	OB3	Holen House Farm d/s	SE2457754592	2020	Catch Depletion Sample	20	13								63						
Oak Beck 1	OB3	Holen House Farm d/s	SE2457754592	2021	Catch Depletion Sample	14	25								43				2	1	
Oak Beck 1	OB4	Holen House Farm u/s	SE2443054575	2016	Catch Depletion Sample	41									30						
Oak Beck 1	OB4	Holen House Farm u/s	SE2443054575	2017	Catch Depletion Sample	40	4								21						
Oak Beck 1	OB4	Holen House Farm u/s	SE2443054575	2018	Catch Depletion Sample	13	4								32						
Oak Beck 1	OB4	Holen House Farm u/s	SE2443054575	2019	Catch Depletion Sample	63									122						
Oak Beck 1	OB4	Holen House Farm u/s	SE2443054575	2020	Catch Depletion Sample	34	8								119						
Oak Beck 1	OB4	Holen House Farm u/s	SE2443054575	2021	Catch Depletion Sample	88	1								104						
Oak Beck 1	OB1	OB1	SE2578754275	2019	Catch Depletion Sample	7									118						
Oak Beck 1	OB1	OB1	SE2578754275	2020	Catch Depletion Sample	9									138						
Oak Beck 1	OB1	OB1	SE2578754275	2021	Catch Depletion Sample	30	3								125						
Oak Beck 1	OB2	OB2	SE2551554562	2019	Catch Depletion Sample	1									52						
Oak Beck 1	OB2	OB2	SE2551554562	2020	Catch Depletion Sample	1	1								243					12	
Oak Beck 1	OB2	OB2	SE2551554562	2021	Catch Depletion Sample	12	1								79				1	1	
Oak Beck 1	OB5	OB5	SE2384254549	2019	Catch Depletion Sample	28	2								58						
Oak Beck 1	OB5	OB5	SE2384254549	2020	Catch Depletion Sample	15	9								90					1	
Oak Beck 1	OB5	OB5	SE2384254549	2021	Catch Depletion Sample	48	8								99						
Oak Beck 1	OB6	OB6	SE2318554548	2019	Catch Depletion Sample	25	1								57					7	
Oak Beck 1	OB6	OB6	SE2318554548	2020	Catch Depletion Sample	30	14								109					7	
Oak Beck 1	OB6	OB6	SE2318554548	2021	Catch Depletion Sample	84	8								107					1	

						Low Tolerance								Medium Tolerance					High Tolerance		
Reach	Site ID	Site Name	Survey NGR	Year	Survey Strategy	Bullhead	Brown / sea trout	Grayling	Brook lamprey	Lamprey sp.	Atlantic salmon	River lamprey	Rainbow trout	Stone loach	Minnow	Chub	Gudgeon	Ruffe	Perch	3-spined stickleback	European eel
Washburn 1	3836	D/S Thruscross Reservoir	SE1550057300	2010	Single Catch Sample		59														
Washburn 1	3836	D/S Thruscross Reservoir	SE1550057300	2014	Catch Depletion Sample		65														
Washburn 1	3836	D/S Thruscross Reservoir	SE1550057300	2019	Catch Depletion Sample		54												2		
Washburn 1	3836	D/S Thruscross Reservoir	SE1550057300	2021	Catch Depletion Sample		50														
Washburn 1	3836	D/S Thruscross Reservoir	SE1550057300	2022	Catch Depletion Sample		50														
Washburn 1	3836	D/S Thruscross Reservoir	SE1550057300	2023	Single Catch Sample		28														
Washburn 1	3837	U/S of Fewston Reservoir	SE1690055400	2010	Single Catch Sample		32		1					4							
Washburn 1	3837	U/S of Fewston Reservoir	SE1690055400	2014	Single Catch Sample	8	22			7				7	17						
Washburn 1	T2	U/S Ford	SE1571956858	2019	Catch Depletion Sample		86														
Washburn 1	T3	D/S Weir/Redshaw Gill Beck	SE1597856494	2019	Catch Depletion Sample		62														
Washburn 1	T4	Low Dam	SE1613256373	2019	Catch Depletion Sample		32							1							
Washburn 1	T5	U/S Cricket Ground	SE1665655603	2019	Catch Depletion Sample	9	106							1							
Washburn 1	T6	Cricket Ground	SE1670155458	2019	Catch Depletion Sample	7	63							1							
Washburn 2	34049	U/S Leathley Bridge (YW HMWB site 8)	SE2312046550	2011	Catch Depletion Sample	77	14							26	43						2
Washburn 2	34049	U/S Leathley Bridge (YW HMWB site 8)	SE2312046550	2015	Catch Depletion Sample	60	21	3		2				10	103	2	1			2	3
Washburn 2	34049	U/S Leathley Bridge (YW HMWB site 8)	SE2312046550	2016	Catch Depletion Sample	58	7			2				14	5						3
Washburn 2	34049	U/S Leathley Bridge (YW HMWB site 8)	SE2312046550	2017	Catch Depletion Sample	81	30				1			53	32		1				4
Washburn 2	34049	U/S Leathley Bridge (YW HMWB site 8)	SE2312046550	2020	Catch Depletion Sample	50	11				2			30	33	2	2				5
Washburn 2	34049	U/S Leathley Bridge (YW HMWB site 8)	SE2312046550	2021	Catch Depletion Sample	65	15				3	1		29	13				1	1	2
Washburn 2	RWL4	Fishpool	SE2308547286	2015	Single Catch Sample	25	19							1	22				1		2
Washburn 2	RWL4	Fishpool	SE2308547286	2016	Single Catch Sample	17	5												1	1	
Washburn 2	RWL4	Fishpool	SE2308547286	2017	Single Catch Sample	7	2							2	6						1
Washburn 2	RWL4	Fishpool	SE2308547286	2020	Catch Depletion Sample	8	8								26	4			3		
Washburn 2	RWL4	Fishpool	SE2308547286	2021	Catch Depletion Sample	36	5							6	34					1	1
Washburn 2	RWL4	Fishpool	SE2308547286	2022	Catch Depletion Sample	112	7			7				27	68	1	11				1
Washburn 2	RWL2	d/s Lindley Bridge	SE2247348303	2015	Single Catch Sample	57	17								39	4					6
Washburn 2	RWL2	d/s Lindley Bridge	SE2247348303	2016	Single Catch Sample	43	12								42						
Washburn 2	RWL2	d/s Lindley Bridge	SE2247348303	2017	Single Catch Sample	32	2								5						5
Washburn 2	RWL2	d/s Lindley Bridge	SE2247348303	2020	Catch Depletion Sample	180	44							1	44						13
Washburn 2	RWL2	d/s Lindley Bridge	SE2247348303	2021	Catch Depletion Sample	167	31													1	26
Washburn 2	RWL1	u/s Lindley Bridge	SE2243248327	2020	Catch Depletion Sample	70	12								40					1	7
Washburn 2	RWL1	u/s Lindley Bridge	SE2243248327	2021	Catch Depletion Sample	41	14														3
Washburn 2	RWL3	d/s Fish Farm	SE2294848102	2020	Catch Depletion Sample	58	22			1					33				1		4
Washburn 2	RWL3	d/s Fish Farm	SE2294848102	2021	Catch Depletion Sample	70	37					1		2							2
Washburn 2	RWL6	d/s Weir	SE2309646252	2020	Catch Depletion Sample	52	13	2						66	100		2			1	5
Washburn 2	RWL6	d/s Weir	SE2309646252	2021	Catch Depletion Sample	62	13				14			52	108		2				

† Values represents the estimated observed abundance for the completed survey ranging from 0-9,10-99,100-999, 1000+

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APPENDIX C MONITORING AND ECOLOGICAL MITIGATION MEASURES

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

Baseline Monitoring - to ensure an adequate baseline dataset exists to describe non-drought conditions for those receptors likely to be impacted by drought permit implementation and to fill any data gaps and reduce uncertainty identified during the environmental assessment	
BMON_H	EA/YWSL to continue monitor river flows and levels/reservoir levels and spill at key monitoring sites
BMON_WQ	EA to continue routine water quality monitoring at existing network of sites on current monthly programme, which includes those on un-impacted reaches suitable as control sites.
BMON_E1	Macroinvertebrate monitoring at a number of locations, including rivers potentially affected by drought measures; to continue in low flow/drought years pending agreement with the EA regarding aquatic species welfare.
BMON_E2	Fish (including Lamprey) monitoring at a number of locations, including rivers potentially affected by drought measures; to continue in low flow/drought years pending agreement with the EA regarding aquatic species welfare.
BMON_E3	Walkover surveys of to map habitat distribution and quality, identifying drought sensitive habitats such as areas of riffle, pools and artificial features as well as features relevant to key ecological receptors like lamprey and salmonids. Results to be captured by annotated walkover maps.
On-set of Environmental drought – monitoring leading to selection and implementation of appropriate mitigation measures	
ODMON_WS	Walkover surveys of habitat quality and identification of drought sensitive habitats such as areas of riffle, pools and artificial features such as weirs and sluices that may be isolated or impassable during low flows. Results to be captured by annotated walkover maps, photography, and completion of a 'River Conditions Observation Form - Low Flows' form.
In-Drought (during drought option implementation) – monitoring leading to selection and implementation of appropriate mitigation measures	
IDMON_WSE	Surveillance walkover surveys of habitat quality and ecological stress, recording signs of environmental problems (reaches to match those in ODMON_WS)
IDMON_WSWQ1	Targeted surveillance walkover surveys of water quality and ecological stress local to 'significant' water quality pressures', to include water quality spot sampling in priority areas such as pools and weirs where aquatic species may become isolated during low flows.
IDMON_WSWQ2	Discharge validation at key outfalls and downstream, where triggered by review of monitoring data. On site walkover will validate whether key CSOs are spilling, or have been recently, observe for signs of fish stress and take spot water quality sampling at additional locations including at locations of potential fish stress.
In-Drought (During Drought Option Implementation) – Mitigation	
IDMIT_H1	Negotiation with the licence holder of a temporary reduction of third party abstractions presenting 'significant' impacts to sensitive features, including financial compensation by Yorkshire Water.
IDMIT_H2	At identified SSSIs, mitigation would comprise the temporary cessation of impacting drought options by Yorkshire Water.
IDMIT_WQ1	Improving the effluent quality from Yorkshire Water WwTWs presenting 'significant' impacts to sensitive features, thereby reducing the water quality pressure (ammonia and oxygen balance) on the impacted features.

IDMIT_WQ2	Short–term relaxation of drought permit flow reduction to dilute/disperse a build up of water quality pressures identified during walkover surveys IDMON_WSWQ1.
IDMIT_E1	Gradual or temporary adjustments to abstraction or compensation flows to prevent stranding, displacement, or stress in sensitive aquatic species (e.g. fish, macroinvertebrates, white–clawed crayfish).
IDMIT_E2	Aeration of watercourse where significant mortality or change in species abundances are likely to be attributed to water quality deterioration.
IDMIT_E3	Creation of alternative refuges in deeper water where walkover surveys identify the loss of important deep water habitat or high densities of fauna in refuges (fish, white-clawed crayfish, water vole)
IDMIT_E4	Provision of in-stream structures and flow baffles to create functional refuges to support flow sensitive species where walkover surveys identify a projected loss of habitat inundation (macroinvertebrates, fish, white-clawed crayfish, water vole, otter)
IDMIT_E5	Regular inspection and clearing of screens to ensure they retain their correct working function (fish, white–clawed crayfish)
IDMIT_E6	Rescue of individuals or groups, in consultation with the EA or NE as appropriate, and relocation to suitable habitat where they are seen to be in distress or where artificially high densities are likely to result in significant impacts (fish, white–clawed crayfish). Measures will be taken to ensure biosecurity at all times. It should be noted that movement of crayfish requires licensing which can take up to 8 weeks. Movement of crayfish would only take place after consultation agreeing that this was the best course of action.
Post-Drought (Drought Options Removed) – Monitoring	
PDMON_E1	Macroinvertebrate monitoring at a number of locations, including rivers following implementation of drought measures; pending agreement with the EA regarding aquatic species welfare.
PDMON_E2	Fish (including Lamprey) monitoring at a number of locations, including rivers following implementation of drought measures; pending agreement with the EA regarding aquatic species welfare.
Post-Drought (Drought Options Removed) – Mitigation	
PDMIT_E1	Enhancement of habitat beyond the impacted reach (macroinvertebrates, fish, fine-lined pea mussel, white-clawed crayfish, water vole)
PDMIT_E2	Provision of artificial freshets to ensure fish are capable of migrating where survey identifies insufficient water depth or volume across structures to facilitate migration (fish)
PDMIT_E3	Modification to barriers and/or flows to improve passage where walkover survey identifies insufficient water depth or volume at obstacles (fish)
PDMIT_E4	Restocking of coarse fish from the catchment where monitoring indicates loss of fish abundance or recruitment (fish)

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