APPENDIX B – ENVIRONMENTAL RECEPTORS

B1 INTRODUCTION

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

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

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

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

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

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

Section B.3 Environmental receptors screening.

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

1. Receptors assessment
2. Summary of impacts.

Section B.5 Monitoring and mitigation

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

Figure B1-1 Ecology Points of Interest for Wharfe Drought Permit

[Insert Figure B1.1]

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 WHARFE 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 Keswick Fitts SSSI	Moderate (Summer) & Minor (Winter)	Area of willow carr on shingle banks beside the Wharfe. Noted for invertebrate interest and flooded at high flows. Reduced flows due to option could increase exposure of cobbles and gravels. The risk to East Keswick SSSI from implementation of the Wharfe at Lobwood drought permit was confirmed as negligible following additional screening undertaken by Arup on behalf of Yorkshire Water[3]	Not sensitive	No
Linton Common SSSI	Moderate (Summer) & Minor (Winter)	The site is designated for limestone grasslands. Due to the distance between the site and the impacted hydrological reach, the SSSI will not be affected by the drought option.	Not sensitive	No
Kirkby Wharfe SSSI	Moderate (Summer) & Minor (Winter)	An area of floodland in the valley of Dorts Dike, a Tributary of the River Wharfe. Due to the distance between the site and the impacted hydrological reach, the SSSI will not be affected by the drought option.	Not sensitive	No
North Pennine Moors SPA, SAC	Moderate (Summer) & Minor (Winter)	A wide variety of habitats with active blanket bogs a priority receptor annex I habitat. Annex I habitats present as a qualifying receptor but not a primary reason for selection of the site includes Northern Atlantic wet heaths with *Erica* tetralix and alkaline fens. The receptor is roughly 0.95km west of the impacted reach. Due to the steep surrounding	Not sensitive	No

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

[3] Yorkshire Water Drought Plan: Sites of Scientific Interest Assessment Report – Arup, March 2019

Site/Receptor and designation	***Hydrological Impact at Location*** *(Major, Moderate, Minor, Negligible)*	***Susceptibility to flow and level impacts***	***Sensitivity*** *(Uncertain, High, Medium, Low, Not sensitive)*	***Further Consideration Required*** *(Y/N)*
		geography it is thought that the receptor is not hydrologically connected.		
South Pennine Moors SPA, SAC, SSSI		Blanket bogs are the only annex I habitat water dependent receptor as a primary reason for selection of the site, blanket bogs are also a priority receptor . Annex I habitats present as qualifying receptor but not a primary reason include Northern Atlantic wet heaths with *Erica tetralix* and transition mires and quaking bogs. The river Wharfe sits in a valley between the north pennine moors and south pennine moors, therefore it is thought that the receptor is not hydrologically connected.	Not sensitive	No

B2.1.2 NERC and local wildlife sites

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

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

Table B2-2 NERC habitats and local wildlife sites

Site/Receptor and designation	***Hydrological Impact at Location*** *(Major, Moderate, Minor, Negligible)*	***Susceptibility to flow and level impacts***	***Sensitivity*** *(Uncertain, High, Medium, Low, Not sensitive)*	***Further Consideration Required*** *(Y/N)*
River Wharfe, Otley & Mid Wharfedale /Wetherby LWS	Moderate (Summer) & Minor (Winter)	A long river corridor supporting otter, water vole, and diverse aquatic habitats. Bankside woodland, neutral grassland, and in-channel features like riffles and pools provide refuge for fish and invertebrates. Locally managed for recreation.	Medium	Yes
Wharfeside Woods	Moderate (Summer) & Minor (Winter)	Predominantly base-rich woodland with sycamore and beech. An area of marginal swamp habitat is present beside the river but is not considered susceptible to changes in flow or water level.	Low	No
Low Mill, Addingham	Moderate (Summer) & Minor (Winter)	Moderately species-rich semi-natural woodland. The site is elevated above the river and not considered susceptible to changes in flow or water level.	Low	No
Lumbgill Wood LWS	Moderate (Summer) & Minor (Winter)	Ancient semi-natural woodland with high bluebell cover and presence of county rare *Chrysosplenium alternifolium*. Not	Not sensitive	No

Site/Receptor and designation	***Hydrological Impact at Location*** *(Major, Moderate, Minor, Negligible)*	***Susceptibility to flow and level impacts***	***Sensitivity*** *(Uncertain, High, Medium, Low, Not sensitive)*	***Further Consideration Required*** *(Y/N)*
		considered susceptible to changes in flow or water level.		
Owler Park and Spring Wood, Ilkley LWS	Moderate (Summer) & Minor (Winter)	Extensive native bluebell cover in broadleaved woodland. Elevated from the river and not considered susceptible to hydrological changes.	Not sensitive	No
Terrace Ghyll, Ilkley LWS	Moderate (Summer) & Minor (Winter)	Extensive native bluebell cover in broadleaved woodland. Elevated from the river and not considered susceptible to hydrological changes.	Not sensitive	No
Crabtree Ghyll LWS	Moderate (Summer) & Minor (Winter)	Ancient semi-natural woodland with high bluebell cover. Located upslope and not sensitive to river flow or water level variations.	Not sensitive	No
Middleton Woods, Ilkley LWS	Moderate (Summer) & Minor (Winter)	Ancient, species-rich acid woodland with over-mature trees and strong bluebell presence. No identified susceptibility to changes in flow or water level.	Not sensitive	No
West Park Wood/Stubbs Wood LWS	Moderate (Summer) & Minor (Winter)	Mosaic of habitats including neutral and upland acid grassland. Set away from watercourses and not considered hydrologically sensitive.	Not sensitive	No
Ben Rhydding Gravel Pits LWS	Moderate (Summer) & Minor (Winter)	A mosaic of species-rich habitats including swamp, fen, and grassland, situated on the banks of the River Wharfe. Partially designated as a Local Nature Reserve, the site supports over 180 plant species, including southern marsh and common spotted orchids, and hosts diverse fauna such as butterflies, sand martins, kingfishers, and otters. Potentially susceptible to changes in river flow and water levels, which can impact wetland habitats.	Medium	Yes
Burley Bypass Verges LWS	Moderate (Summer) & Minor (Winter)	MG5 rare grassland habitat: species rich neutral grassland. Not sensitive to changes in flow or water level.	Not sensitive	No
Otley Sand and Gravel Pits LWS	Moderate (Summer) & Minor (Winter)	Species rich standing water, mixed fen, hedgerow and mixed habitats. Potentially susceptible to changes in river flow and water levels, which can impact wetland habitats.	Medium	Yes
Knotford Nook LWS	Moderate (Summer) & Minor (Winter)	Species-rich standing water, regionally important ornithologically. Not sensitive to changes in flow or water level.	Not sensitive	No
Owl Head Wood LWS	Moderate (Summer) & Minor (Winter)	Ancient or long-standing acid woodland. Not sensitive to changes in flow or water level.	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)*
Ox Close Wood LWS	Moderate (Summer) & Minor (Winter)	Ancient semi-natural woodland; species rich woodland; species-rich woodland; good bluebell cover. Not sensitive to changes in flow or water level.	Not sensitive	No
Spring Wood, Sicklinghall LWS	Moderate (Summer) & Minor (Winter)	Ancient or long-standing woodland. Not sensitive to changes in flow or water level.	Not sensitive	No
Lime Kiln Wood LWS	Moderate (Summer) & Minor (Winter)	Ancient or long-standing neutral to calcareous woodland. Not sensitive to changes in flow or water level.	Not sensitive	No
Langwith Wood LWS	Moderate (Summer) & Minor (Winter)	Species-rich neutral woodland: Locally rare species (Green hellebore). Not sensitive to changes in flow or water level.	Not sensitive	No
Deepdale / Jackdaw Crag LWS	Moderate (Summer) & Minor (Winter)	Species-rich woodland, the most northerly site in Britain for bryophyte *Gymnostomum viridulum*, though is not associated water the raparian zone and therefore not sensitive to changes in flow or water level.	Not sensitive	No
Thorp Arch LWS	Moderate (Summer) & Minor (Winter)	Rare grassland habitat (CG4, CG5): species rich calcareous grassland.. Not sensitive to changes in flow or water level.	Not sensitive	No
Brickyard Pond LWS	Moderate (Summer) & Minor (Winter)	Lowland mire. The site is not hydrologically connected to the impacted reach. The mire is located approximately 350 metres away from the reach, and no streams or inlets are present.	Not sensitive	No
NERC Priority Habitats - Deciduous woodland 326145, 326146, 326147, 326148, 326149	Moderate (Summer) & Minor (Winter)	*Arrhenatherum elatius* grassland, *Cynosurus cristatus–Centaurea nigra* grassland, *Lolium perenne–Cynosurus cristatus* grassland *Arrhenatherum elatius* grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - Lowland meadows 425204, 425205, 425206	Moderate (Summer) & Minor (Winter)	*Arrhenatherum elatius* grassland, *Cynosurus cristatus–Centaurea nigra* grassland, *Lolium perenne–Cynosurus cristatus* grassland *Arrhenatherum elatius* grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - Lowland meadows 42520, 425208	Moderate (Summer) & Minor (Winter)	*Arrhenatherum elatius* grassland, *Cynosurus cristatus–Centaurea nigra* grassland, *Lolium perenne–Cynosurus cristatus* grassland *Arrhenatherum*	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)*
		elatius grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors		
NERC Priority Habitats - Deciduous woodland 326132	Moderate (Summer) & Minor (Winter)	*Brachypodium pinnatum* grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - Lowland fens 412760	Moderate (Summer) & Minor (Winter)	*Carex acutiformis* swamp, *Lolium perenne–Cynosurus cristatus* grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - No main habitat but additional habitats present 458335	Moderate (Summer) & Minor (Winter)	Coastal and floodplain grazing marsh. Unlikely to be in connectivity with impacted reach	Not sensitive	No
NERC Priority Habitats - Deciduous woodland 324364	Moderate (Summer) & Minor (Winter)	Coastal and floodplain grazing marsh. Unlikely to be in connectivity with impacted reach	Not sensitive	No
NERC Priority Habitats - Lowland meadows 423982	Moderate (Summer) & Minor (Winter)	*Cynosurus cristatus–Centaurea* nigra grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - Coastal and floodplain grazing marsh 39690	Moderate (Summer) & Minor (Winter)	Deciduous woodland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - No main habitat but additional habitats present 445939	Moderate (Summer) & Minor (Winter)	Fens. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - No main habitat but additional habitats present 446300	Moderate (Summer) & Minor (Winter)	Fens, Lowland meadows and pastures. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - Deciduous woodland 325749	Moderate (Summer) & Minor (Winter)	Good quality semi-improved grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - Deciduous woodland 320147	Moderate (Summer) & Minor (Winter)	Holcus *lanatus–Deschampsia cespitosa* grassland, other water-margin vegetation. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No

Site/Receptor and designation	***Hydrological Impact at Location*** *(Major, Moderate, Minor, Negligible)*	***Susceptibility to flow and level impacts***	***Sensitivity*** *(Uncertain, High, Medium, Low, Not sensitive)*	***Further Consideration Required*** *(Y/N)*
NERC Priority Habitats - Coastal and floodplain grazing marsh 39050	Moderate (Summer) & Minor (Winter)	*Lolium perenne*–Cynosurus cristatus grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - No main habitat but additional habitats present 438828	Moderate (Summer) & Minor (Winter)	Lowland meadows and pastures. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - Good quality semi-improved grassland 362900	Moderate (Summer) & Minor (Winter)	Lowland meadows and pastures; Restoration of species-rich, semi-natural grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - Coastal and floodplain grazing marsh 41544, 65946, 65959, 69036, 69038, 69094, 69095, 69102	Moderate (Summer) & Minor (Winter)	Maintenance of grassland for target receptors. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - Good quality semi-improved grassland 356855, 357850, 357851	Moderate (Summer) & Minor (Winter)	Maintenance of grassland for target receptors. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - Good quality semi-improved grassland 358576	Moderate (Summer) & Minor (Winter)	Maintenance of grassland for target receptors, coastal and floodplain grazing marsh. Unlikely to be in connectivity with impacted reach	Not sensitive	No
NERC Priority Habitats - Coastal and floodplain grazing marsh 41388, 69040, 69041, 69042	Moderate (Summer) & Minor (Winter)	Maintenance of wet grassland for breeding waders. Unlikely to be in connectivity with impacted reach	Not sensitive	No
NERC Priority Habitats - Lowland fens 413420, 413421	Moderate (Summer) & Minor (Winter)	*Phragmites australis* swamp and reed-beds *Glyceria maxima* swamp *Typha latifolia* swamp, Reedbeds. Unlikely to be in connectivity with impacted reach	Not sensitive	No
NERC Priority Habitats - Deciduous woodland 326359	Moderate (Summer) & Minor (Winter)	*Phragmites australis* swamp and reed-beds *Glyceria maxima* swamp *Typha latifolia* swamp. Unlikely to be in connectivity with impacted reach	Not sensitive	No
NERC Priority Habitats - Deciduous woodland 309745, 309746, 309747, 309800, 309801, 309802	Moderate (Summer) & Minor (Winter)	Reedbeds. Unlikely to be in connectivity with impacted reach	Not sensitive	No
NERC Priority Habitats - No main habitat but additional habitats present 433733, 433945, 433946	Moderate (Summer) & Minor (Winter)	Reedbeds. Unlikely to be in connectivity with impacted reach	Not sensitive	No

Site/Receptor and designation	***Hydrological Impact at Location*** *(Major, Moderate, Minor, Negligible)*	***Susceptibility to flow and level impacts***	***Sensitivity*** *(Uncertain, High, Medium, Low, Not sensitive)*	***Further Consideration Required*** *(Y/N)*
NERC Priority Habitats - Coastal and floodplain grazing marsh 39483, 44745, 44750, 44751, 44752, 44754, 44797, 45020, 45041, 45177, 45183, 45218, 45267, 51840, 51869, 51889, 60684, 60844, 60891, 60922, 61106, 61155, 68499, 68502, 68852, 69258, 69260, 69266, 69459, 69461, 69532	Moderate (Summer) & Minor (Winter)	Coastal and floodplain grazing marsh. Unlikely to be in connectivity with impacted reach or support aquatic receptors	Not sensitive	No
NERC Priority Habitats - Good quality semi-improved grassland 365556	Moderate (Summer) & Minor (Winter)	Good quality semi-improved grassland. Unlikely to be in connectivity with impacted reach or support aquatic receptors	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.

Data obtained from the Environment Agency, YWSL and a review of available data from NBN gateway was used to inform the assessment of white-clawed crayfish in the impacted reach. The data showed no surveys or records have been recorded in the impacted reach. White-clawed crayfish have been screened out based on targeted surveys carried out by the Environment Agency, which did not find any white-clawed crayfish but confirmed the presence of signal crayfish. Based on the absence of suitable habitat and presence of signal crayfish in the impacted reach, the receptor is not considered at risk from the drought permit. Based on the available information these species are considered not to be susceptible to drought order impacts and **not sensitive** to the physical environment impacts identified in **Appendix A.**

Data obtained from the Environment Agency and a review of available data from NBN gateway was used to inform the assessment of otter in the impacted reach. Review of Environment Agency and YWSL records indicates the presence of otter within the impacted reach. However, no information from survey findings was available and although the home ranges of otter can extend over tens of kilometres it is considered appropriate, following the precautionary principle, to consider otter likely to be present in the reach at the time of the implementation of a drought option. Based on the available information these species are considered not to be susceptible to drought option impacts and have a **low** sensitivity to the physical environment impacts identified in **Appendix A.**

Data obtained from the Environment Agency and a review of available data from NBN gateway was used to 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 water vole likely to be present in the reach at the time of the implementation of a drought option. Based on the limited available information water vole are considered to be susceptible to drought option impacts and have an **uncertain** sensitivity to the physical environment impacts identified in **Appendix A.**

The rare species of fine-lined pea mussel *Pisidium tenuilineatum* has been identified as being present in Wharfe 1. Review of EA records indicate the potential presence of fine-lined pea mussel in the River Wharfe.

Pisidium sp. was sampled at Harewood and Castley survey sites, but detailed species data and quantitative data on populations of this species in the watercourse have not been made available. YWSL has undertaken targeted Fine-lined Pea Mussel surveys in 2015 and 2016 at Addingham. The results of these surveys indicate that fine-lined pea mussel was not observed. The River Wharfe population of fine-lined pea mussel is thought to be geographically distant from all other British populations (mainly to central southern England) and is, therefore, of both national and local importance.[4] Fine-lined pea mussel are thought to be found living a wide range of flow and sediment conditions, with a preference to less high-energy conditions amongst, or in the lee of, marginal aquatic plants, downstream of constructions or obstructions, or in shallow embayment's[5]. Based on the 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 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[6], European eel and river lamprey) and five notable fish species (grayling, bullhead, brook lamprey, barbel[7] and grayling).

One nationally scarce macroinvertebrate species, *Dixa maculata*, (see **Table B2-3**) was observed in sampling carried out by the EA in 2010.

Table B2-3 Notable Macroinvertebrate Species Designations

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

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)*
NERC Species – Crustacea Freshwater White-clawed Crayfish (*Austropotamobius pallipes)*	Moderate	Limited data is available for the impacted reach. White-clawed crayfish are not likely to be present in the impacted reach as signal crayfish are identified as present during a targeted survey.	Not sensitive	No
Notable Species - Invertebrate -True fly *(Dixa maculata)*	Moderate (Summer only)	Species associated with slow-flowing water, therefore not likely to be potentially susceptible to drought option impacts. 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.	Not sensitive	No

[4] Killeen, I.J, Williams, S. (1998). The status and distribution of *Pisidium Tenuilineatum* Stelfox, 1918 (Mollusca: *Sphaeriidae*) in the River Wharfe. Naturalist 124: 101-106.

[5] Killeen, I.J, Willing, M.J. (2004). Further surveys to elucidate the distribution of the fine-lined pea mussel *Pisidium tenuilineatum* Stelfox, 1918. R&D Technical Report W1-054/TR. Environment Agency.

[6] 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.

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

Site/Receptor and designation	Hydrological Impact at Location *(Major, Moderate, Minor, Negligible)*	Susceptibility to flow and level impacts	Sensitivity *(Uncertain, High, Medium, Low, Not sensitive)*	Further Consideration Required *(Y/N)*
NERC Species – mammals Otter *(Lutra lutra)*	Moderate	Otters are known to use the impacted reaches. Further consideration would be necessary to determine to what extent or how they may be impacted by reduced flows caused by the drought option.	Low	Yes
NERC Species – mammals Water vole (*Arvicola amphibious)*	Moderate	Limited data is available for the impacted reach. Changes in water level are the most important factor influencing water vole populations, with species readily inhabiting areas of slow flowing and standing water. As such hydrological and associated impacts as a result of this drought option may reduce habitat availability and alter the species food supply.	Uncertain	Yes
NERC Species – Molluscs Fine-lined pea mussel *(Pisidium tenuilineatum)*	Moderate	Population occurs at the northern most edge of its distribution. Nutrients and inappropriate channel management are listed as threats as is wash out from high flows. Extent to which vulnerable to drought option impacts unknown – may be vulnerable to drying.	Medium	Yes
NERC Species – Fish -Atlantic Salmon (*Salmo salar)* -Brown Trout (*Salmo trutta)* -European Eel *(Anguilla Anguilla)* -River lamprey *(Lampetra fluviatilis)*	Moderate	Potentially susceptible as duration of impacts could include all seasons, and thus could impact spawning, migration, provision of cover etc. Due to the presence of obstructions within the waterbody preventing upstream migrations there is less chance of natural recovery should the fish populations be damaged. In addition, the scale of the change is very high over a long reach of the watercourse. Predation could occur on fish stranded in pools in high densities.	High	Yes
Notable Species – Fish -Grayling (*Thymallus thymallus)* -Bullhead *(Cottus gobio)* -Barbel *(Barbus barbus)* -Brook lamprey *(Lampetra planeri)*	Moderate	Potential for water quality issues to be exacerbated at lower flows. Potential for increased predation at lower flows. Important migratory spawning habitats.	Medium	Yes

B2.1.4 WFD receptors

B2.1.4.1 Macroinvertebrates

The WFD waterbodies GB104027064257 River Wharfe from Barben Beck/ River Dibb to Hundwith Beck, GB104027064258 River Wharfe from Hundwith Beck to River Washburn, GB104027064254 River Wharfe from River Washburn to Collingham Beck, GB104027064255 River Wharfe from Collingham Beck to Tadcaster Weir and GB104027064256 River Wharfe from Tadcaster Weir to River Ouse are all classified as 'High' for macroinvertebrates in 2022, Cycle 3.

Baseline macroinvertebrate data is provided by eight Environment Agency monitoring sites:

- The WFD waterbody GB104027064257 (River Wharfe from Barben Beck/River Dibb to Hundwith Beck) classifies as high for macroinvertebrates in 2022, Cycle 3. Baseline data is provided by one EA monitoring site at Ikley (ID 1000).
- The WFD waterbody GB104027064258 (River Wharfe from Hundwith Beck to River Washburn) classifies as high for macroinvertebrates in 2022, Cycle 3. Baseline data is provided by one EA monitoring site at Otley (ID 339).
- The WFD waterbody GB104027064254 (River Wharfe from River Washburn to Collingham Beck) classifies as high for macroinvertebrates in 2022, Cycle 3. Baseline data is provided by three EA monitoring site at Castley (ID 337), Harewood (ID 969) and Linton Bridge (ID 972).
- The WFD waterbody GB104027064255 (Wharfe from Collingham Beck to Tadcaster Weir) classifies as high for macroinvertebrates in 2022, Cycle 3. Baseline data is provided by two EA monitoring sites at Boston Spa (ID 347) and downstream of Tadcaster (ID 1327).
- The WFD waterbody GB104027064256 (Wharfe from Tadcaster Weir to River Ouse) which classifies as high for macroinvertebrates in 2022, Cycle 3. Baseline data is provided by one EA monitoring sites at Ulleskelfe (ID 973). Due to sampling inefficiency the Autumn 2021 (Site ID 973) sample has been excluded from the baseline data set.

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

The indicative WFD classification for these sites is based on the worst classification between $WHPT_{ASPT}$ and $WHPT_{NTAXA}$, these ranged between ‘Bad' on seven occurrences and 'High' on nine 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		

$WHPT_{ASPT}$ scores ranged between 2.63 - 7.01 (5.79) with the lowest $WHPT_{ASPT}$ score of 1.2 at 2.63 at Site 973 in Spring 2022, and the highest score of 7.01 at Site 344 in Spring 2022. The $WHPT_{ASPT}$ expected scores for ranged between 4.74 to 6.69 across the sites, with six of the 40 samples below the 'Good/Moderate boundary'. WHPT ASPT EQR scores ranged between 0.54 - 1.25 (0.95) with the lowest $WHPT_{ASPT}$ EQR of 0.54 at Site 973 in Spring 2022, and the highest EQR of 1.25 at Site 973 in Autumn 2020.

Monitoring data shows variation in $WHPT_{NTAXA}$ scores ranging between 3 and 33 (19.36), with the lowest $WHPT_{NTAXA}$ score of 3 at Site 973 in Spring 2022, and the highest score of 33 at Site 339 in Autumn 2020. The $WHPT_{NTAXA}$ expected scores ranged between 25.34 to 28.93 across the sites, with 17 of the 40 samples below the 'Good/Moderate boundary'. $WHPT_{NTAXA}$ EQR scores ranged between 0.12 - 1.25 (0.72) with the lowest $WHPT_{NTAXA}$ EQR of 0.12 at Site 973 in Spring 2022, and the highest EQR of 1.25 at Site 339 in Autumn 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. Baseline data indicates that under present conditions, the macroinvertebrate community in Wharfe 1 is highly sensitive to reduced flows (**Figure B2.1**). 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

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

$LIFE_{FAMILY}$ 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 - 8.6 (7.31) with the lowest $LIFE_{FAMILY}$ score of 6 at Site 1327 in Spring 2021, and the highest score of 8.6 at Site 344 in Spring 2022. The $LIFE_{FAMILY}$ expected scores ranged between 6.43 to 7.65 across the sites, with 5 of the 40 samples below the 'Good/Moderate' boundary. $LIFE_{FAMILY}$ EQR scores ranged between 0.83 - 1.13 (1.01) with the lowest $LIFE_{FAMILY}$ EQR of 0.83 at Site 1327 in Spring 2021, and the highest EQR of 1.13 at Site 973 in Autumn 2020.

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 22.2 - 90.5 (57.67) with the lowest PSI_{FAMILY} score of 22.2 at Site 1327 in Autumn 2022, and the highest score of 90.5 at Site 1000 in Spring 2021. The PSI_{FAMILY} expected scores ranged between 32.28 to 67.02 across the sites, with 18 of the 40 above the expected PSI_{FAMILY} score for their respective season. PSI_{FAMILY} EQR scores ranged between 0.44 - 2.42 (1.06) with the lowest PSI_{FAMILY} EQR of 0.44 at Site 1327 in Autumn 2022, and the highest EQR of 2.42 at Site 973 in Autumn 2020.

A total of two INNS species, including *Crangonyx pseudogracilis/floridanus and Potamopyrgus antipodarum* were recorded as present at three sites in 2010.

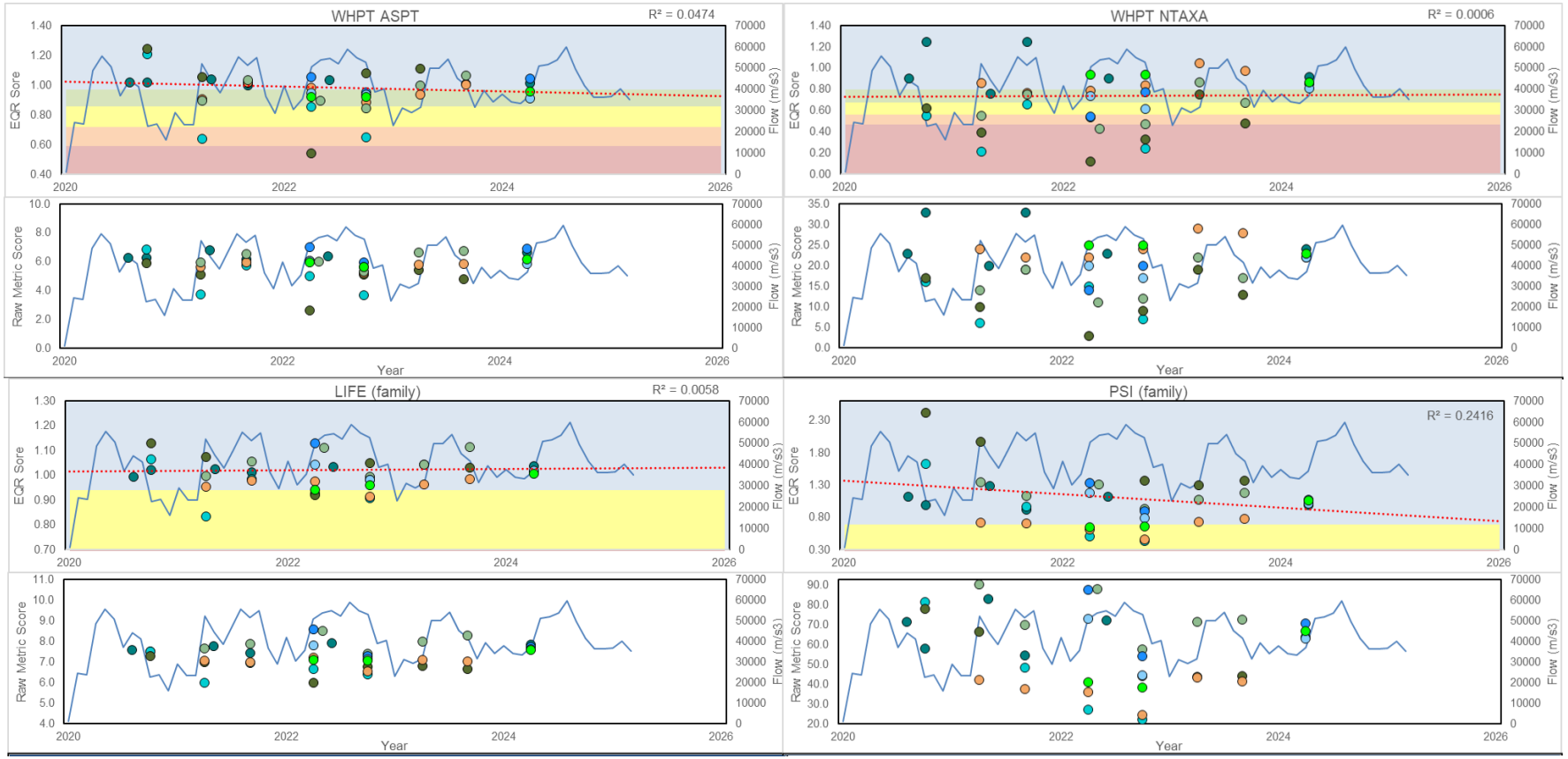
A single designated species, *Dixa maculata*, was recorded at Site 337 in 2010.

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

Site ID	Site NGR	Survey count	Survey Range	LIFE EQR Score Min - Max (AVG.)	LIFE (Family) Score Min - Max (AVG.)	PSI (Family) EQR Score Min - Max (AVG.)	PSI (Family) Score Min - Max (AVG.)	WHPT ASPT EQR Score Min - Max (AVG.)	WHPT ASPT EQR Class Min - Max (AVG.) *B/P/M/G/H*	WHPT ASPT Score Min - Max (AVG.)	WHPT NTAXA EQR Score Min - Max (AVG.)	WHPT NTAXA EQR Class Min - Max (AVG.) *B/P/M/G/H*	WHPT NTAXA Score Min - Max (AVG.)
339	SE1878845491	7	2020 to 2024	0.99 - 1.04 (1.02)	7.43 - 7.9 (7.63)	0.93 - 1.29 (1.05)	54.6 - 83.3 (65.56)	1 - 1.04 (1.02)	H - H (H)	6.15 - 6.81 (6.38)	0.76 - 1.25 (1.03)	G - H (H)	20 - 33 (27)
1327	SE4856243688	5	2020 to 2022	0.83 - 1.06 (0.94)	6 - 7.5 (6.7)	0.44 - 1.64 (0.89)	22.2 - 81.8 (44.9)	0.64 - 1.21 (0.87)	P - H (G)	3.7 - 6.86 (5.02)	0.21 - 0.66 (0.44)	B - M (B)	6 - 19 (13)
973	SE5240340539	7	2020 to 2023	0.92 - 1.13 (1.04)	6 - 7.27 (6.75)	1.3 - 2.42 (1.69)	44 - 78.1 (55.52)	0.54 - 1.25 (1.01)	B - H (H)	2.63 - 5.9 (4.83)	0.12 - 0.75 (0.45)	B - G (B)	3 - 19 (12)
347	SE4314445827	6	2021 to 2023	0.92 - 0.99 (0.96)	6.55 - 7.21 (6.99)	0.46 - 0.79 (0.67)	24.4 - 43.4 (37.63)	0.89 - 1.02 (0.96)	G - H (G)	5.2 - 6.09 (5.76)	0.77 - 1.04 (0.88)	G - H (H)	22 - 29 (25)
1000	SE1372348162	6	2021 to 2023	0.99 - 1.11 (1.05)	7.4 - 8.5 (7.95)	0.94 - 1.35 (1.16)	57.9 - 90.5 (75.18)	0.84 - 1.07 (0.96)	M - H (G)	5.33 - 6.74 (6.21)	0.43 - 0.87 (0.62)	B - H (M)	11 - 22 (16)
344	SE0831450001	3	2022 to 2024	0.98 - 1.13 (1.04)	7.28 - 8.6 (7.87)	0.9 - 1.33 (1.1)	54.3 - 88 (71.1)	0.95 - 1.06 (1.02)	G - H (H)	5.97 - 7.01 (6.63)	0.54 - 0.85 (0.72)	P - H (G)	14 - 22 (19)
337	SE2577945876	3	2022 to 2024	0.98 - 1.04 (1.02)	7.13 - 7.81 (7.52)	0.8 - 1.18 (1)	44.8 - 73.1 (60.3)	0.91 - 0.95 (0.93)	G - G (G)	5.65 - 6.06 (5.85)	0.62 - 0.81 (0.72)	M - H (G)	17 - 22 (20)
969	SE3090445964	3	2022 to 2024	0.94 - 1.01 (0.97)	7.05 - 7.58 (7.24)	0.65 - 1.06 (0.79)	38.3 - 67 (48.83)	0.92 - 0.96 (0.94)	G - G (G)	5.66 - 6.19 (5.93)	0.86 - 0.94 (0.91)	H - H (H)	23 - 25 (24)

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

The WFD waterbody GB104027064257 Wharfe from Barben Becl/River Dibb to Hundwith Beck Water Body is classified under cycle 3 (2022) as 'moderate'. The classification is informed by two sites, U/S Denton Road Bridge (ID 9012) which was classified as 'good' in 2019, and Appletreewick B (Lower Site) (ID 3758) which was classified as 'poor' in 2019.

WFD waterbodies GB104027064258 Wharfe from Hundwith Beck to River Washburn, GB104027064254 Warfe from R Washburn to Collingham Beck, GB104027064255 Wharfe from Collingham Beck to Tadcaster Weir, GB104027064256 Wharfe from Tadcaster Weir to River Ouse all have no classification for the fish element.

Baseline data is available for 13 Environment Agency monitoring sites. YWSL commissioned additional surveys at six sites from 2020 through to 2022.**Table B 2-8** details the survey sites within each WFD waterbody.

- The WFD waterbody GB104027064257 (River Wharfe from Barben Beck/River Dibb to Hundwith Beck) classifies as 'moderate' for Fish in 2022, Cycle 3. Baseline data is provided by two EA monitoring sites at Ikley (ID 13762) and Ilkley stepping stones riffle (ID 59923).
- The WFD waterbody GB104027064258 (River Wharfe from Hundwith Beck to River Washburn) is not classified for fish in 2022, Cycle 3. Baseline data is provided by two EA monitoring sites at D/S Burley weir (ID 59963) and D/S Otley weir (ID 60003).
- The WFD waterbody GB104027064254 (River Wharfe from River Washburn to Collingham Beck) is not classified for fish in 2022, Cycle 3. Baseline data is provided by five EA monitoring site at Knotford (ID 3763), Pool Mill (ID 3764),Castley (ID 3765), Harewood (ID 79983) and Netherby (ID 67543).
- The WFD waterbody GB104027064255 (Wharfe from Collingham Beck to Tadcaster Weir) is not classified for fish in 2022, Cycle 3. Baseline data is provided by three EA monitoring sites at Boston Spa - Fry Survey (ID 42073), Newton Kyme (ID 59983) and Tadcaster post 2006 (ID 32652).
- The WFD waterbody GB104027064256 (Wharfe from Tadcaster Weir to River Ouse) is not classified for fish in 2022, Cycle 3. Baseline data is provided by one EA monitoring sites at Ulleskelfe (ID 3786).

Minnow were the most abundant species across the reach, with estimated log abundances of 1000–9999 recorded at Pool Mill, D/S Burley Weir, Tadcaster Post 2006, and Boston Spa – Fry Survey. High observed counts were also common, particularly in 2024 and at Boston Spa, where seine netting inflated values relative to electric fishing.

Stone loach showed similar patterns, with estimated log abundances recorded at Pool Mill, Castley, and Harewood. Elsewhere, observed counts were ranged between one and 38 individuals with consistent presence at the sites.

Bullhead were recorded at most sites and years, with estimated log abundances at Pool Mill, Castley, and D/S Burley Weir. Observed counts at other sites were generally varied, ranging from one to 175 individuals. The species was absent at Ulleskelf and during the years when only Boston Spa – Fry Survey was undertaken.

Brown trout were present at most sites except Ulleskelf and Boston Spa – Fry Survey (method-limited). Observed counts ranged from a high of 67 at Ilkley in 2014 to consistent lows (one–three individuals) at Newton Kyme, Tadcaster Post 2006, and Castley.

Grayling were most abundant at Pool Mill and Castley between 2010 and 2014, with observed counts reaching 119. However, numbers declined over time, with few or no individuals recorded at most sites from 2020 onward.

Atlantic salmon were recorded in low numbers, with observed counts up to 28 at D/S Otley Weir. Several sites—including Ilkley, Knotford, and Boston Spa—recorded no salmon. European eel were also recorded in low numbers (1–10), with absence only at Netherby, which was surveyed once.

Potentially two lamprey species were counted within the reach. Brook lamprey and Lamprey sp. were recorded in low numbers across multiple sites. Lamprey sp. were counted at Ilkley, Knotford, Pool Mill, Castley, Ulleskelf, Tadcaster Post 2006 and Boston Spa – Fry Survey. Estimated log abundances were recorded at Pool Mill, Castley, and Tadcaster Post 2006, though most records were based on observed counts below 10. A review of NBN gateway records shows historic and recent records for river lamprey and brook lamprey within the River Wharfe, as such it is not possible to rule out the presence of river lamprey within the reach.

Coarse fish species, including dace, chub, roach, barbel, gudgeon, bleak, and bream, were more common and abundant at downstream sites such as Tadcaster Post 2006 and Ulleskelf. Boston Spa – Fry Survey recorded especially high observed counts for flounder (up to 282), gudgeon (78), and roach, reflecting the use of seine netting.

The River Wharfe supports a fish community typical of mid-to-upper catchments, with salmonids and small-bodied species dominating upstream and coarse fish becoming more prevalent downstream as detailed in

Table B2-9 . Minnow were the dominant species, with high estimated log abundances and observed counts across many sites. Stone loach, bullhead, and gudgeon were widespread in moderate abundance. Brown trout and grayling were recorded at most sites, though both showed year-to-year variation. Atlantic salmon, European eel, and lamprey were recorded sporadically in low numbers, indicating the reach functions as a migratory corridor.

Downstream sites supported more diverse and abundant coarse fish communities. Overall, the fish community reflects a clear longitudinal gradient and is considered to have a **medium** sensitivity to the physical environment impacts identified in **Appendix A**.

Table B 2-8 Wharfe 1 Fish Survey Site Information

WFD waterbody	Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
GB104027064257	3762	Ilkley	SE1260048400	Electric Fishing (AC, PDC and DC)	4	2014	2022
	3763	Knotford	SE2270045800	Electric Fishing (AC, PDC and DC)	3	2010	2014
GB104027064258	3764	Pool Mill	SE2320045600	Electric Fishing (AC, PDC and DC)	7	2010	2024
	3765	Castley	SE2570045900	Electric Fishing (AC, PDC and DC)	5	2010	2022
GB104027064254	3786	Ulleskelf	SE5240040500	Electric Fishing (AC, PDC and DC)	3	2010	2014
	32652	Tadcaster post 2006	SE4852043720	Electric Fishing (AC, PDC and DC)	3	2010	2024
	42073	Boston Spa - Fry Survey	SE4310045900	Netting (including Seine or Fyke)	8	2010	2024
	59923	Ilkley stepping stones riffle	SE1321848254	Electric Fishing (AC, PDC and DC)	1	2014	2014
	59963	D/S Burley weir	SE1658547429	Electric Fishing (AC, PDC and DC)	5	2014	2024
GB104027064255	59983	Newton Kyme	SE4491645561	Electric Fishing (AC, PDC and DC)	4	2014	2022
	60003	D/S Otley weir	SE2025546062	Electric Fishing (AC, PDC and DC)	4	2014	2022

WFD waterbody	Site ID	Site Name	Survey NGR	Method Grouped	Survey Count	Min Survey Year	Max Survey Year
	67543	Netherby (discretionary only)	SE3316746702	Electric Fishing (AC, PDC and DC)	1	2016	2016
GB104027064256	79983	Harewood	SE3132246122	Electric Fishing (AC, PDC and DC)	1	2024	2024

Table B2-9 Wharfe 1 Fish Survey Results

Tolerance Category[8]	Species Name	2010	2011	2012	2014	2015	2016	2017	2020	2021	2022	2023	2024
High tolerance	Roach	X	X		X						X		X
	3-spined stickleback	X	X	X	X	X	X	X	X	X	X		X
	European eel	X	X		X				X	X	X		X
	Perch	X	X		X						X		X
	Roach x bream hybrid	X											
	Flounder	X	X		X								X
	Barbel	X			X		X		X		X		X
Medium tolerance	Dace	X	X		X		X		X	X	X		X
	Gudgeon	X	X		X		X			X	X		X
	Stone loach	X	X	X	X	X	X	X	X	X	X		X
	Minnow	X	X	X	X	X	X	X	X	X	X	X	X
	Chub	X	X		X	X	X		X	X	X	X	X
	Pike	X	X		X			X			X		X
	Bleak		X		X						X		X
	Common bream	X											
	Tench	X											
	Ruffe									X	X		X
Low tolerance	Bullhead	X	X	X	X		X		X	X	X		X
	Brown trout	X	X		X		X		X	X	X		X
	Grayling	X	X		X		X		X	X	X		X
	Lamprey sp.	X	X		X				X	X			X
	Atlantic salmon	X			X		X		X	X	X		X
	Brook lamprey									X	X		
Unclassified tolerance	Brown trout x salmon hybrid				X								

B2.1.4.3 WFD waterbody status

Table B2-10 Error! Not a valid bookmark self-reference. summarises the WFD classification of waterbody which contain the impacted reach. **Table B2-10** also displays the objective status for 2022 (Cycle 3) or the predicted status in 2027 where the objective is to meet good status is in 2027. This is displayed for overall, fish and macroinvertebrate elements and provides comparison with 2016 status, the table also displays the measures which have been assigned to the waterbody in order to reach their objective.

[8] 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.

Table B2-10 WFD classifications

Waterbody ID & Name		**GB104027064257 River Wharfe from Barben Beck/ River Dibb to Hundwith Beck**	**GB104027064258 River Wharfe from Hundwith Beck to River Washburn**	**GB104027064254 River Wharfe from River Washburn to Collingham Beck**	**GB104027064255 River Wharfe from Collingham Beck to Tadcaster Weir**	**GB104027064256 River Wharfe from Tadcaster Weir to River Ouse**	**Sensitivity** *(Uncertain, High, Medium, Low, Not Sensitive)*
Physical Environment Impact at Location *(Major, Moderate, Minor, Negligible)*		Moderate impacts (summer/autumn) Minor impacts (winter)					
RBMP Cycle 3 Status/ Potential	Overall	Moderate	Moderate	Poor	Moderate	Moderate	
	Fish	Moderate	-	-	-	-	Medium
	Macroinvertebrates	High	High	High	High	High	Medium
Hydro-morph designation		Heavily modified	Heavily modified	Heavily modified	Heavily modified	Heavily modified	
RBMP3 Waterbody Objective	Overall	Good	Good	Good	Good	Good	
	Fish	Moderate	-	-	-	-	
	Macroinvertebrates	Good	Good	Good	Good	Good	
Waterbody Measures		None	None	None	None	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[9] (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 - -Caspian Mud Shrimp (*Chelicorophium curvispinum*) -New Zealand Mud Snail (*Potamopyrgus antipodarum*) -Signal Crayfish (*Pacifiastacus leniusculus*) -Northern Cranonyctid (*Crangonyx pseuogracilis*)	Moderate	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
Mammals – American mink (*Neovision neovision*)	Moderate	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
INNS - Fish Rainbow trout (*Oncorhynchus mykiss*)	Moderate	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*) -Giant Hogweed (*Heracleum mantegazzianum*) -Japanese Knotweed (*Fallopian japonica*)	Moderate	The implementation of this drought permit is not anticipated to increase the spread of Invasive non-native species.	Not sensitive	No
INNS - Aquatic plants -Canadian pondweed (*Elodea canadensis*)	Moderate	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.

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

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	Moderate	The National Landscape comprises certain water dependent habitats which depending on their location will have taken into account through consideration of designated sites.	Not sensitive	No
Yorkshire Dales National Park	Moderate	The National Park borders the River Wharfe. The implementation of the drought option is unlikely to have an impact when compared to baseline natural drought conditions.	Not sensitive	No
Anglo-Saxon Cemetery and Medieval Manorial Centre – Scheduled Ancient Monument	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Churchyard cross at the Church of St. Peter	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Medieval Settlement and part of the open field system immediately south of Middleton – Scheduled Ancient Monument	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Old Bridge – Scheduled Ancient Monument	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Site of Roman Fort, Ilkley – Scheduled Ancient Monument	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Otley Bridge – Scheduled Ancient Monument	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Cup and Ring marked rock in Wharfemeadows Park – Scheduled Ancient Monument	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Rougemont Castle Ringwork and Bailey and associated fishponds and outwork	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Wetherby Bridge – Scheduled Ancient Monument	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Two Roman Forts, Two Roman Camps, Vicus, Iron Age Enclosure,	Moderate	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)*
Bronze Age Barrows, and Neolithic Henge Monument West of Newton Kyme – Scheduled Ancient Monument				
Settlement site revealed by aerial photography near Moat House – Scheduled Ancient Monument	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Fortified manor house known as Kyme Castle	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Tadcaster Motte and Bailey Castle – Scheduled Ancient Monument	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Roman Villa – Scheduled Ancient Monument	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Bracken Ghyll Golf Club	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Ilkley Golf Club	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Dales Way – National Trail	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Ebor Way – National Trail	Moderate	Unlikely to be impacted over the duration of the drought options implementation	Not sensitive	No
Angling on the River Wharfe	Moderate	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
Navigation on the River Wharfe	Moderate	Navigable from Tadcaster to confluence with Ouse. Drought option unlikely to affect river levels on this stretch, most of which is tidal.	Not sensitive	No

B3 ENVIRONMENTAL RECEPTORS SCREENING SUMMARY

Table B3-1 Environmental receptors summary of the Wharfe 1

Reach (Hydrological Impact)	Wharfe 1 (Moderate)
Associated Drought Options	**Wharfe at Lobwood**
WFD Waterbody	GB104027064257 River Wharfe from Barben Beck/ River Dibb to Hundwith Beck GB104027064258 River Wharfe from Hundwith Beck to River Washburn GB104027064254 River Wharfe from River Washburn to Collingham Beck GB104027064255 River Wharfe from Collingham Beck to Tadcaster Weir GB104027064256 River Wharfe from Tadcaster Weir to River Ouse
Statutory Designated Sites	
East Keswick Fitts SSSI	*X*
Linton Common SSSI	*X*
Kirkby Wharfe SSSI	*X*
North Pennine Moors SPA, SAC	*X*
South Pennine Moors SPA, SAC, SSSI	*X*
NERC Habitat and LWS	
River Wharfe, Otley & Mid Wharfedale/Wetherby LWS	✓
Ben Rhydding Gravel Pits LWS	✓
Otley Sand and Gravel Pits LWS	✓
NERC and Notable Species Receptors	
White-clawed crayfish	*X*
Otter	✓
Water vole	✓
Dixa maculata	*X*
Fine-lined pea mussel	✓
Atlantic salmon	✓
Brown trout	✓
European Eel	✓
River lamprey	✓
Barbel	✓
Bullhead	✓
Brook lamprey	✓
Grayling	✓
WFD Waterbody WFD Status Receptors	
Fish	✓
Invertebrates	✓
Landscape, Navigation, Recreation and Heritage Receptors	
Receptors	*X*

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

B4 RECEPTORS 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[10]. The potential changes to the physical environment as a result of drought option implementation are described in **Appendix A**.

B4.1 WHARFE 1

B4.1.1 Receptor assessment

B4.1.1.1 Statutory designated sites/Local wildlife sites

River Wharfe, Otley & Mid Wharfedale/Wetherby LWS

The River Wharfe flows west to east from Lob Wood, west of Addingham to Thorp Arch near Wetherby. This site includes the river, its southern banks and any islands. The land use is varied with the river passing through grassland, woodland, arable land and the urban areas of Ilkley, Otley and Wetherby, although much of the length of the river passes through rural areas. The river varies in character along the route, with the upper areas near Addingham being relatively fast flowing and with a fine gravel and shingle substrate. The lower stretches have a silt or mud substrate and are slower flowing. The Wharfe receptors many riffles, pools, islands and runs. The river banks range from shallow sloping sand and gravel beaches to steep sided banks. These receptors contribute to the diversity of habitats along the Wharfe. The Wharfe is an important fishery with populations of grayling, barbel and brown trout. **Appendix A** highlights the potential for a moderate risk of reduction in total wetted aquatic habitat in the reach, and moderate risk of changes in available habitat for different species requirements, however noting that dominant flow types will be retained. As such, the risk from the implementation of the drought option to the River Wharfe, Otley & Mid Wharfedale/Wetherby LWS is deemed to be **minor**.

Ben Rhydding Gravel Pits LWS/LNR

The Ben Rhydding Gravel Pits Nature Reserve has a variety of habitats, with some areas undisturbed by the gravel extraction having mature trees present. Elsewhere colonization of the workings has resulted in tree cover, mostly birch and willow approximately 40 years old. There are lagoons in the centre of the site and a number of informal paths, The Dalesway long distance footpath runs through the site. This site is one of a patchwork of interlinking woods throughout this part of the Wharfe valley**.** Disused millponds are often standing water with limited inflow from adjacent waterbodies. The lagoon covers an area of 3200m^2 and is shallowest at the eastern end. The height of the water varies by several metres depending on height of the river with water seeping through the banks; there are no water courses feeding directly into it[11]. The habitats on the site have been greatly influenced by its former status as gravel pits that have largely been in-filled. The tipped material has been compacted and drainage is severely impeded. The impeded drainage provides a delay in draw down of the water level of the lagoons as a response to the change in flows in the river.

Based on the available information these lagoons are hydrologically connected with the impacted reach, though via water passing through the banks and not via dedicated inlets. A reduction in flows within the River Wharfe will unlikey result in a disconnection of the lagoons with the impacted reach as the transfer of water will likely be maintained. The assumed hydrological regime, the risk from the implementation of the drought option to Ben Rhydding Gravel Pits LWS/LNR is deemed to be **negligible**.

Otley Sand and Gravel Pits LWS

The site consists of water areas, recently planted woodlands and reedbeds, rough grassland and stream edges. The large stand waters are used extensively for sailing, with Otley Sailing Club present of the largest waterbody (Weston Water). The site includes an extensive area of Common Spotted Orchids, Marsh Orchids and some Bee Orchids, Red Bartsia, Creeping Jenny, Changing Forget-me-not and Gypsywort, all of which are local in the area. These waterbodies may potentially be offline, but some connectivity is likely and cannot

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

[11] City of Bradford District Council (2013). Ben Rhydding Gravel Pits Nature Reserve- Mangagement Plan Agreement.

be ruled out, and a precautionary approach has been adopted. Given the location of Otley Sand and Gravel Pits within the floodplain of the River Wharfe, it's plausible that these water bodies maintain some level of hydrological connectivity with the river. This connection could be sustained through groundwater exchange or occasional surface water inflows during high-flow events. Based on the available information these standing waters may potentially be hydrologically connected and a reduction in flows within the River Wharfe may result in a disconnection of the waterbodies with the impacted reach, but given the assumed hydrological regime and the large size of the standing waters the risk from the implementation of the drought option to Otley Sand and Gravel Pits LWS is deemed to be **negligible**.

B4.1.1.2 NERC and other protected species

Water vole

In the absence of quantitative data on populations of water vole a detailed assessment of the impact in Wharfe 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 American mink, stoat, and weasels.

The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-1**. The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are considered to be short-term and reversible.

Table B4-1 Impacts on water vole in Wharfe 1

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

Otter

The drought option proposed for the River Wharfe is expected to result in short-term and reversible changes to the river's physical environment as detailed in **Appendix A**. The potential impacts include minor reductions in flow velocity and wetted width, but crucially, these changes are expected to be negligible in terms of their overall impact on otter habitat utilisation.

Compared to the natural drought scenario, the drought option is predicted to have a limited additional impact. The moderate reduction in flow (up to 18% in summer) is not expected to significantly alter habitat connectivity or the availability of foraging sites. Moreover, the overall habitat structure within the Wharfe reach remains relatively stable despite the proposed flow reductions. The drought option does not significantly affect bank-

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

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

side vegetation or resting sites, ensuring that key riparian corridors remain intact. As a result, the primary habitat receptor is utilised by otters, such as foraging areas, resting sites, and safe passage along the river corridor, are not expected to experience significant disruption.

The predicted changes in flow are minor and short-lived, and the structure of riparian habitats is expected to remain largely intact. Given otters' adaptability and mobility, the overall risk to their habitat utilisation within the River Wharfe under the drought option is considered **negligible**. The likely impacts arising from the hydrological changes as a result of the implementation of the drought option are identified in **Table B4-2**.

Table B4-2 Impacts on otter in Wharfe 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

Fine-lined pea mussel

The drought option proposed for the River Wharfe is predicted to result in short-term, reversible changes to the river's physical environment, as outlined in Appendix A. These include minor reductions in flow and wetted width. However, based on the available information, these changes are unlikely to result in significant effects on the fine-lined pea mussel, a species typically associated with marginal and shallow habitats in slow-flowing or standing waters[14].

Compared to the natural drought scenario, the additional impacts under the drought option are considered limited. The modelled reduction in flows (up to 18% during summer low flows) is not expected to significantly alter sediment deposition or marginal habitat extent. As a result, the potential for exposure or loss of suitable mussel habitat is low. The risk of stranding or mortality due to changes in depth or wetted width is also minimal, given the expected retention of flow through key wetted margins[15].

Although the fine-lined pea mussel is known to be sensitive to eutrophication and water quality deterioration, particularly elevated nutrient and organic loading[16], the drought option does not predict a deterioration in water quality that would pose a substantial risk as detailed in **Appendix A**. Risk of short term acute, infrequent, temporary water quality pressures are localised to areas downstream of six CSO during rainfall events. The overall flow reduction is not expected to cause stagnation or significant changes to dissolved oxygen concentrations under typical seasonal conditions.

The species' known populations in the River Wharfe are limited and patchily distributed, and its microhabitat requirements mean that it is unlikely to be widespread across the reach[17]. However, given its rarity and national conservation importance, a precautionary assessment has been applied.

Overall, the changes associated with the drought option are unlikely to impact the fine-lined pea mussel's core habitat or water quality conditions. The risk of population-level effects is low, and the impact is considered **negligible**. 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 fine-lined pea mussel data and the subsequent assessment is classed as low, though the assessment is based on an assumed presence following a precautionary approach.

[14] Killeen, I. J. (2003). *Pisidium tenuilineatum – Species account.* In: Killeen, I. J., Moorkens, E. A., & Seddon, M. B. *Mollusc Red Data Lists for Europe.* European Commission.

[15] Environment Agency (2010). *River Basin Planning: Guidance on the classification of aquatic invertebrates.*

[16] JNCC (2023). *UK Priority Species data collation: Pisidium tenuilineatum.*

[17] Killeen, I. J. (2007). *Survey of rare and threatened non-marine molluscs in England and Wales.* Environment Agency Science Report SC030195.

Table B4-3 Impacts on fine-lined pea mussel in Wharfe 1

Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Fine-lined pea mussel	• Exposure/loss of marginal habitat is unlikely as impacts on wetted width and sediment dynamics is considered minor • Stranding and mortality of individuals as a result of a reduction in depth and/or wetted width is also considered unlikely. • The species is considered to be particularly vulnerable to water quality changes (eutrophication), but water quality risks to the species are considered unlikely	National	Negligible	Negligible

Fish

The fish community within the River Wharfe reach comprises several NERC Act Section 41 species and other notable fish species**,** including both resident and migratory species. The implementation of the drought option may potentially result in short-term and reversible changes to the river's physical environment, as detailed in **Appendix A**. These changes primarily involve moderate reductions in flow velocity and wetted width. Additionally, longitudinal connectivity will not be compromised**,** ensuring that migration corridors remain intact.

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 overall confidence in the data and subsequent assessment for Atlantic salmon, brown trout, grayling, bullhead, barbel, brook lamprey and European eel has been classed as high due to the number of surveys and the age of the most recent surveys completed. The confidence in the data and assessment for river lamprey has been classed as low due to the absence from survey data and reliance on historical records.

Table B4-4 Impacts on NERC and notable fish species in Wharfe 1

NERC/ notable Receptor	Impact	Ecological Value of Receptor	Impact Magnitude	Significance of Impact
Atlantic salmon	• Siltation of spawning gravels could occur as a result of increased sediment availability from the collapse of riverbanks • Decreased growth, morphological change and/or alteration to feeding and migration • Mortality as a result of water quality deterioration (oxygen stress, gill clogging) – Salmonids and grayling • Fragmentation of habitats and increased significance of obstacles/barriers • Stranding of individuals as a result of a reduction in velocity, depth and/or wetted width, possibly resulting in the exposure of the river bed • Increased mortality (density dependant) as a result of increased predation • Exposure/loss of important habitats (wetland habitats for juveniles and adults) for eel • It is noted that depth of water is not critical to Bullhead[18] and the species is also widespread within the catchment	National	Medium	Moderate
Brown trout		National	Medium	Moderate
Grayling		Regional	Medium	Moderate
Bullhead		Regional	Low	Minor
Barbel		County	Low	Minor
River lamprey		National	Medium	Moderate
Brook Lamprey		National	Medium	Moderate
European eel		National	Low	Minor

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

B4.1.1.3 WFD receptors

Macroinvertebrates

This assessment focuses on evaluating the risk of deterioration of the macroinvertebrate element as a result of the implementation of the drought option, considering the potential impacts beyond those expected from natural drought conditions. The assessment is based on the drought option being in place for up to six months from the date on which the permit is granted. The drought option may result in flow reductions of up to 18% during summer and dry autumn conditions, while impacts during winter may result in flow reductions of up to 13.5%, as detailed in **Appendix A**. The primary impact on the macroinvertebrate community relates to the moderate reduction in river flow during summer and autumn, which may lead to a moderate decrease in wetted width and depth. However, this reduction is not expected to significantly change habitat availability, as the dominant flow types (smooth and rippled) will be retained, preserving the overall habitat structure.

As indicated by the $WHPT_{NTAXA}$ EQRs, the macroinvertebrate community shows a good to high level of diversity, and consequently, loss of habitat may reduce the diversity of the community as a result of habitat loss for certain species. Furthermore, the increased friction between flow and channel bed may reduce flow velocity, as the macroinvertebrate community is sensitive to flow velocity reductions, as indicated by high LIFE scores. This may reduce the suitability of the reaches to species which require high flow velocities. The community is considered to be sensitive to water quality pressures as indicated by high $WHPT_{ASPT}$ EQRs, however the water quality changes as a result of the implementation of the drought option are predicted to present a moderate risk. Water quality deterioration as a result of the drought option may potentially have a short-term acute impact on invertebrate community, associated with additional temporary water quality pressures locally downstream of six listed CSO's during rainfall events.

The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are predicted to present a moderate risk in summer and minor risk in winter to the macroinvertebrate component of the WFD waterbodies; WFD waterbodies GB104027064257 River Wharfe from Barben Beck/ River Dibb to Hundwith Beck, GB104027064258 River Wharfe from Hundwith Beck to River Washburn, GB104027064254 River Wharfe from River Washburn to Collingham Beck, GB104027064255 River Wharfe from Collingham Beck to Tadcaster Weir and GB104027064256 River Wharfe from Tadcaster Weir to River Ouse. The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. However, the macroinvertebrate community recovery is expected to be relatively quick due to effective re-colonisation strategies in macroinvertebrates[19'20]. Therefore, the risk to deterioration of the WFD status of the waterbody is considered to be **moderate**.

Fish

The combined physical environment changes (river flows, river habitat and water quality) as a result of the implementation of the drought option are predicted to present a **moderate** risk to the fish component of the WFD waterbody GB104027064257 River Wharfe from Barben Beck/ River Dibb to Hundwith Beck.

WFD waterbodies GB104027064258 Wharfe from Hundwith Beck to River Washburn, GB104027064254 Warfe from R Washburn to Collingham Beck, GB104027064255 Wharfe from Collingham Beck to Tadcaster Weir, GB104027064256 Wharfe from Tadcaster Weir to River Ouse all have no classification for the fish element. The duration of impacts could be up to 6 months and occur at any time of the year and therefore affect all seasons. Drought option impacts on the physical environment are summarised in **Appendix A**.

A minor risk of change in the energy of the system associated with up to 18% reduction in flow for the duration of the drought option poses a moderate risk to available aquatic habitat and a minor risk to longitudinal connectivity. A minor risk of change in sediment dynamics could lead to the potential deposition of fine sediment, impacting brown trout, Atlantic salmon, barbel, bullhead, grayling, brook lamprey and river lamprey spawning.

Moderate risks to water quality are posed downstream of six frequently operating CSOs, which potentially present an environmental risk in the reach. Whilst CSOs pose a short-term risk of acute ammonia toxicity and

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

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

oxygen sags locally downstream during rainfall events these are generally seen as localised pressures within the reach.

The likely impacts arising from the hydrological changes as a result of the drought permit are identified in **Table B4-5**. The absence of a WFD classification for fish further supports the conclusion that the drought option is unlikely to result in significant changes to the fish community as a whole. Therefore, the risk to the fish community is considered to be **moderate**. The overall confidence in the fisheries data and subsequent assessment has been classed as high due to the number of surveys and the age of the most recent surveys completed.

Table B4-5 Wharfe 1 impacts on fish communities

Impact	Impact Magnitude	Significance of Impact	Level of Confidence
• Delays and potential cessation of migration due to reduced flows. • Reduction in spawning and juvenile survival due to habitat loss. • Increased risk of stress and predation. • Mortality as a result of a moderate risk of water quality deterioration (ammonia toxicity and oxygen sags).	Medium	Moderate	Medium

B4.1.2 Summary of Impacts

Table B4-6 summarises the outcomes of the environmental receptors assessment and includes deterioration to fish and macroinvertebrate receptors within WFD waterbodies and significance of impacts to designated sites, NERC Act Section 41 receptors and other significant receptors.

Table B4-6 Summary of impacts identified in Wharfe 1's environmental receptors assessment

Reach	Wharfe 1	
	Significance of Impact[21]	**Mitigation Required** *(Y/N)*
Statutory designated sites/Local wildlife sites		
River Wharfe, Otley & Mid Wharfedale/Wetherby LWS	Minor	No
Ben Rhydding Gravel Pits LWS	Negligible	No
Otley Sand and Gravel Pits LWS	Negligible	No
NERC and Notable Species Receptors		
Otter (*Lutra lutra)*	Negligible	No
Water vole (*Arvicola amphibius*)	Moderate	Yes
Fine-lined pea mussel (*Pisidium tenuilineatum*)	Negligible	No
Atlantic salmon (*Salmo salar*)	Moderate	Yes
Brown trout (*Salmo trutta)*	Moderate	Yes
European eel (*Anguilla anguilla*)	Minor	No
River lamprey (*Lampetra fluviatilis*)	Moderate	Yes
Brook lamprey (*Lampetra planeri)*	Moderate	Yes
Barbel (*Barbus barbus*)	Minor	No
Bullhead (*Cottus gobio)*	Minor	No
Grayling (*Thymallus thymallus)*	Moderate	Yes
WFD Status Receptors[22]		
Fish	Moderate	Yes
Invertebrates	Moderate	Yes

[21] Risk of Deterioration for WFD receptors

[22] GB104027064257 River Wharfe from Barben Beck/ River Dibb to Hundwith Beck
GB104027064258 River Wharfe from Hundwith Beck to River Washburn
GB104027064254 River Wharfe from River Washburn to Collingham Beck
GB104027064255 River Wharfe from Collingham Beck to Tadcaster Weir
GB104027064256 River Wharfe from Tadcaster Weir to River Ouse

B5 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 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.5 of YWSL's Drought Plan EMP and a summary is provided in the main EAR Section 6.2.

YWSL have identified that for the period of implementation of the drought option, sewage treatment can be enhanced, reducing the water quality pressure on the impacted receptors from ammonia, and oxygen balance. Further information can be found in the YWSL WwTW optimisation plan[23] which provides details on enhancement for WwTW that discharge into rivers where compensation flows may be reduced under drought permit implementation.

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

A 'Combined Sewer Overflows Optimisation and Maintenance for Drought Plan' has also been developed by YWSL, which identifies all significant intermittent water quality pressures identified in this EAR. During any future drought onset period YWSL will also consult with the Environment Agency and additional sites could be identified as required.

[23] YWSL (2025) Wastewater Treatment Works Optimisation and Maintenance for Drought Plan.

ANNEX1 FULL FISH SURVEY COUNTS

						Low tolerance						Medium tolerance									High tolerance								N/A
Site ID	Site Name	Survey NGR	Year	Survey Method	Survey Strategy	Bullhead	Brown trout	Grayling	Lamprey sp.	Atlantic salmon	Brook lamprey	Dace	Gudgeon	Stone loach	Minnow	Chub	Pike	Bleak	Common bream	Tench	Ruffe	Roach	3-spined stickleback	European eel	Perch	Roach x bream hybrid	Flounder	Barbel	Brown trout x salmon hybrid
3762	Ilkley	SE1260048400	2014	Electric Fishing (AC, PDC and DC)	Single Catch Sample	11	67	14	2			1	3	7															
			2020			639	6	2						364	855														
			2021			100	14				4			38	100								2						
			2022			50	16	2			2		2	38	50	1								2					
59923	Ilkley stepping stones riffle	SE1321848254	2014	Electric Fishing (AC, PDC and DC)	Single Catch Sample	999†	20	8						9†	9†									1					
59963	D/S Burley weir	SE1658547429	2014	Electric Fishing (AC, PDC and DC)	Single Catch Sample	999†	15	4						9†	999†														
			2020			134		4		2				52	18									1					
			2021			10	8	6		3	1			17	52	2							3						
			2022			1	8	3			2	2		7	25									3					
			2024			999†	10	3						999†	9999†														
60003	D/S Otley weir	SE2025546062	2014	Electric Fishing (AC, PDC and DC)	Single Catch Sample	999†	8	11		28				9†	99†									1					
			2020			16	14	6		3		1		10	15	2								2					
			2021			32	3			1	7			9	76	13								10					
			2022			3	9			3			3	2	27	1													
3763	Knotford	SE2270045800	2010	Electric Fishing (AC, PDC and DC)	Single Catch Sample				3				40	9†	999†									4	1	3			
			2011			1			5			2	15	5	60	1	2						3	3	1				
			2014			9	1		9†					9†	99†									9†	1				
3764	Pool Mill	SE2320045600	2010	Electric Fishing (AC, PDC and DC)	Single Catch Sample	999†	29	95		11		3	2	99†	999†	4	8							6	1				
			2011			175	22	100	3			1	2	36	175	7	4							5	3				
			2014			99†	47	119	9†	12				9†	999†	4	1							4	1				
			2020		CPUE	29			1					17	98								1						
			2021		Single Catch Sample	97	9	2	14	13		1	3	81	100								9	6					
			2022				1						2	1	29	3							1		1				
			2024			99†	50			10			12	999†	9999†	17	1						9†	3	5				
3765	Castley	SE2570045900	2010	Electric Fishing (AC, PDC and DC)	Single Catch Sample	99†	31	35		4			5	99†	999†	4	2						9†	3					
			2014			999†	12	22		6				99†	999†		1							1					
			2020		Catch Depletion Sample	106	2	28		26					26														
			2021		Single Catch Sample	56	4	1	11				1	36	47	1							2	7					
			2022			1	3					2	2	10	49	2						1	5	1					
79983	Harewood	SE3132246122	2024	Electric Fishing (AC, PDC and DC)	Single Catch Sample	99†	3	10		3			1	9999†	9999†	3								1					
67543	Netherby (discretionary only)	SE3316746702	2016	Electric Fishing (AC, PDC and DC)	Single Catch Sample	9†	5	28		5			4	9†	99†	15												4	
42073	Boston Spa - Fry Survey	SE4310045900	2010	Netting (including Seine and Fyke)	Single Catch Sample (Part Width)	2						3			465	2							9						
			2012			1								1	1692								9						
			2014									4	18		504	40							272						
			2015											2	1076	76							282						
			2016									2	78	3	1136	3							53					7	
			2017											12	2214		1						12						
			2023												578	8													
			2024			4			6					4	498	6						2	22	6					
59983	Newton Kyme	SE4491645561	2014	Electric Fishing (AC, PDC and DC)	Single Catch Sample	99†		1		12				9†	99†														
			2020			5	1	9				1		17	15	1													8	
			2021			5						12		8	50	4					2		1	1					
			2022									5	1	7	50	5	1	4			2							2	
32652	Tadcaster post 2006	SE4852043720	2010	Electric Fishing (AC, PDC and DC)	Single Catch Sample	99†	9	22	9†	4		140	1	99†	999†	114	7		1	1		14	9†	5	2		13	31	
			2014				1	8				31				41	1	2				4			9		2	21	1
			2024			999†	1	4	9†	15		210	35	9†	9999†	80	10	18			2	188		1	26		12	34	
3786	Ulleskelf	SE5240040500	2010	Electric Fishing (AC, PDC and DC)	Single Catch Sample							2	5	99†	99†	1	2					2		2	2		9		
			2011									14			16		9	2				8					3		
			2014					4	9†	1		3	2		99†	6	1	2				5			2		8	4	

† Values represents the estimated observed abundance for the completed survey ranging from 0-9,10-99,100-999, 1000+

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