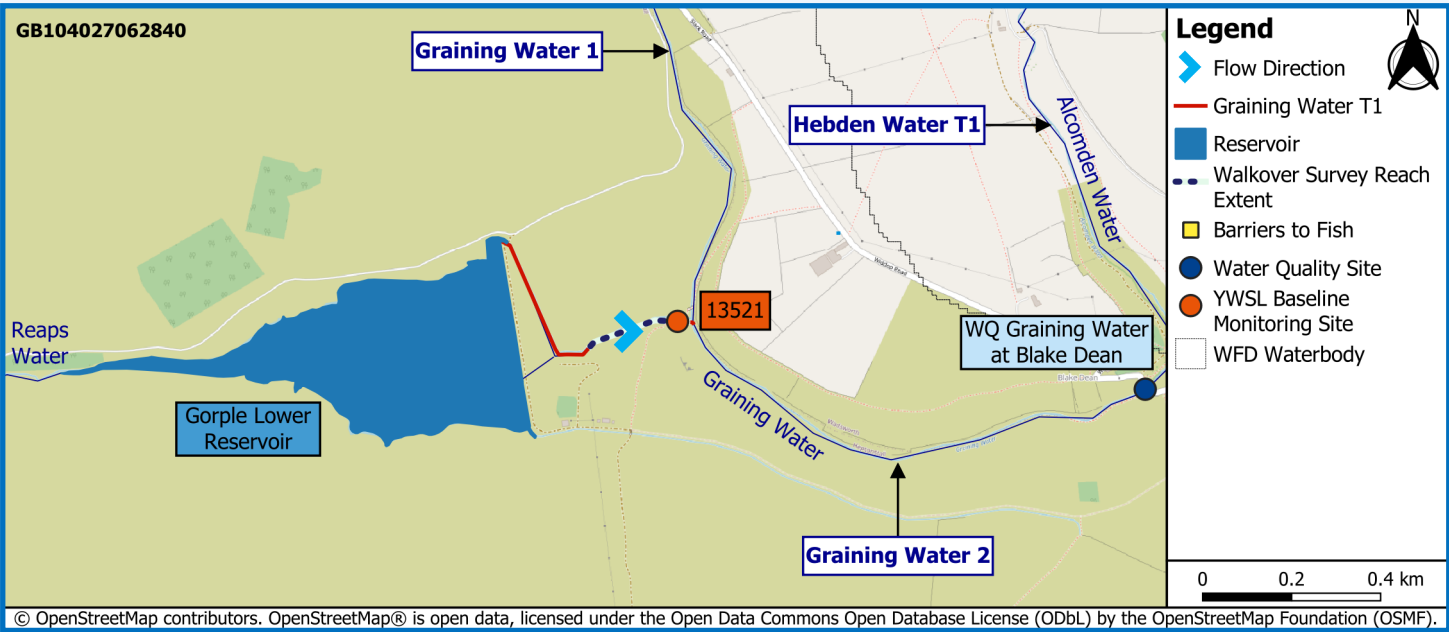


Reach Setting

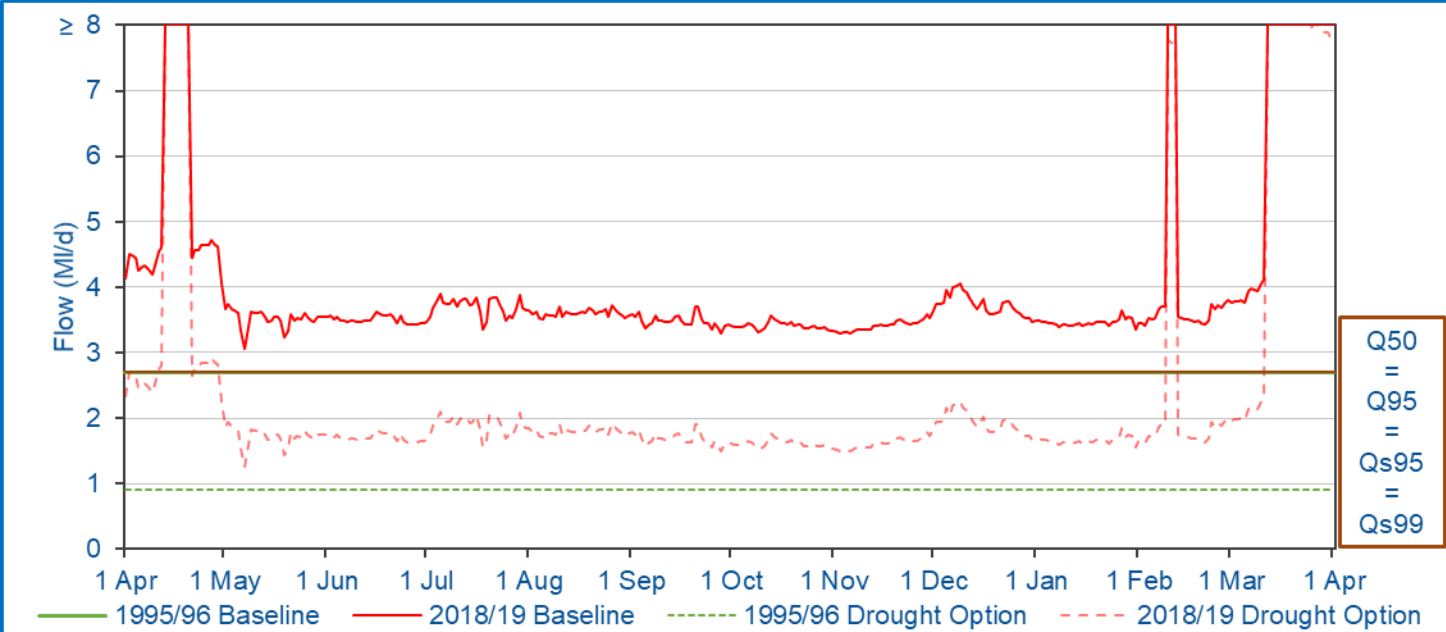


Reach Setting Information:

The bedrock geology is dominated by the Millstone Grit Group. There is no significant superficial geology recorded in or around the reach. Soil types along the reach are composed wholly of slowly permeable, wet very acid upland soils. There is no urbanisation in this reach.

	Supplementary Information
Catchment Area at Assessment Point	7.3km ²
Mean Slope Gradient	4.4°
Length of Reach	0.6km
Additional Catchment Area	0.14km ²
Upstream Reach	N/A
Downstream Reach	Graining Water 2

River Flow Regime



	Reference Conditions (MI/d)	Drought Plan Conditions (MI/d)	% Reduction	Impact
Q _s 95	2.70	0.89	67	Summer
Q _s 99	2.70	0.89	67	Major
Q95	2.70	0.89	67	Winter
Q50	2.70	0.89	67	Major

There are no significant flow additions/reductions associated with this reach

River Habitats



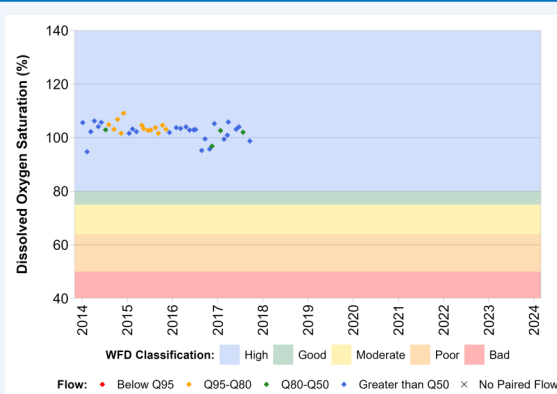
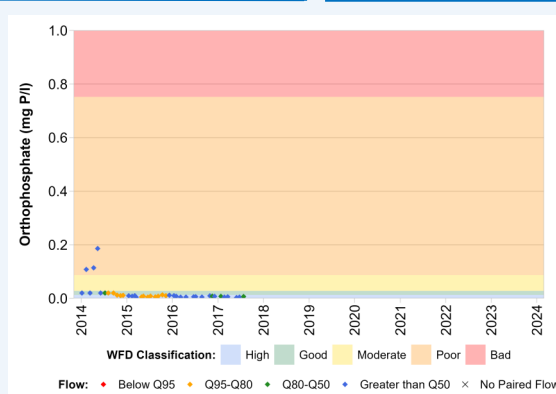
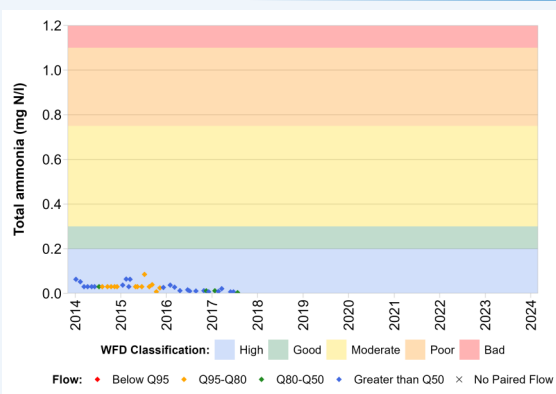
River Water Quality

There are no significant water quality pressures associated with this reach

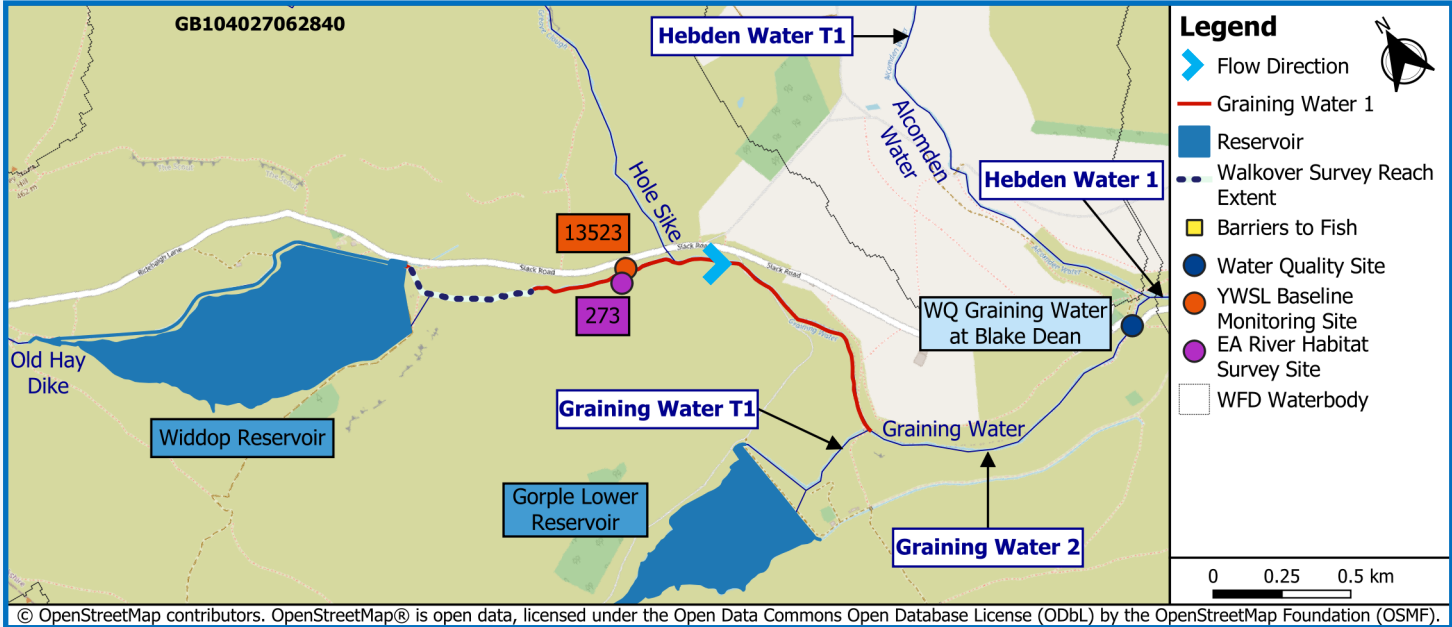
At Graining Water at Blake Dean (NE-49505155), in Graining Water 2, the average pH between 2014-2023 was 7.4 with a maximum temperature of 18.6°C for the same period.



Figure A4.1
Graining Water T1
Physical Environment Information



Reach Setting

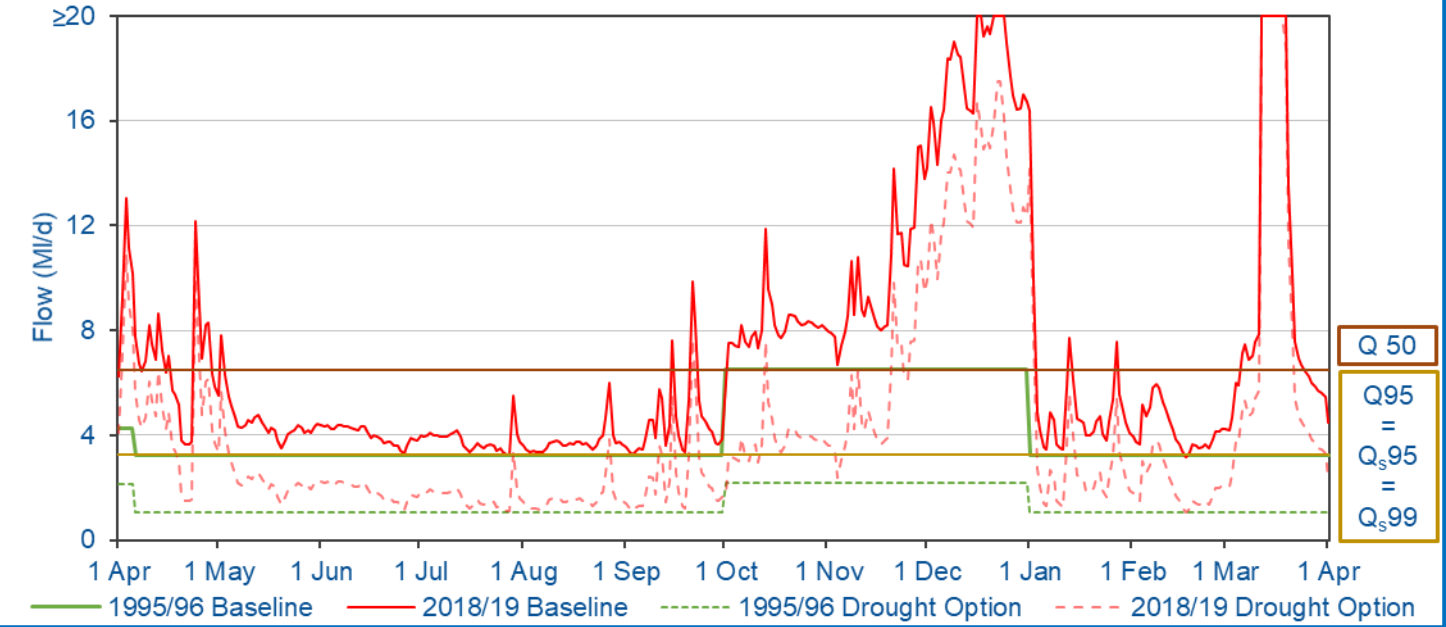


Reach Setting Information:

The superficial geology is very limited with no significant deposits identified. Soil types along the reach vary from very acid, loamy upland soils in the upper sections of the reach near the reservoir outflow, blanket bog peat soils in the mid sections of the reach and slowly permeable, wet, very acid upland soils in the lower sections of the reach. Urbanisation in the reach is very low, with a single residential building at the top of the reach on the left bank.

	Supplementary Information
Catchment Area at Assessment Point	3.5km ²
Mean Slope Gradient	1.2°
Length of Reach	2.2km
Additional Catchment Area	7.5km ²
Upstream Reach	N/A
Downstream Reach	Graining Water 2

River Flow Regime



	Reference Conditions (ML/d)	Drought Plan Conditions (ML/d)	% Reduction	Impact
Q _s 95	3.24	1.07	67	Winter Major
Q _s 99	3.24	1.07	67	
Q95	3.24	1.07	67	Summer Major
Q50	6.50	2.15	67	

There are no significant flow additions/reductions associated with this reach

River Habitats



River Water Quality

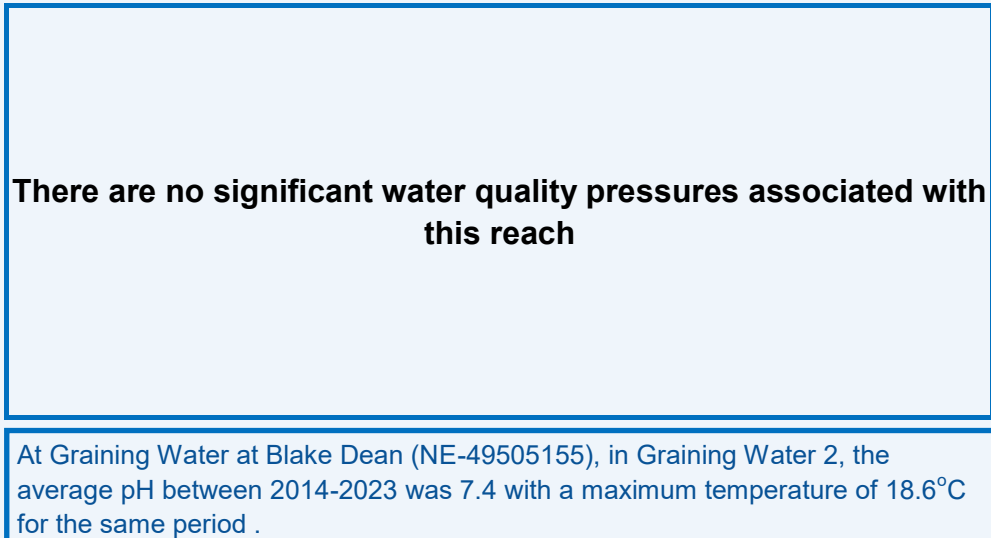
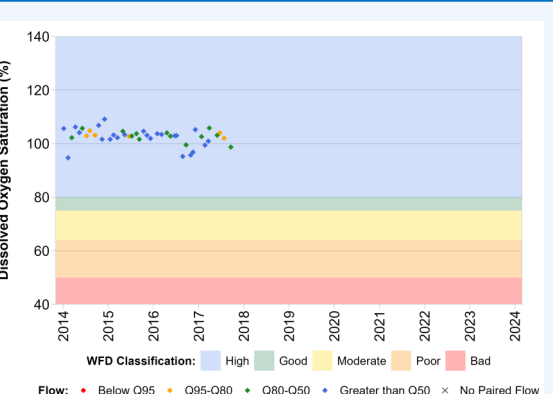
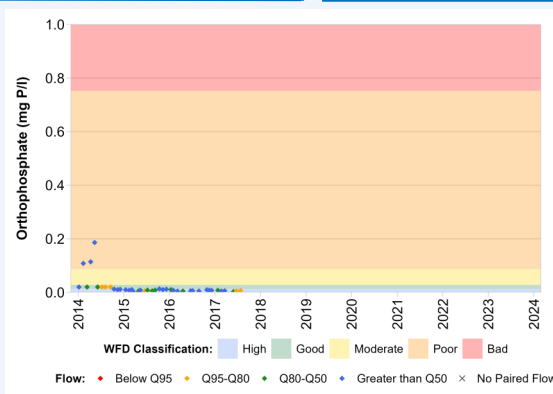
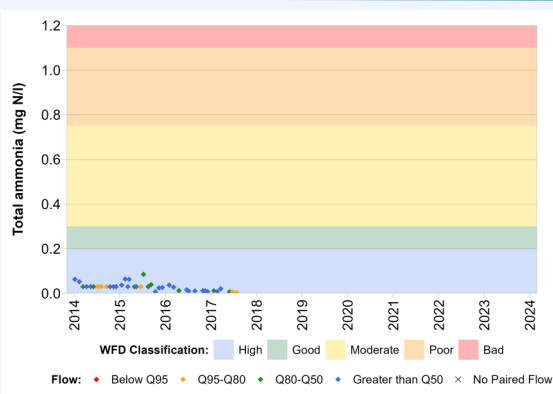
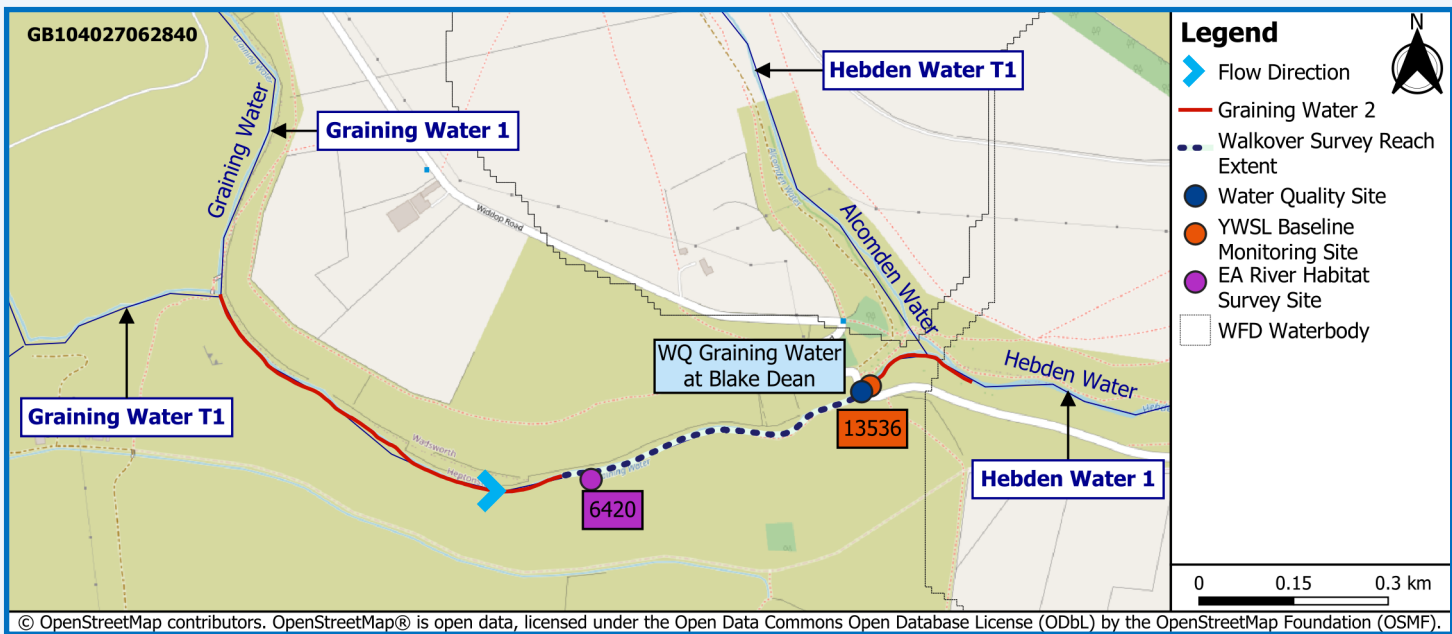


Figure A4.2
Graining Water 1
Physical Environment Information



Reach Setting

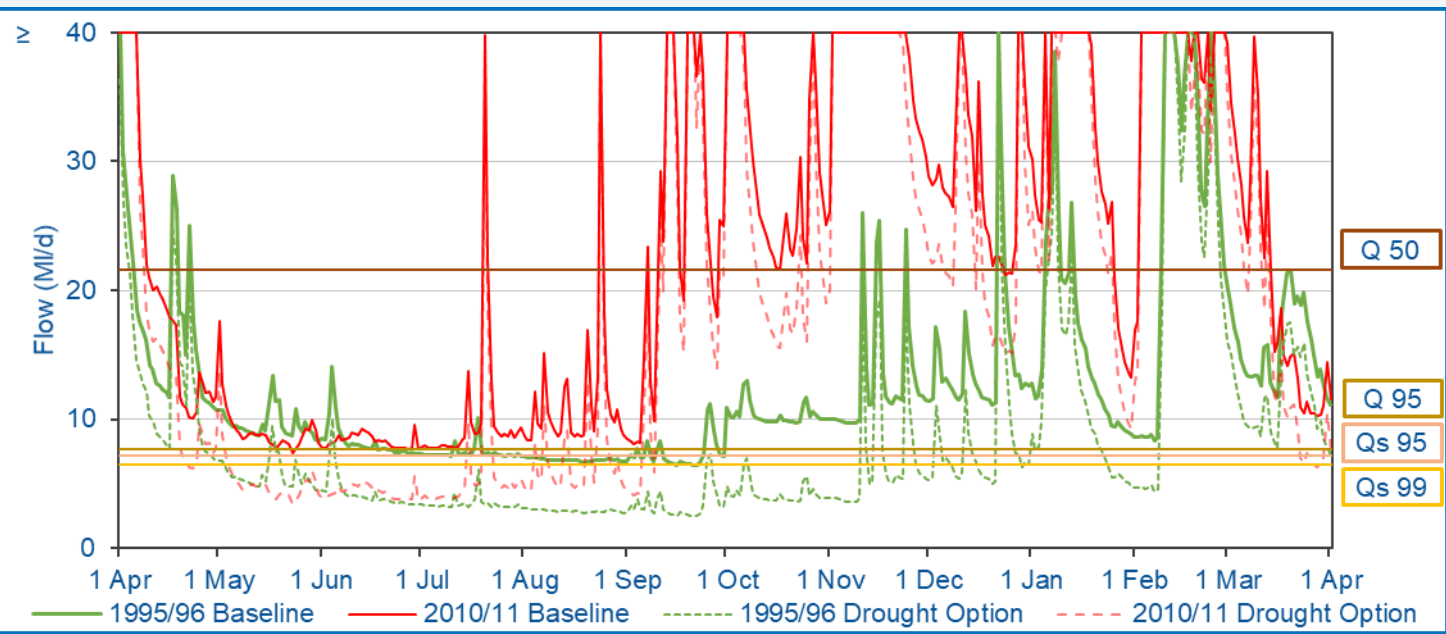


Reach Setting Information:

The bedrock geology is dominated by the Millstone Grit Group. There is no significant superficial geology recorded beneath or around the reach. Soils in the reach are composed of slowly permeable, wet very acid upland soils at the immediate start of the reach and very acid, loamy upland soils constitute the remaining reach. There is no urbanisation in the reach.

	Supplementary Information
Catchment Area at Assessment Point	18.4km ²
Mean Slope Gradient	1.2°
Length of Reach	1.4km
Additional Catchment Area	1.3km ²
Upstream Reach	Graining Water T1/ Graining Water1
Downstream Reach	Hebden Water 1

River Flow Regime



	Reference Conditions (Ml/d)	Drought Plan Conditions (Ml/d)	% Reduction	Impact
Q _s 95	7.21	3.23	55	Summer Major
Q _s 99	6.54	2.56	61	
Q95	7.67	3.04	60	Winter Major
Q50	21.7	15.5	29	

There are no significant flow additions/ reductions associated with this reach

River Habitats



Dominant upland riparian vegetation

Occasional boulders on bankside

Dominant coarse substrate

Abundant exposed boulders



Abundant steep sided banks

Abundant moderate energy flows

Step-pool sequence

River Water Quality

There are no significant water quality pressures associated with this reach

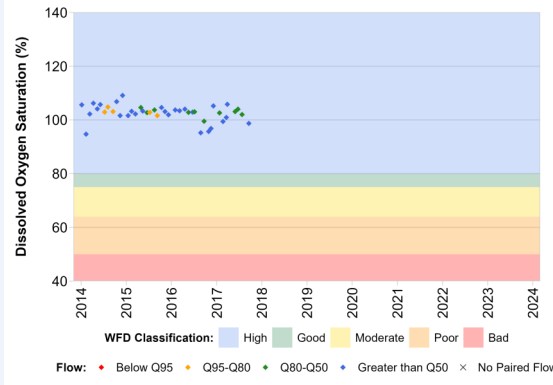
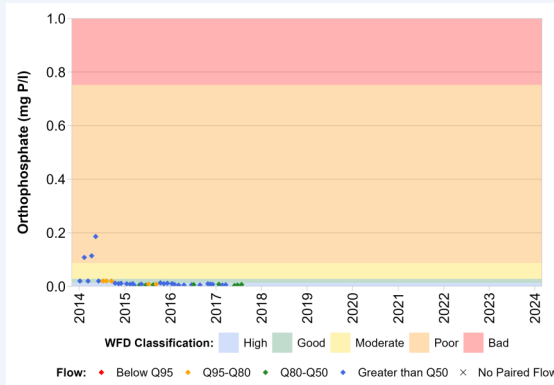
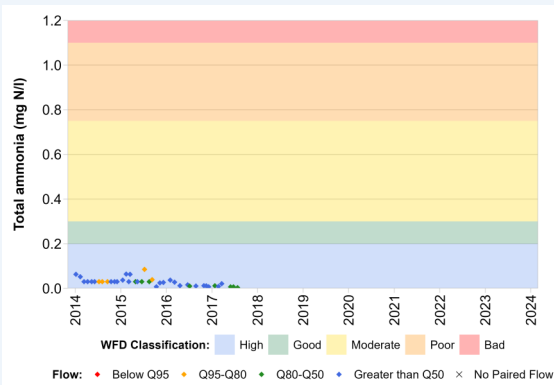
At Graining Water at Blake Dean (NE-49505155) the average pH between 2014-2023 was 7.4 with a maximum temperature of 18.6°C for the same period.



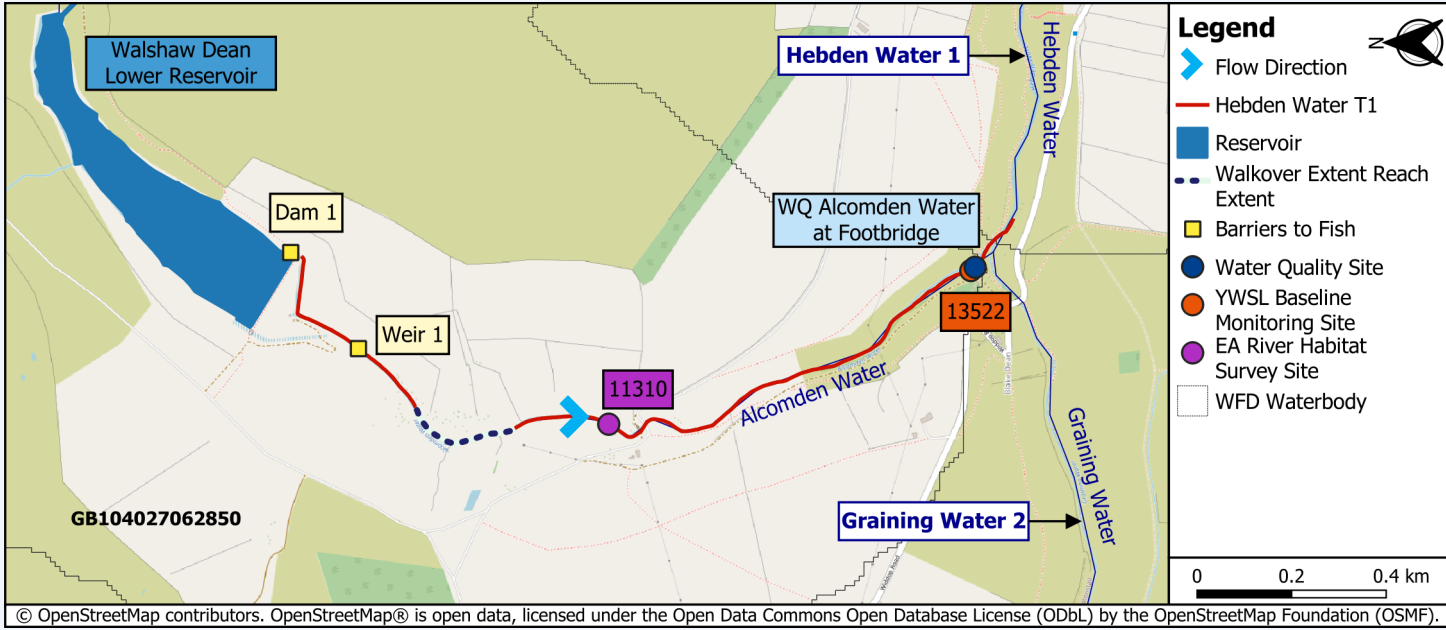
Figure A4.3

Graining Water 2

Physical Environment Information



Reach Setting

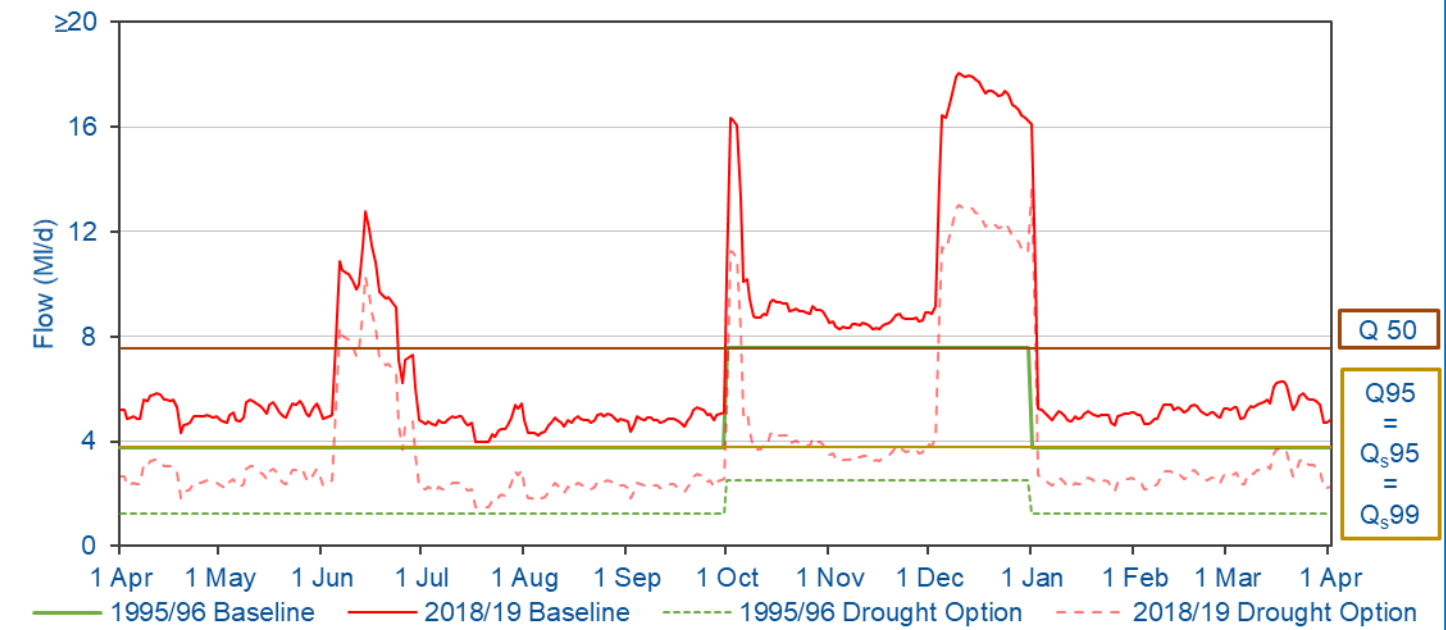


Reach Setting Information:

The bedrock geology is dominated by the Millstone Grit Group and superficial geology is very limited with only limited deposits of alluvium along the reach. Soil types along the reach are composed predominantly of slowly permeable, wet very acid upland soils. There is no urbanisation along this reach.

	Supplementary Information
Catchment Area at Assessment Point	9.5km ²
Mean Slope Gradient	2.2°
Length of Reach	2.0km
Additional Catchment Area	1.9km ²
Upstream Reach	N/A
Downstream Reach	Hebden Water 1

River Flow Regime



	Reference Conditions (MI/d)	Drought Plan Conditions (MI/d)	% Reduction	Impact
Qs95	3.78	1.25	67	Summer Major
Qs99	3.78	1.25	67	
Q95	3.78	1.25	67	Winter Major
Q50	7.56	2.49	67	

There are no significant flow additions/reductions associated with this reach

River Habitats

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

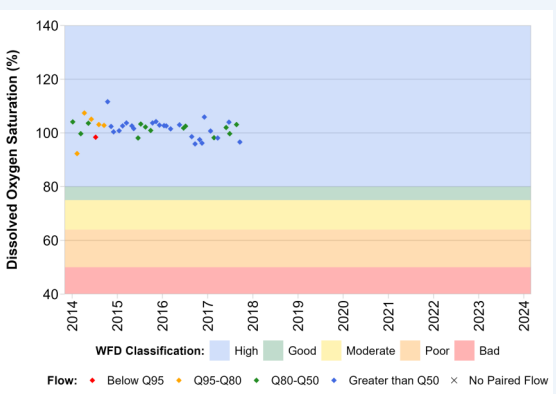
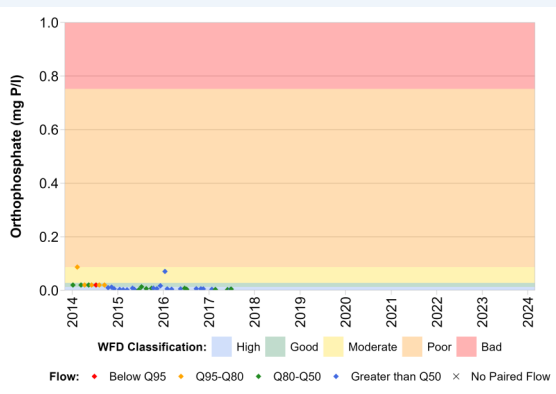
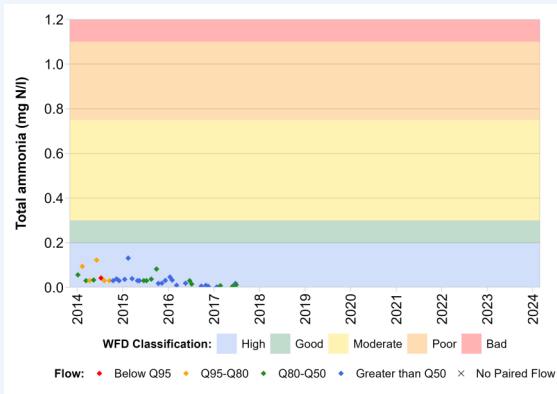
River Water Quality

There are no significant water quality pressures associated with this reach

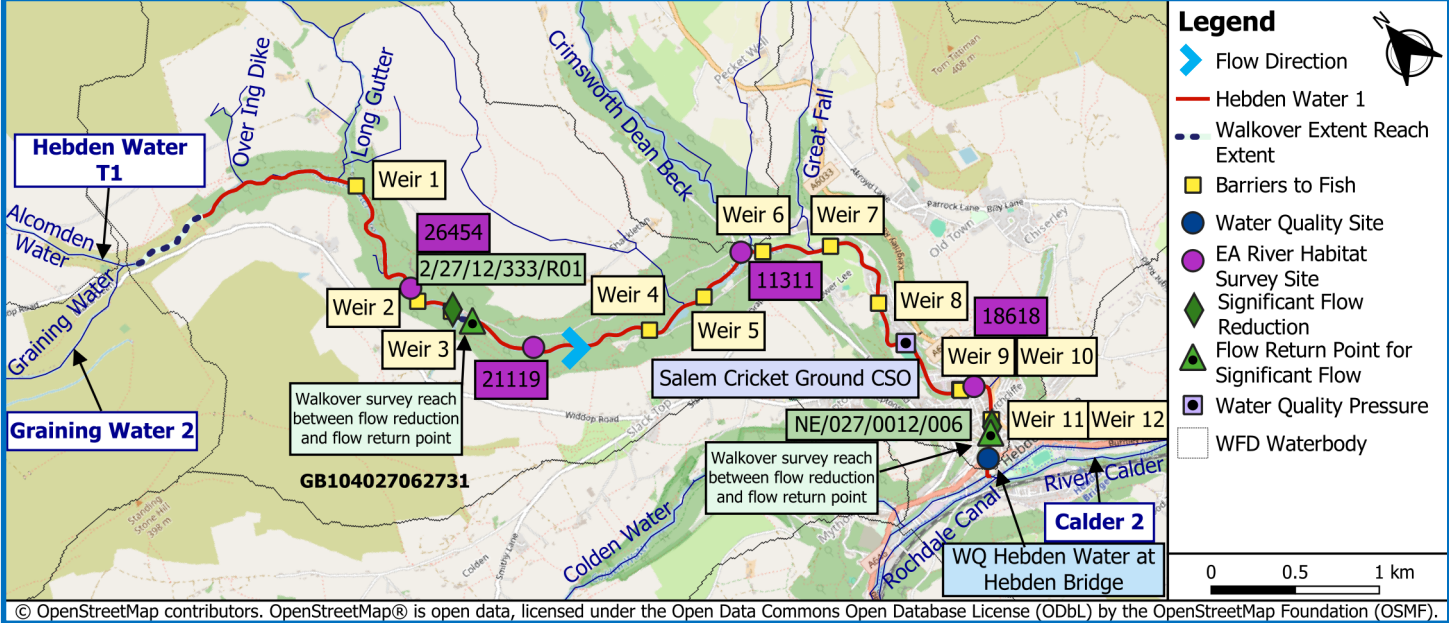
At Alcomden Water at Footbridge (NE-49505156) the average pH between 2014-2023 was 7.6 with a maximum temperature of 17.4°C for the same period.



Figure A4.4
Hebden Water T1
Physical Environment Information



Reach Setting

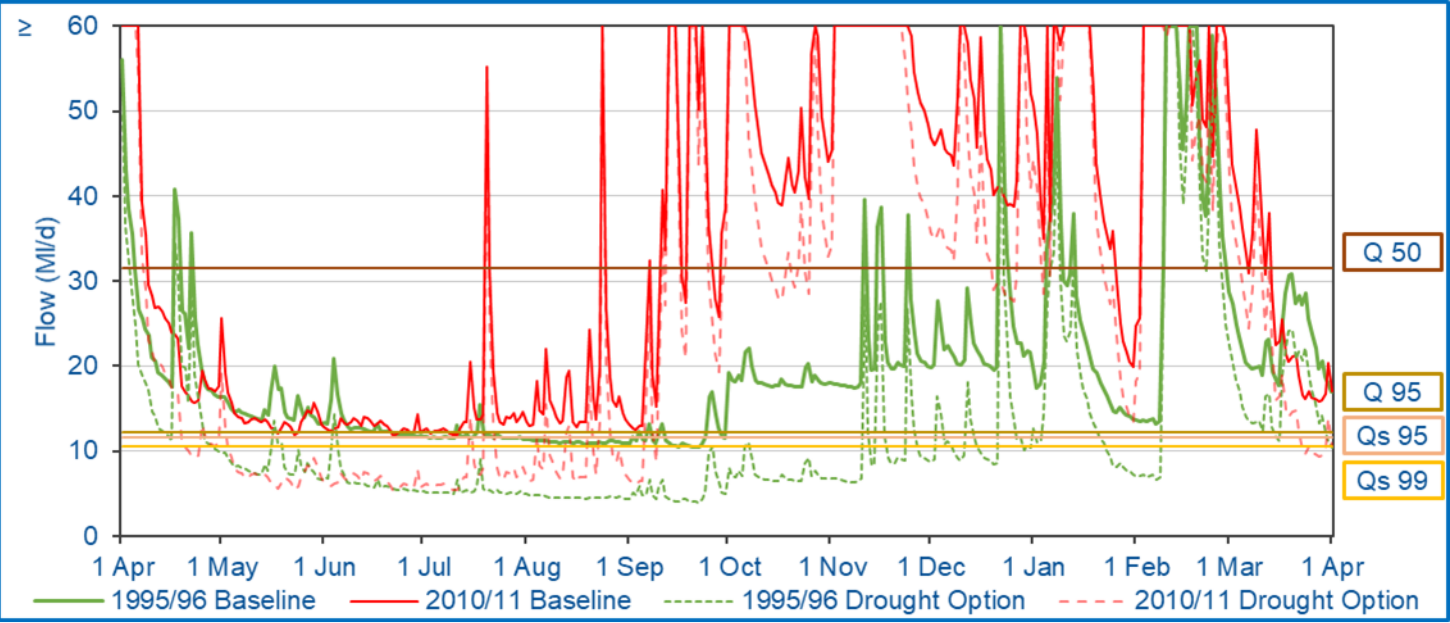


Reach Setting Information:

The bedrock geology is dominated by the Millstone Grit Group and superficial geology is predominantly composed of alluvium along the channel path with some spatially limited head deposits around the mid sections of the reach. Soil types along the reach are very acid, loamy upland soils (with a peaty surface). This reach becomes more urbanised towards it's end where it flows through Hebden Bridge.

	Supplementary Information
Catchment Area at Assessment Point	31.1km ²
Mean Slope Gradient	1.0°
Length of Reach	7.5km
Additional Catchment Area	27.9km ²
Upstream Reach	Graining Water 2/ Hebden Water T1
Downstream Reach	River Calder 2

River Flow Regime



	Reference Conditions (MI/d)	Drought Plan Conditions (MI/d)	% Reduction	Impact	Significant Flow Additions/Reductions	Flow Rate (MI/d)	Abstraction / Discharge
-					HEBDEN WATER-HARCASTLE CRAGS-HEBDEN BRIDGE 2/27/12/333/R01	35.43	Abstraction
Q _s 95	11.6	5.06	56	Summer Major	BRIDGE MILL GOYT - BRIDGE MILL-NE/027/0012/006	69.984	Abstraction
Q _s 99	10.6	4.09	61				
Q95	12.2	5.07	53	Winter Major			
Q50	31.6	20.3	36				

River Habitats

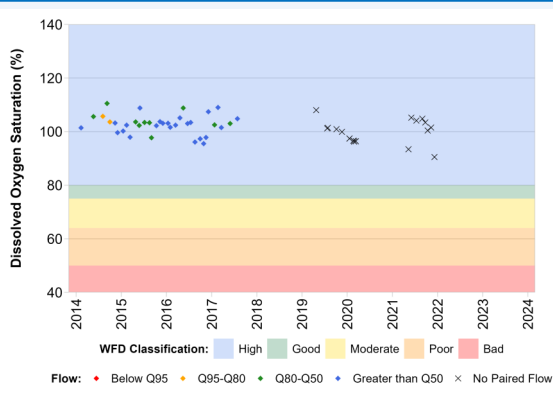
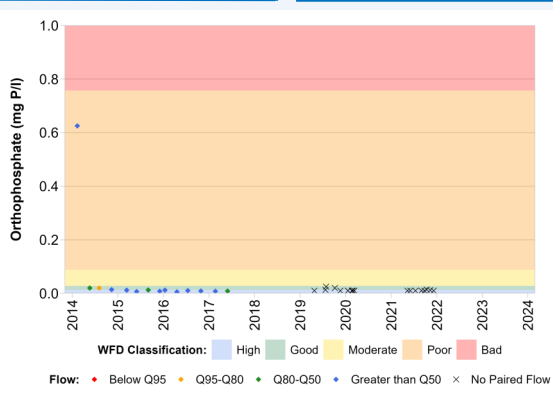
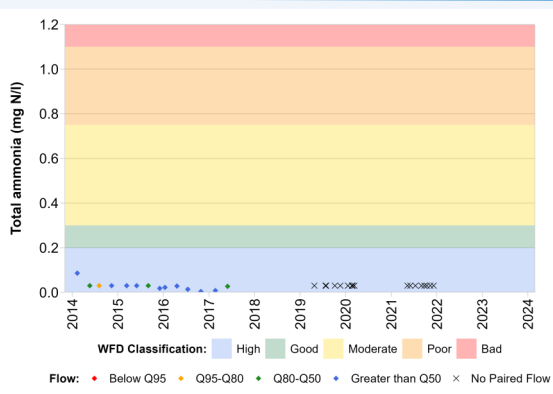


River Water Quality

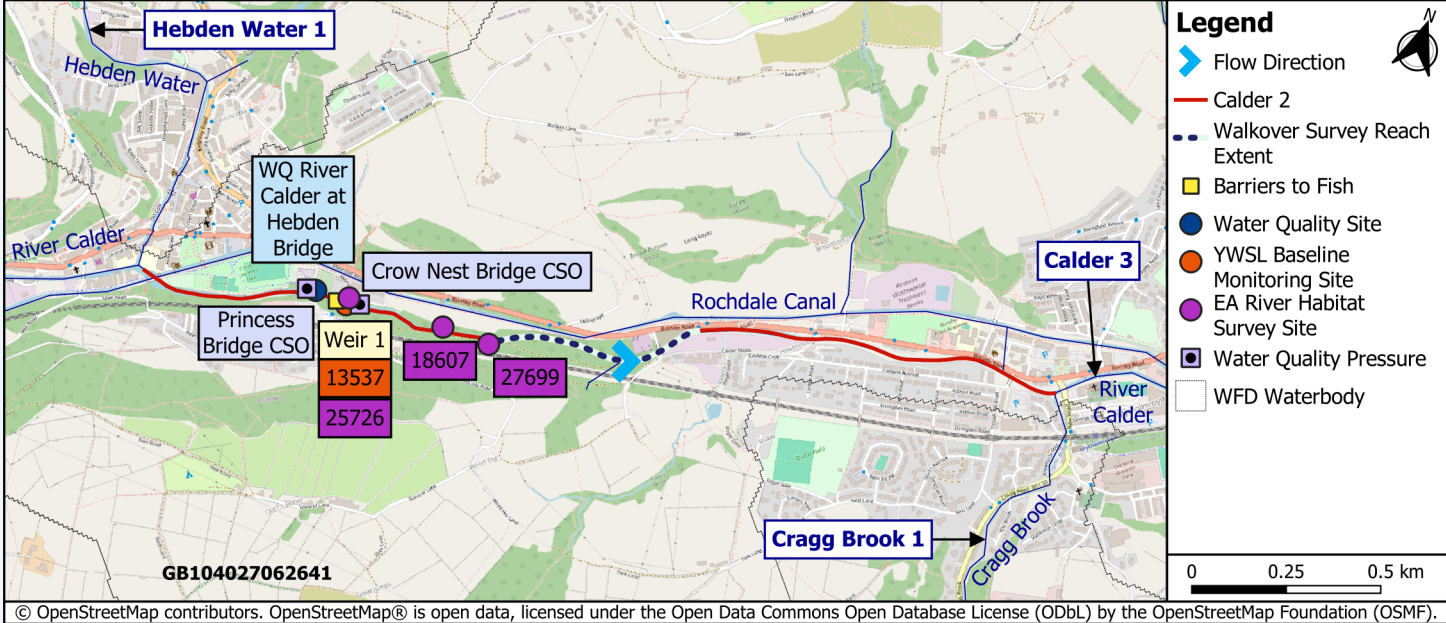
Significant Water Quality Pressures	Permit Conditions
Salem Cricket Ground/ CSO WRA8419 1	Intermittent discharge

At Hebden Water At Hebden Bridge (NE-49500377) the average pH between 2014-2023 was 7.6 with a maximum temperature of 18.4°C for the same period.

Figure A4.5
Hebden Water 1
Physical Environment Information



Reach Setting

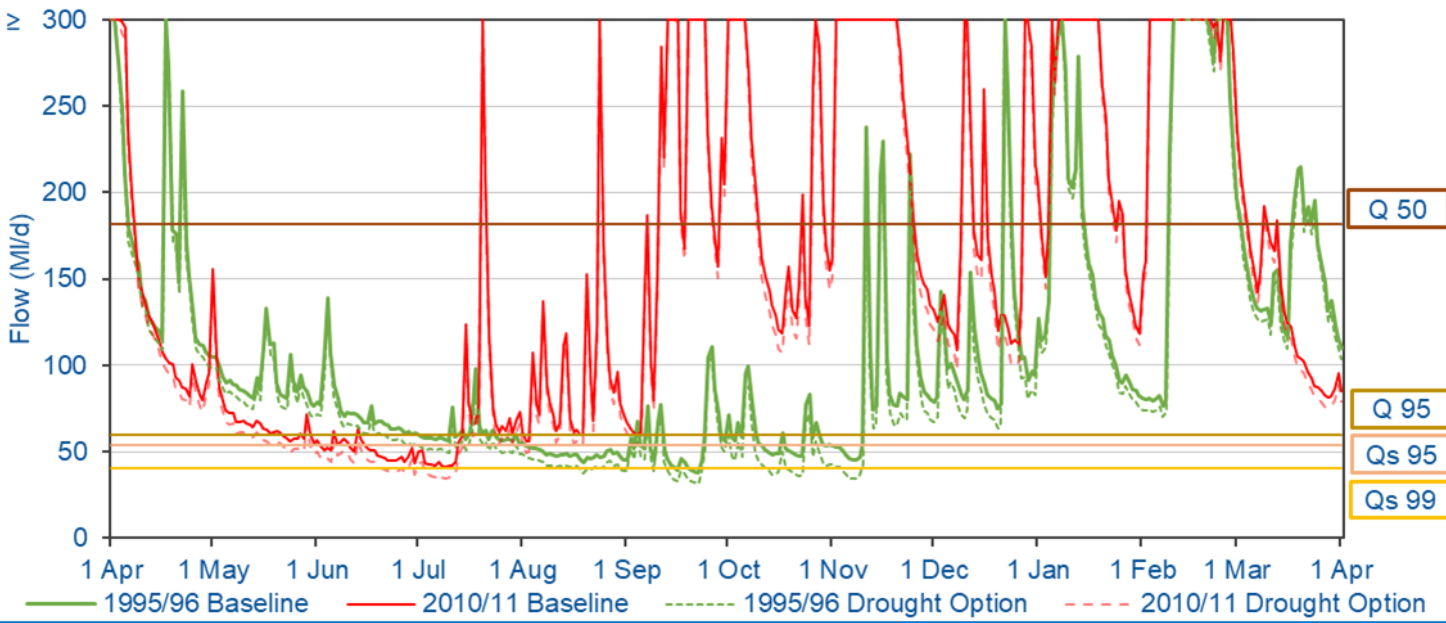


Reach Setting Information:

The bedrock geology is dominated by the Millstone Grit Group and superficial geology is composed of alluvium along the channel path with scattered glaciofluvial deposits, particularly near the end of the reach. Soil types along the reach are freely draining, slightly acid loamy soils. This is a highly urbanised reach flanked by Hebden Bridge and Mytholmroyd.

	Supplementary Information
Catchment Area at Assessment Point	142.4km ²
Mean Slope Gradient	0.1°
Length of Reach	2.5km
Additional Catchment Area	4.5km ²
Upstream Reach	Hebden Water 1
Downstream Reach	Calder 3

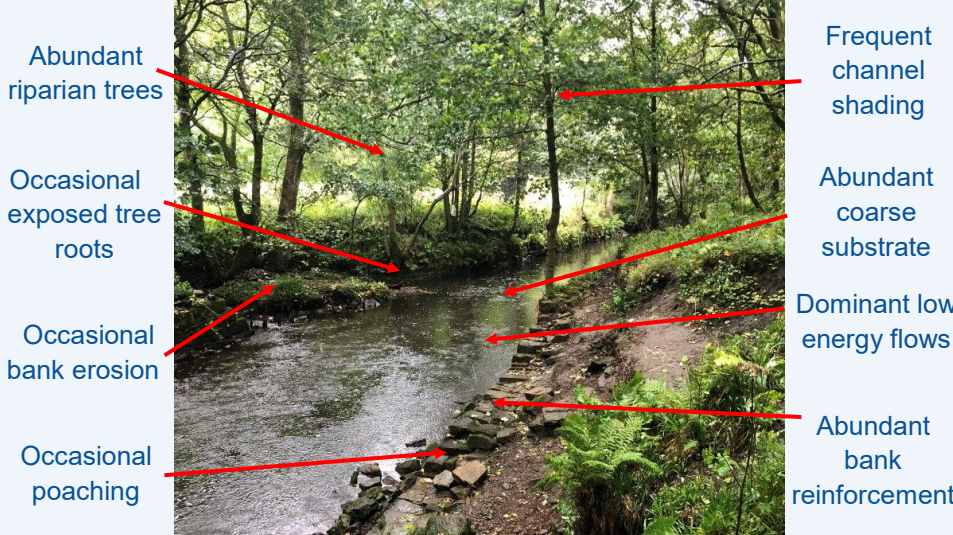
River Flow Regime



	Reference Conditions (MI/d)	Drought Plan Conditions (MI/d)	% Reduction	Impact
Q _s 95	53.5	47.0	12	Summer Moderate
Q _s 99	40.5	34.0	16	
Q95	59.7	48.8	19	Winter Minor
Q50	181	170	6	

There are no significant flow additions/reductions associated with this reach

River Habitats

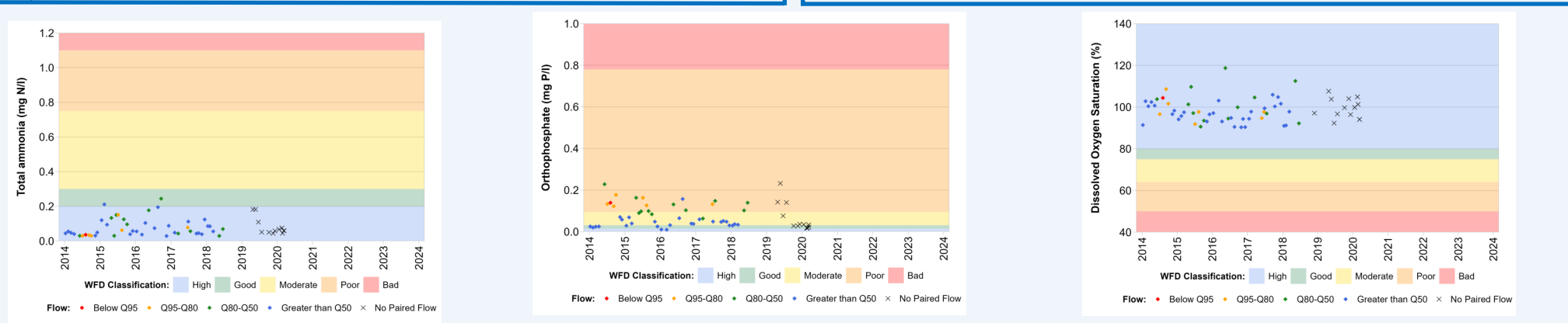


River Water Quality

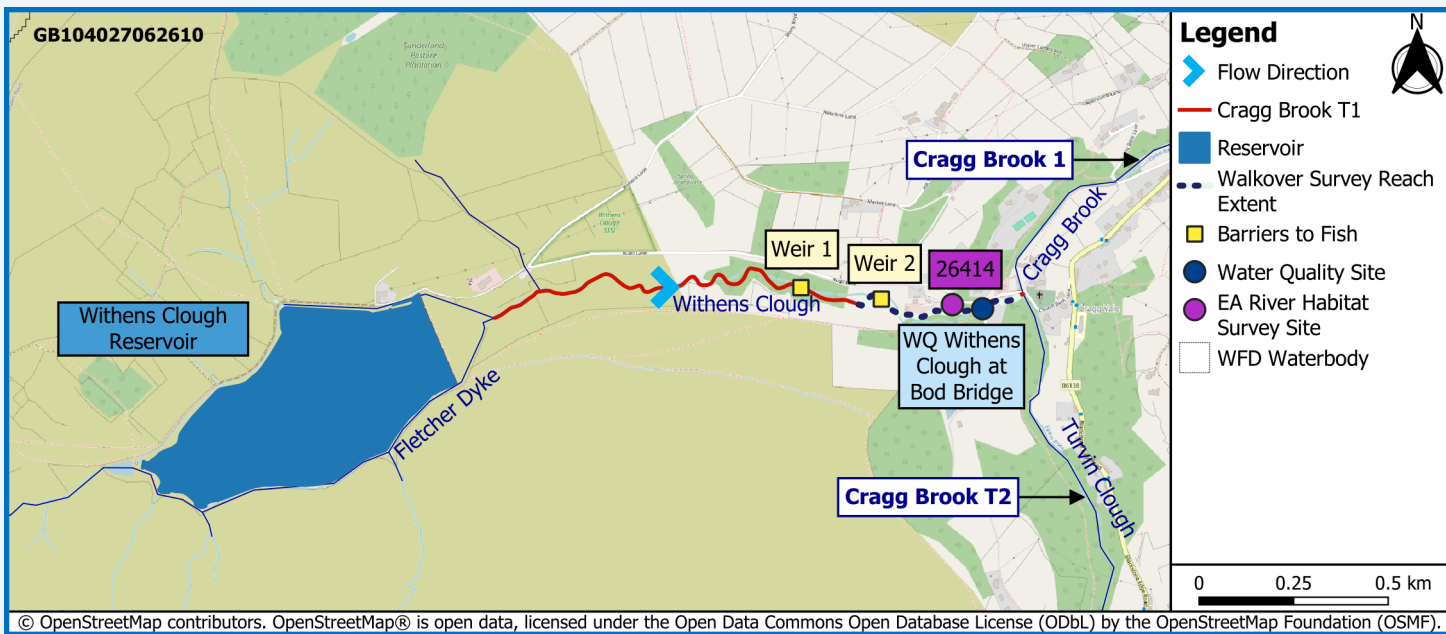
Significant Water Quality Pressures	Permit Conditions
Crow Nest Bridge CSO	Intermittent discharge
Princess Bridge NO 2 CSO	Intermittent discharge

At River Calder At Hebden Bridge (NE-49500612) the pH between 2014-2023 was 7.7 and the max temperature was 19.1°C for the same period.

Figure A4.6
River Calder 2
Physical Environment Information



Reach Setting

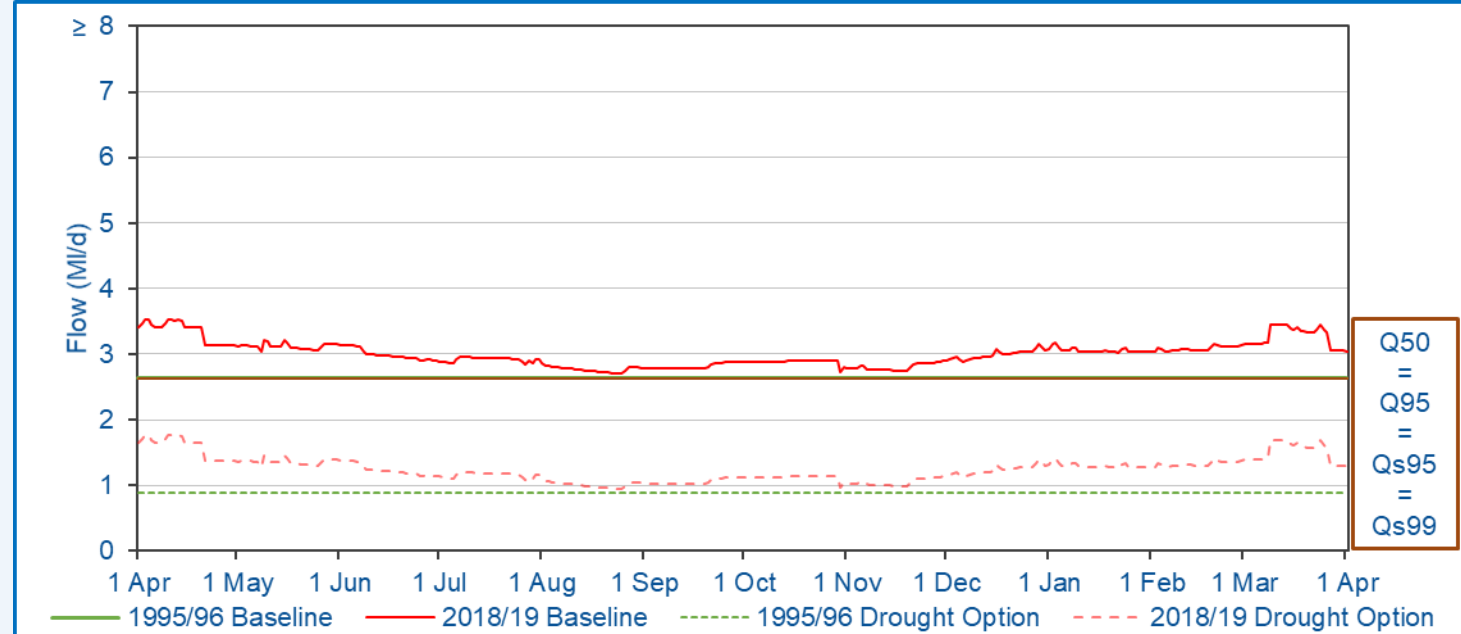


Reach Setting Information:

Bedrock geology is dominated by Millstone Grit lithologies (mudstone, sandstone and siltstone) and no significant superficial deposits have been identified in and around the reach. Soils in the reservoir catchment are predominantly composed of very acid, loamy upland soils. Urbanisation in the reach is very limited although some buildings are present on the left bank at the end of the reach as the reach passes through Cragg Vale.

	Supplementary Information
Catchment Area at Assessment Point	5.0km ²
Mean Slope Gradient	3.5°
Length of Reach	1.6km
Additional Catchment Area	1.6km ²
Upstream Reach	N/A
Downstream Reach	Cragg Brook 1

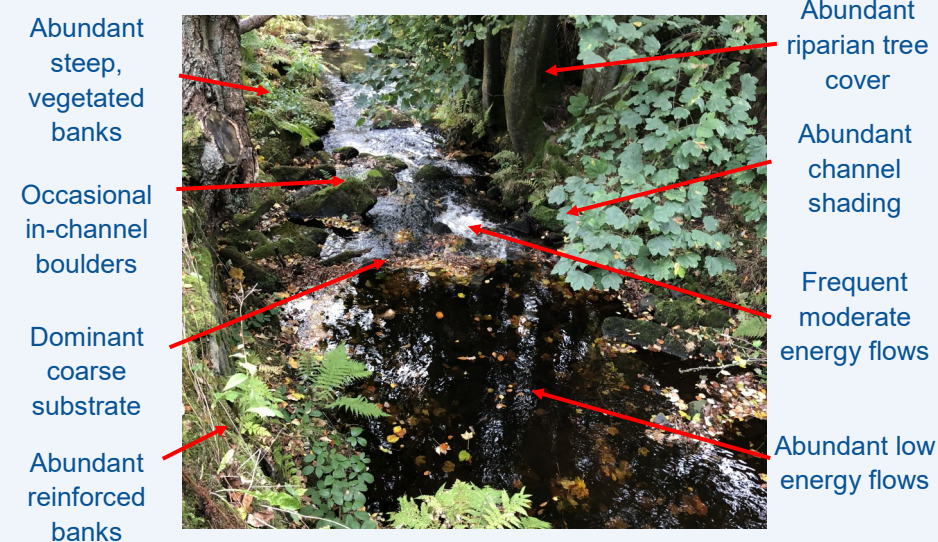
River Flow Regime



	Reference Conditions (MI/d)	Drought Plan Conditions (MI/d)	% Reduction	Impact
Q _s 95	2.64	0.87	67	Summer Major
Q _s 99	2.64	0.87	67	
Q95	2.64	0.87	67	Winter Major
Q50	2.64	0.87	67	

There are no significant flow additions/reductions associated with this reach

River Habitats



River Water Quality

There are no significant water quality pressures associated with this reach

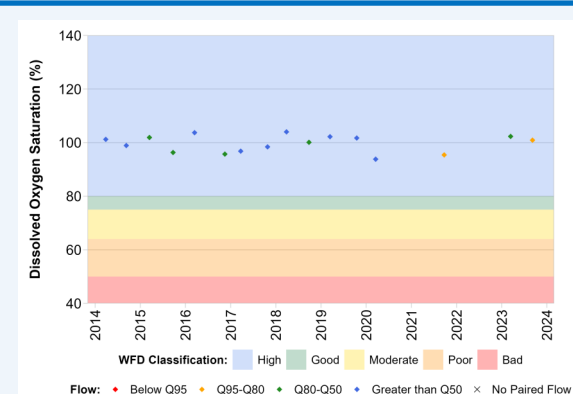
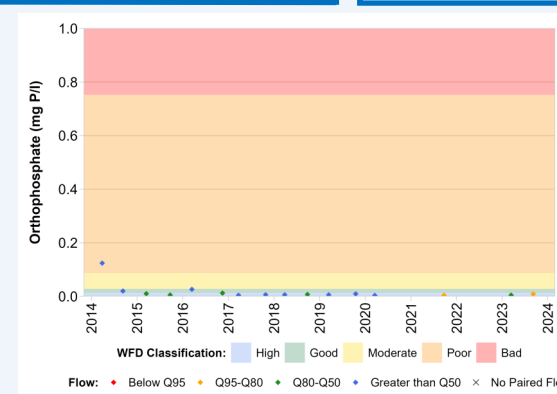
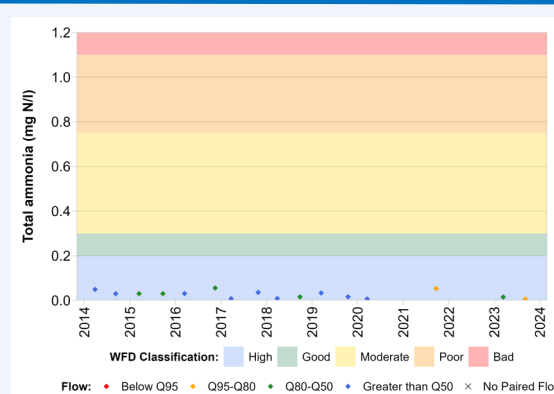
At Withens Clough at Bod Bridge (NE-49505157) the average pH between 2014-2025 was 7.3 with a maximum temperature of 16.6°C for the same period.



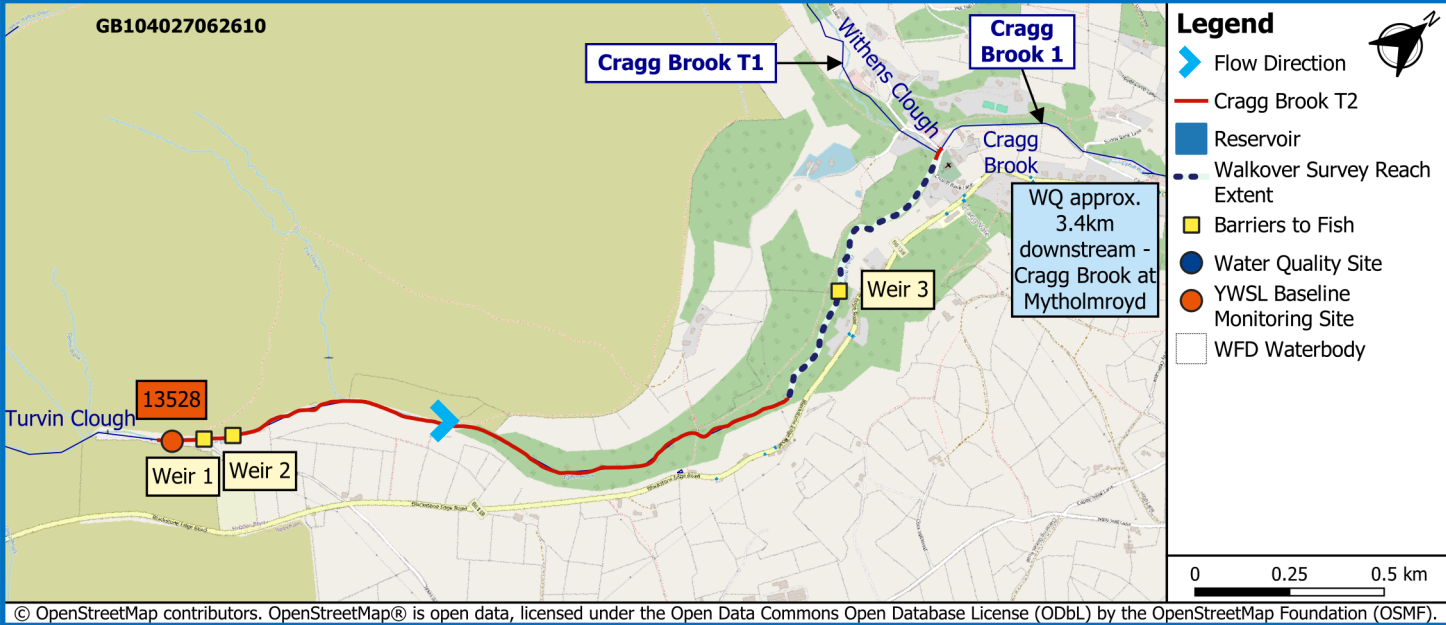
Figure A4.7

Cragg Brook T1

Physical Environment Information



Reach Setting

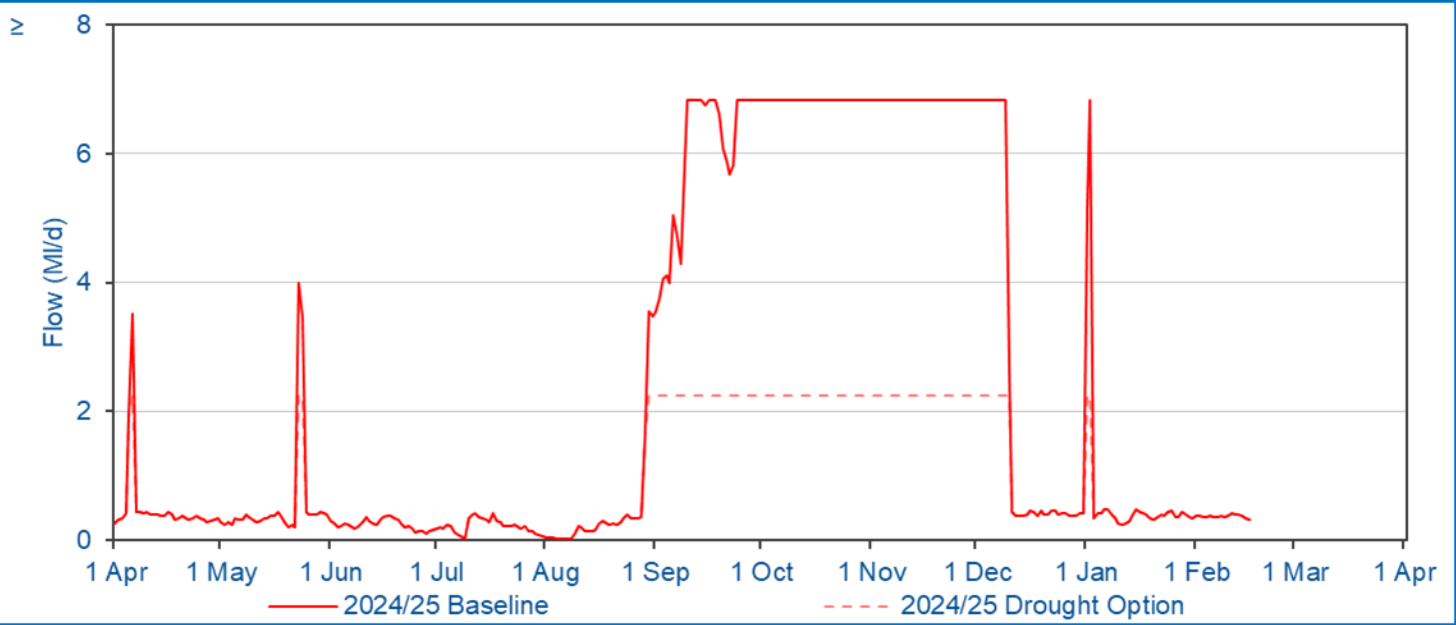


Reach Setting Information:

The superficial geology is very limited no significant deposits identified. Soil types along the reach are composed predominantly of very acid, loamy upland soils. Some suburban/urban land use is present on the left bank at the confluence with Withens Clough.

	Supplementary Information
Catchment Area at Assessment Point	3.9km ²
Mean Slope Gradient	3.2°
Length of Reach	2.6km
Additional Catchment Area	8.9km ²
Upstream Reach	N/A
Downstream Reach	Cragg Brook 1

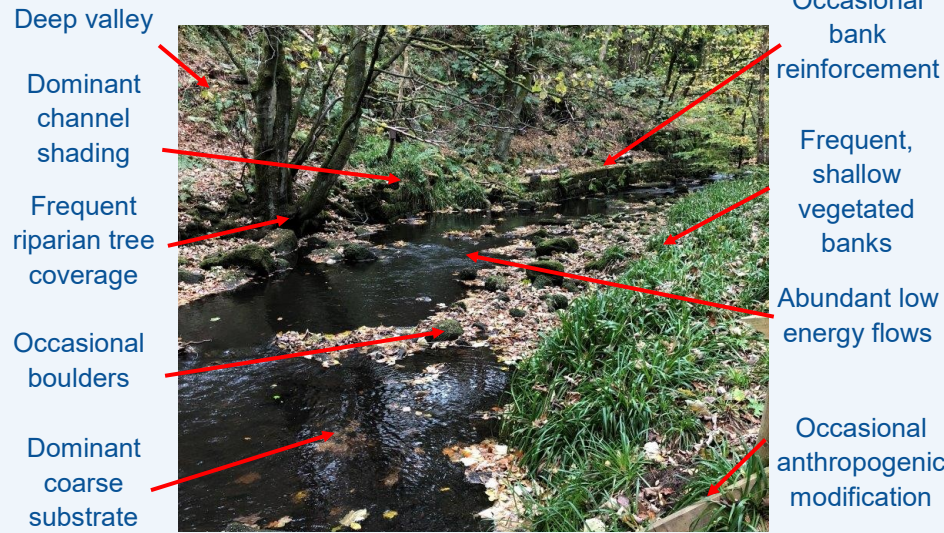
River Flow Regime



Reduction in flows by up to 67% at times when abstraction is occurring. Potential for a **major** hydrological impact at any time of year noting that the lowest natural flows are protected by the prescribed flow condition.

There are no significant flow additions/reductions associated with this reach

River Habitats



River Water Quality

There are no significant water quality pressures associated with this reach

At Cragg Brook At Mytholmroyd (NE-49500145) the average pH between 2014-2023 was 7.75 with a maximum temperature of 18.2°C for the same period.

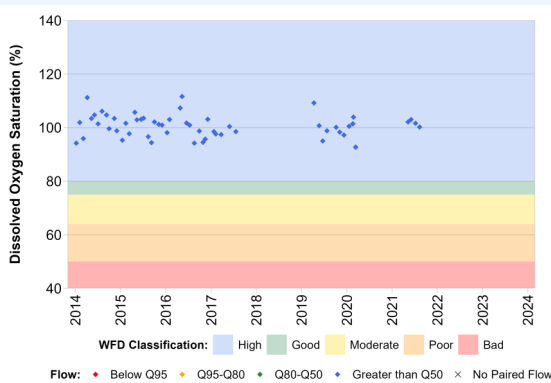
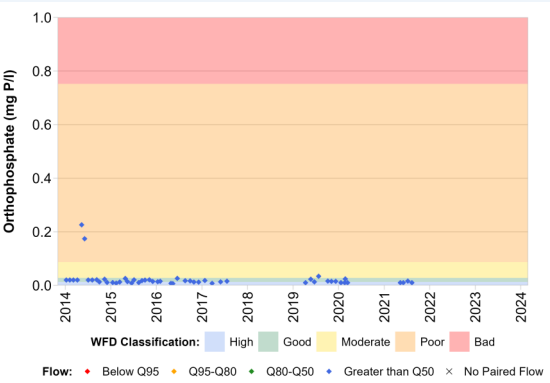
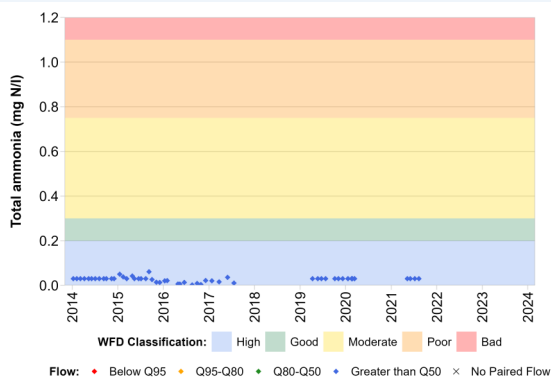
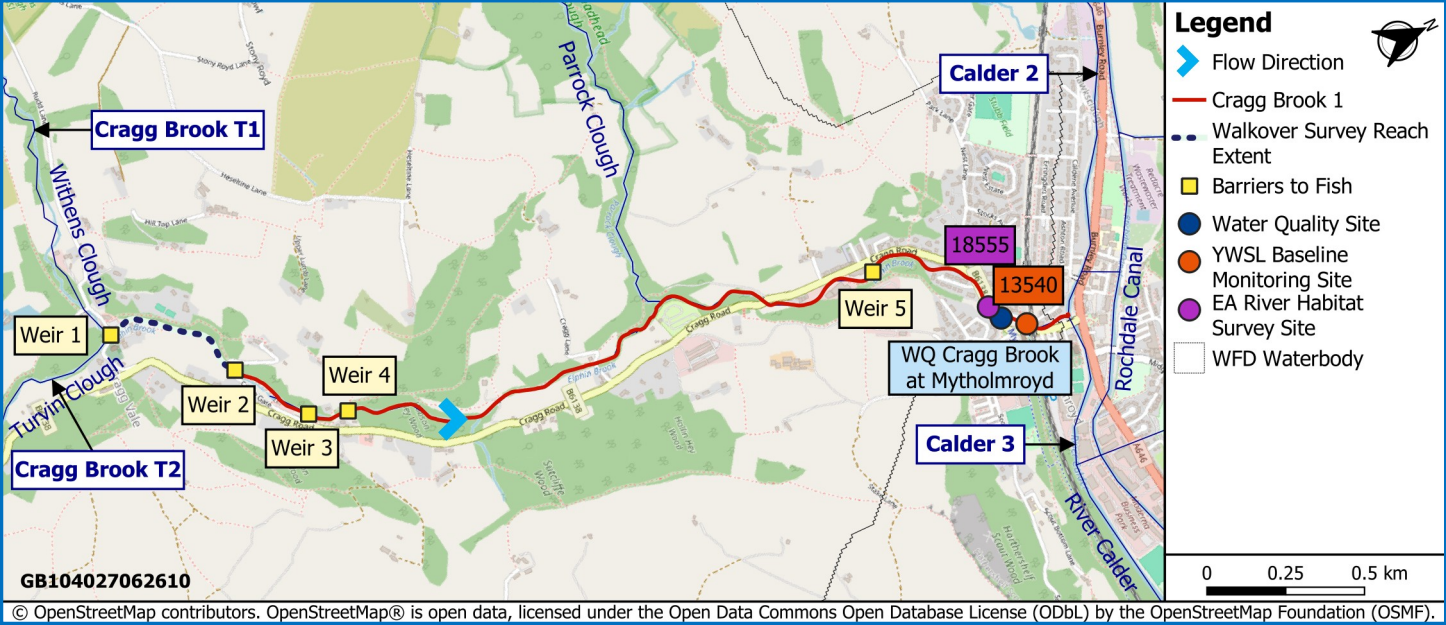


Figure A4.8
Cragg Brook T2
Physical Environment Information

Reach Setting

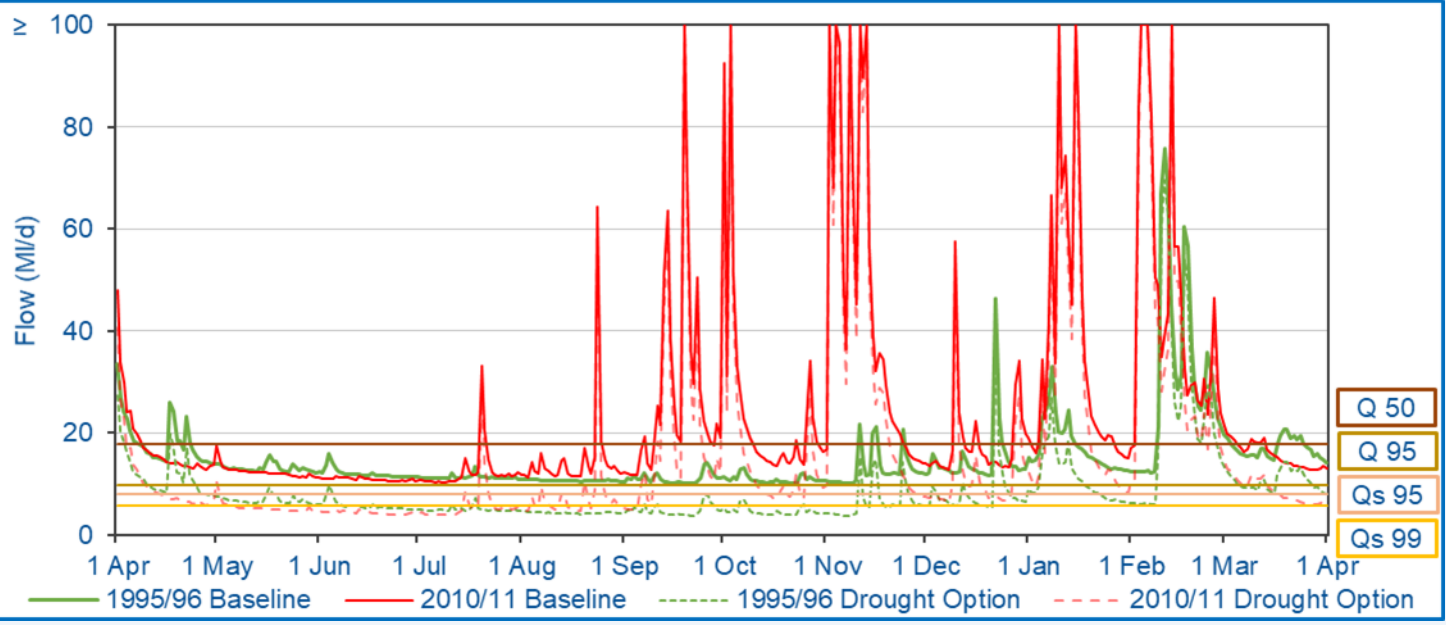


Reach Setting Information:

The superficial geology is limited to alluvium beneath the channel and scattered head deposits around the channel. Soil types along the reach are composed predominantly of very acid, loamy upland soils in the upper section of the reach with freely draining, slightly acid loamy soils in the lower sections of the reach. Urbanisation is variable along the reach becoming dominant as the channel flows through Mytholmroyd ~2.5km downstream.

	Supplementary Information
Catchment Area at Assessment Point	19.4km ²
Mean Slope Gradient	1.2°
Length of Reach	3.6km
Additional Catchment Area	6.7km ²
Upstream Reach	Cragg Brook T1/T2
Downstream Reach	River Calder 3

River Flow Regime



	Reference Conditions (Ml/d)	Drought Plan Conditions (Ml/d)	% Reduction	Impact
Q _s 95	11.0	4.64	58	Summer Major
Q _s 99	10.3	3.92	62	
Q95	11.3	4.96	56	Winter Major
Q50	18.4	12.1	34	

There are no significant flow additions/reductions associated with this reach

River Habitats

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

River Water Quality

There are no significant water quality pressures associated with this reach

At Cragg Brook At Mytholmroyd (NE-49500145) the average pH between 2014-2023 was 7.75 with a maximum temperature of 18.2°C for the same period.

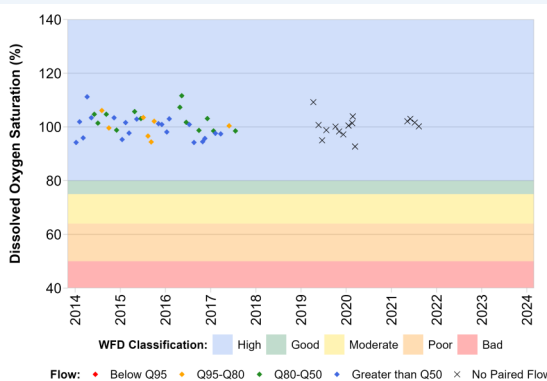
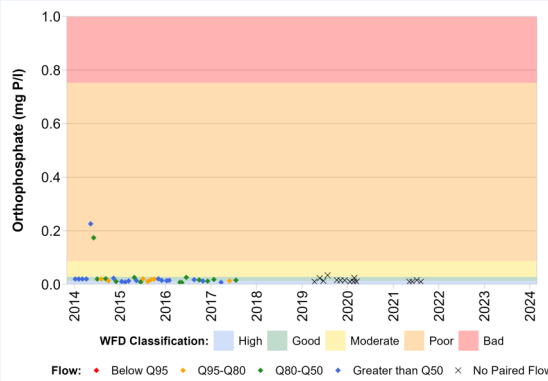
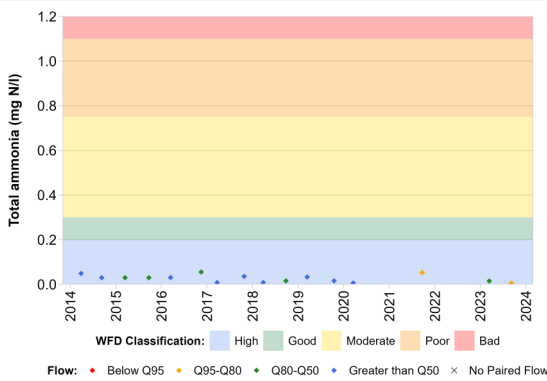
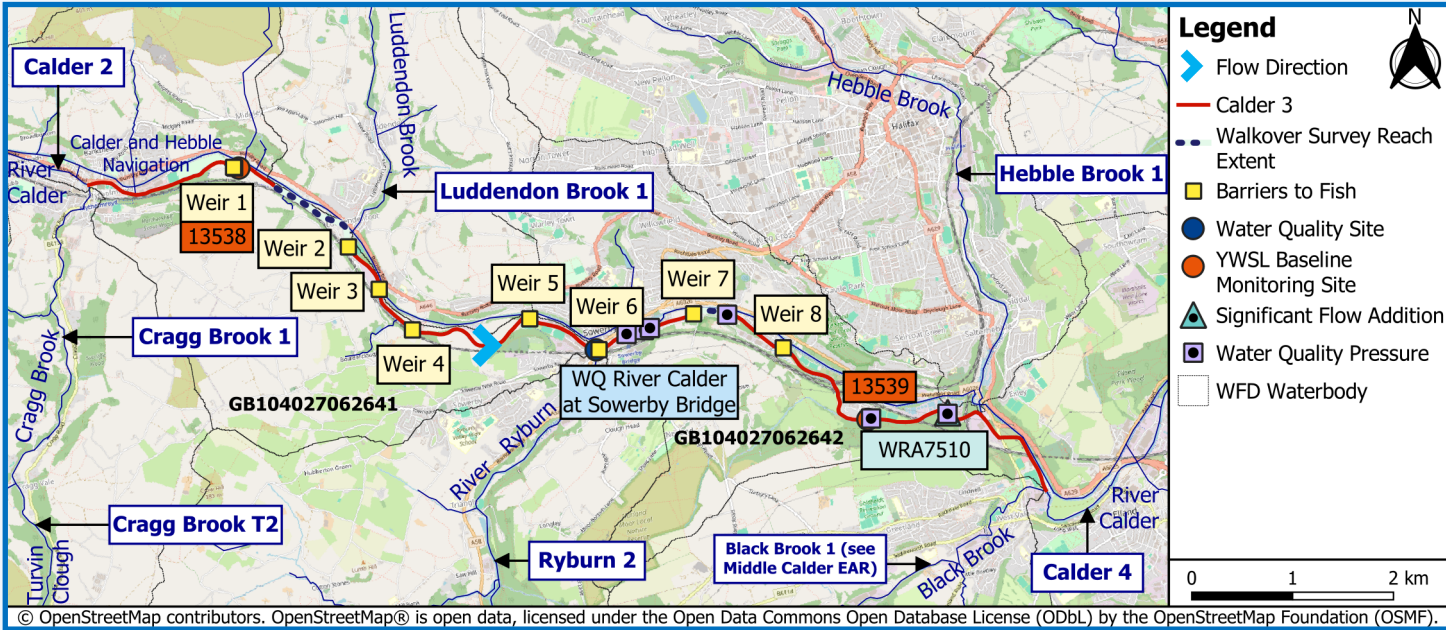


Figure A4.9
Cragg Brook 1
Physical Environment Information

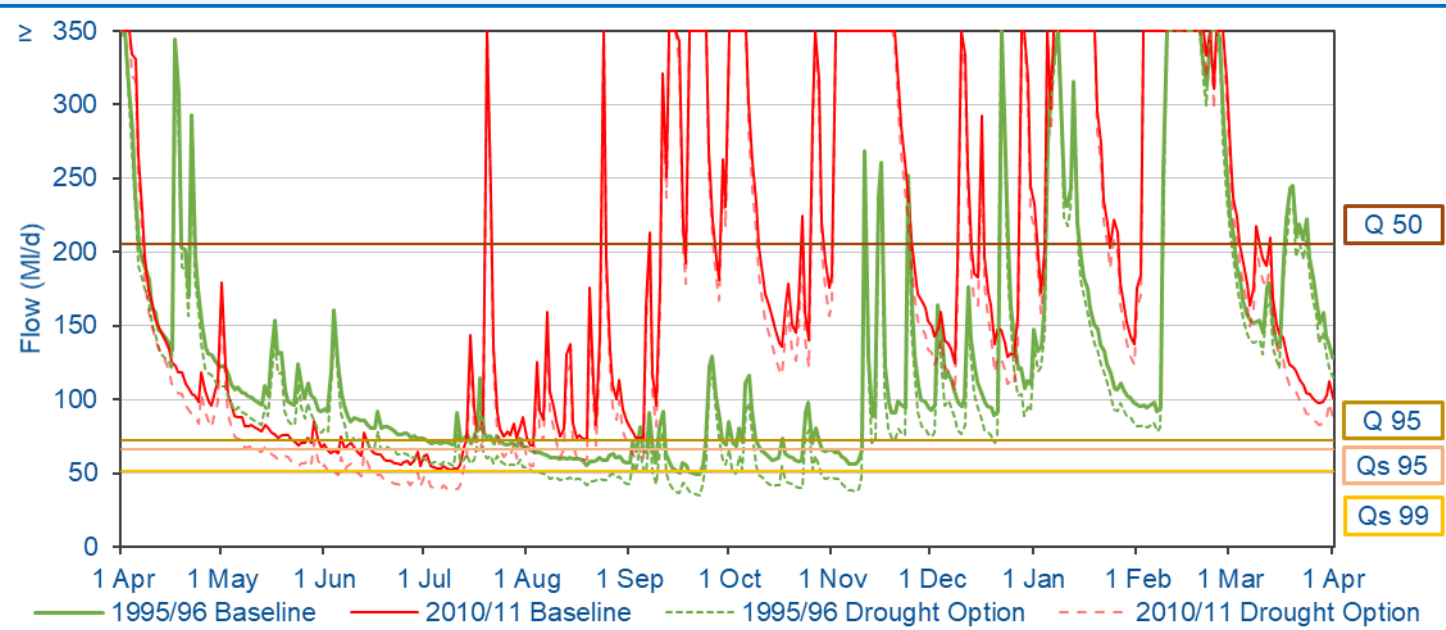
Reach Setting



Reach Setting Information:
The bedrock geology is dominated by lithologies of the Millstone Grit Group (mudstone, sandstone and siltstone) and superficial geology is composed predominantly of alluvium beneath the channel with some scattered alluvial fan deposits in the lower sections of the reach. Soil types along the reach are composed of freely draining, slightly acid loamy soils. Surrounding land use is predominately urbanised with occasional areas of improved grassland.

	Supplementary Information
Catchment Area at Assessment Point	173.0km ²
Mean Slope Gradient	0.1°
Length of Reach	11.8km
Additional Catchment Area	130.3km ²
Upstream Reach	River Calder 2/ Cragg Brook 1
Downstream Reach	Calder 4 (see Middle Calder EAR)

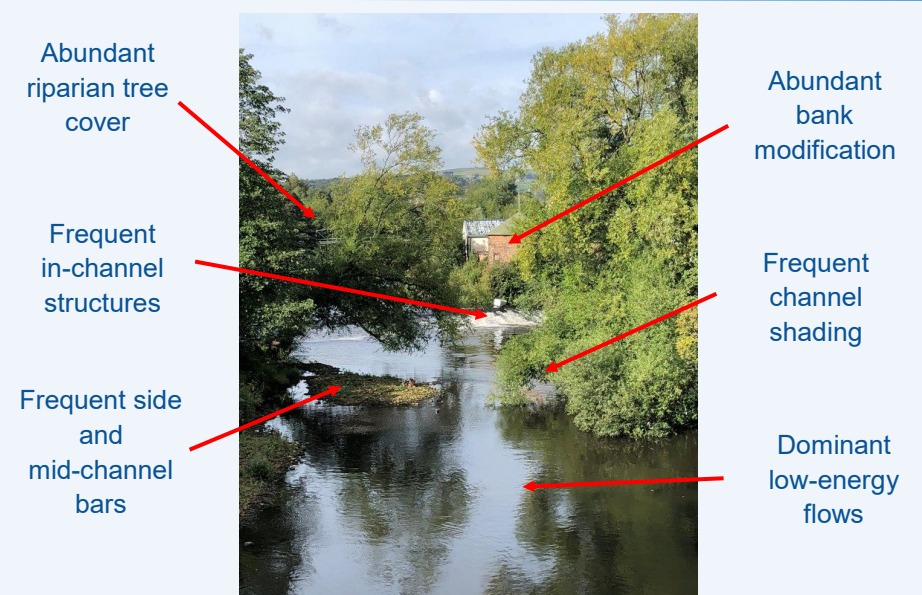
River Flow Regime



	Reference Conditions (Ml/d)	Drought Plan Conditions (Ml/d)	% Reduction	Impact
Q _s 95	66.1	53.3	19	Summer Moderate
Q _s 99	51.7	38.9	25	
Q95	73.0	55.4	24	Winter Minor
Q50	207	189	8	

Significant Flow Additions/Reductions	Flow Rate (Ml/d)	Abstraction / Discharge
Halifax STW WRA7510	57.7 (DWF)	Discharge

River Habitats

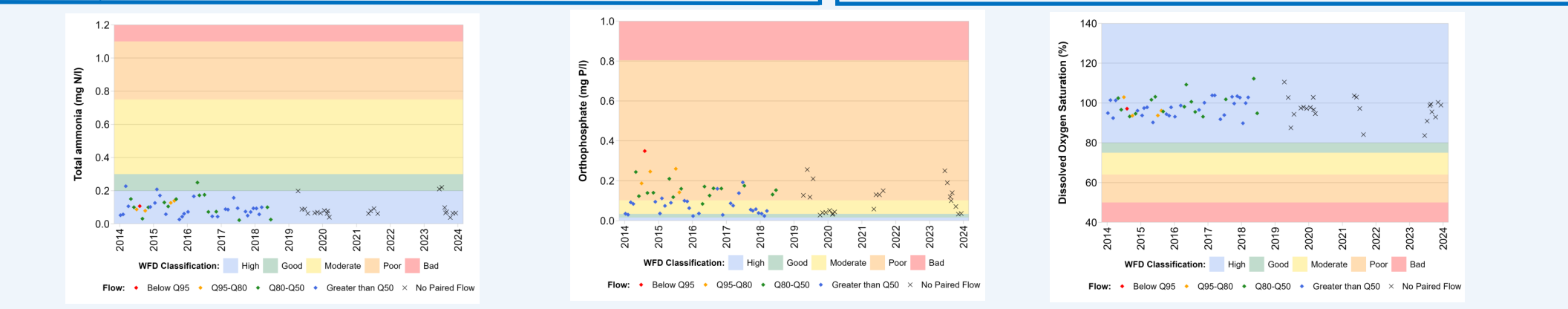


River Water Quality

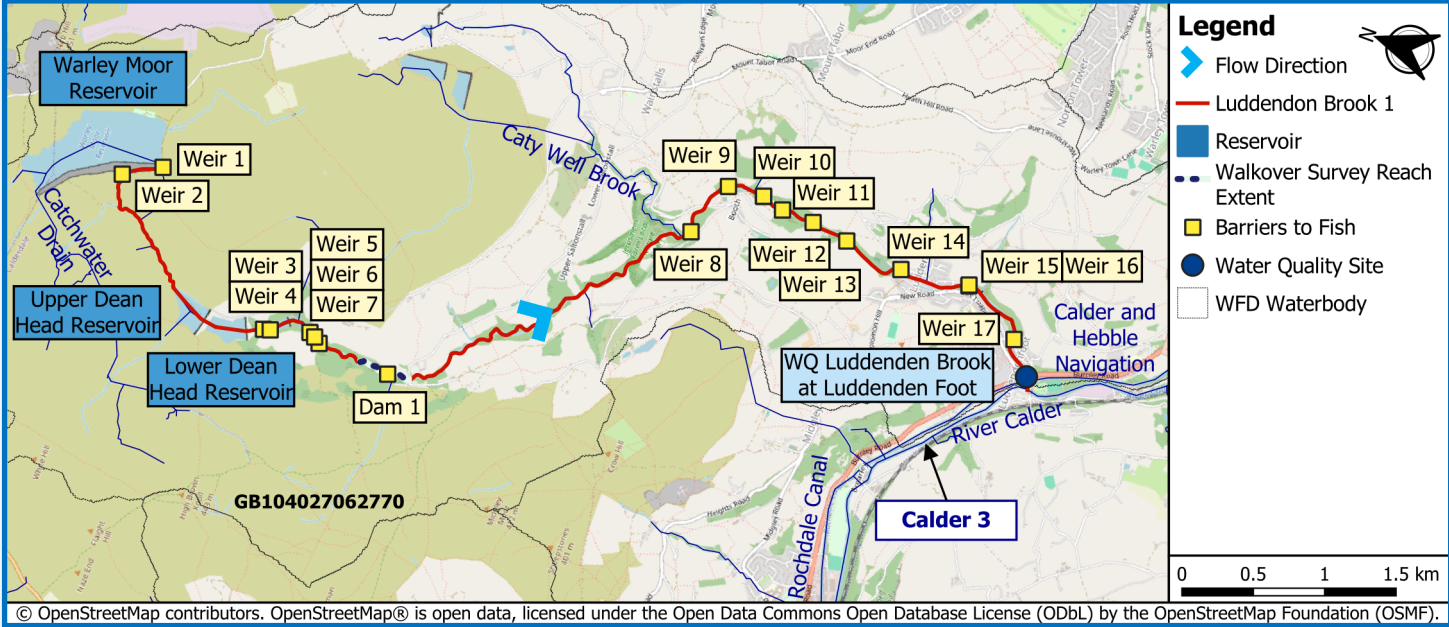
Significant Water Quality Pressures	Permit Conditions
There are 6 CSOs that could be considered intermittent water quality pressures in this reach, each with descriptive consents.	Intermittent discharges

At River Calder at Sowerby Bridge (NE-49500625) the average pH between 2014-2024 was 7.7 with a maximum temperature of 20.4°C for the same period.

Figure A4.10
River Calder 3
Physical Environment Information



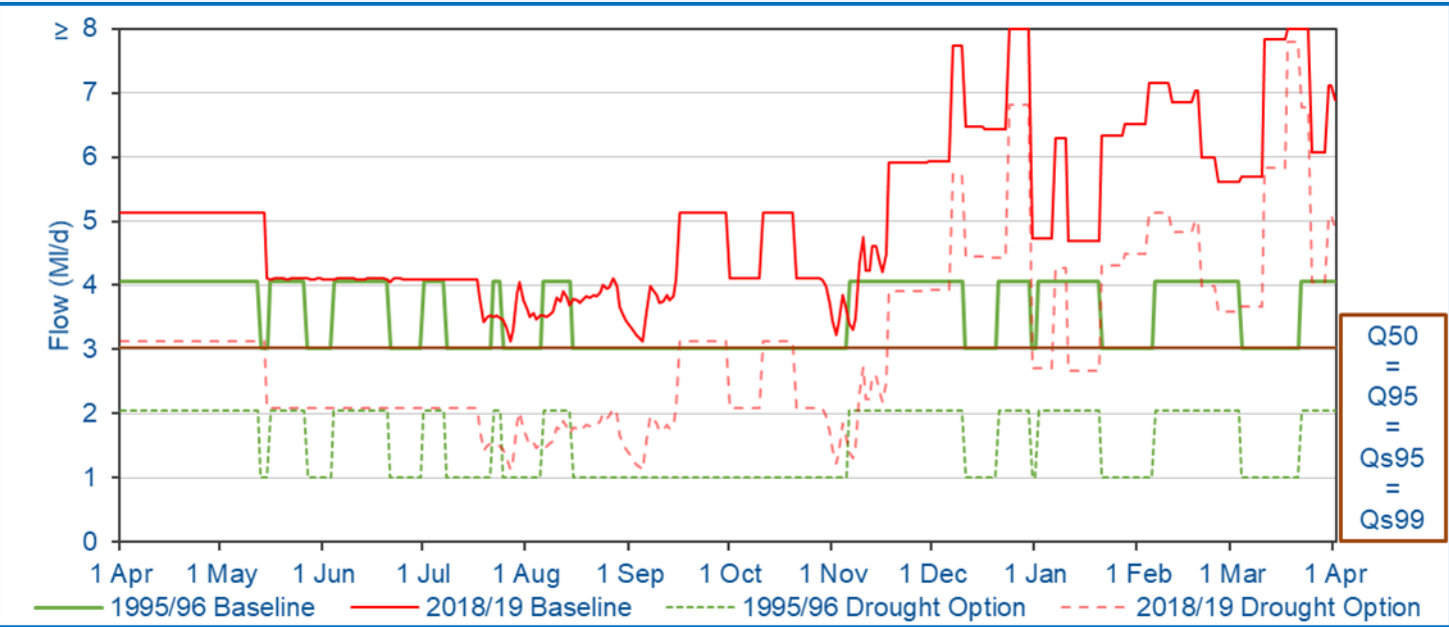
Reach Setting



Reach Setting Information:
The bedrock geology is dominated by the Millstone Grit Group and superficial geology is limited to deposits of alluvium beneath the channel, mostly in its lower sections. There are also spatially-limited deposits of head around the reach. Soil types in the upper to mid sections of the reach are composed predominantly of very acid, loamy upland soils with freely draining, slightly acid loamy soil in the lower sections of the reach. Urbanisation is low until ~7.3km downstream when the channel passes Luddenden Foot.

	Supplementary Information
Catchment Area at Assessment Point	2.4km ²
Mean Slope Gradient	2.0°
Length of Reach	9.1km
Additional Catchment Area	19.3km ²
Upstream Reach	N/A
Downstream Reach	River Calder 3

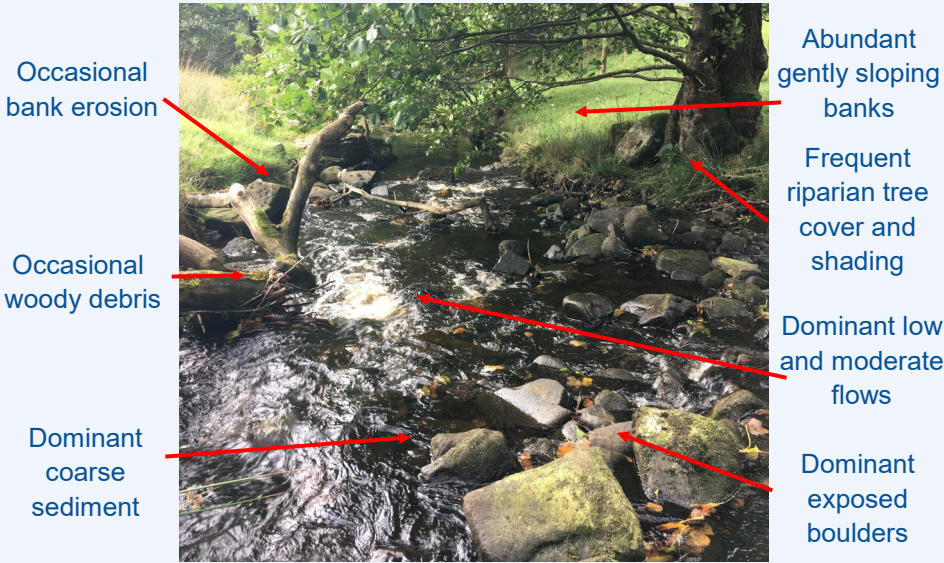
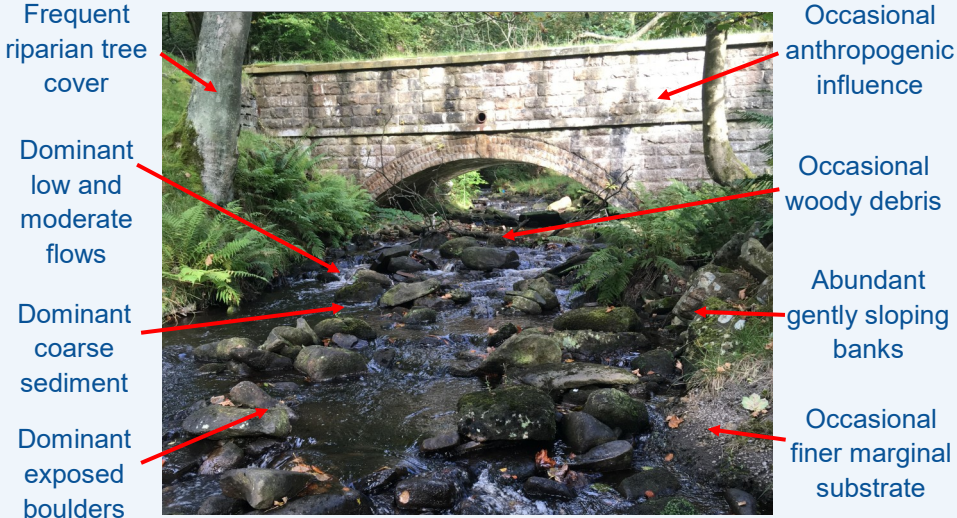
River Flow Regime



	Reference Conditions (ML/d)	Drought Plan Conditions (ML/d)	% Reduction	Impact
Q _s 95	3.02	1.00	67	Summer Major
Q _s 99	3.02	1.00	67	
Q95	3.02	1.00	67	Winter Major
Q50	3.02	1.00	67	

There are no significant flow additions/reductions associated with this reach

River Habitats



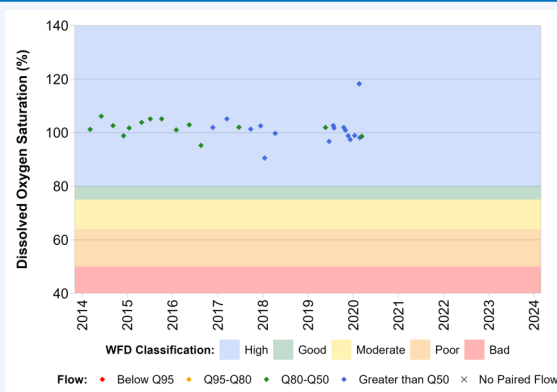
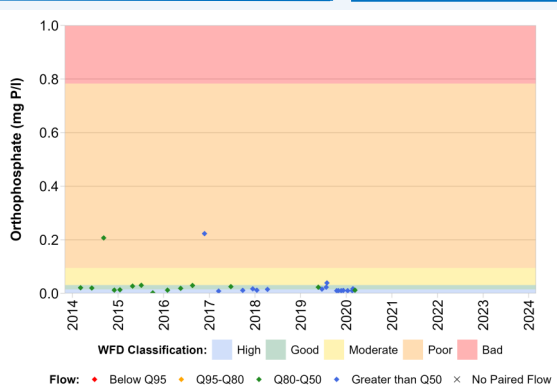
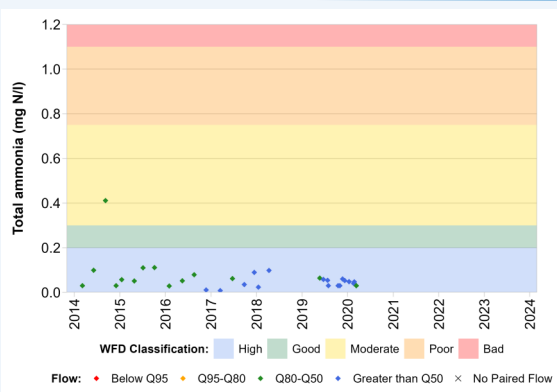
River Water Quality

There are no significant water quality pressures associated with this reach

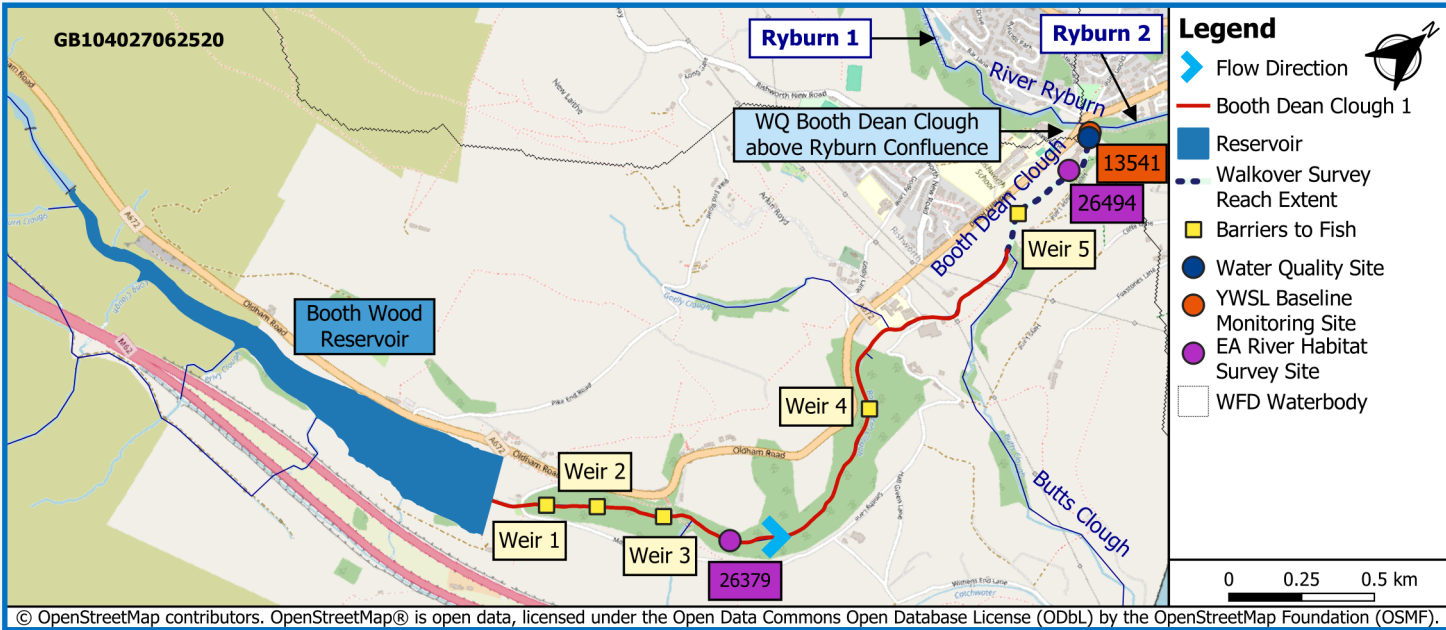
At Luddenden Brook At Luddenden Foot (NE-49500499) the average pH between 2014-2023 was 7.8 with a maximum temperature of 18.7°C for the same period.



Figure A4.11
Luddenden Brook 1
Physical Environment Information



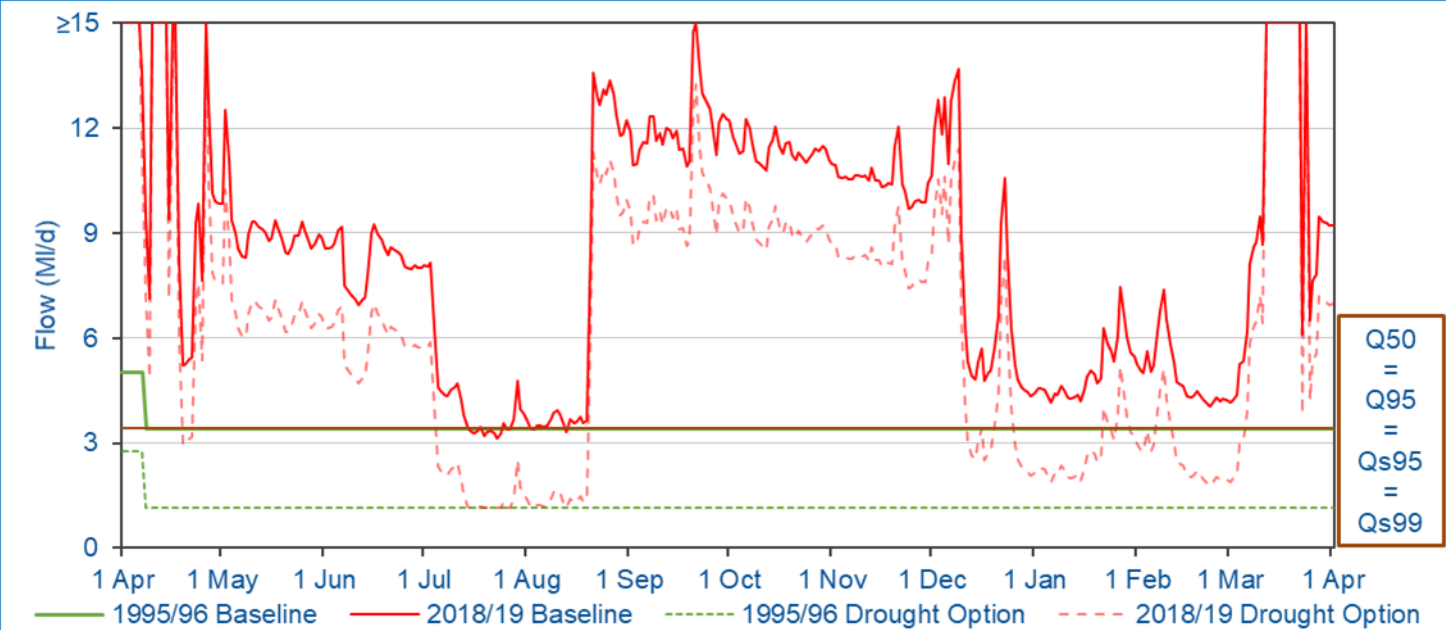
Reach Setting



Reach Setting Information:
The bedrock geology is dominated by lithologies of the Millstone Grit Group (mudstone, sandstone and siltstone). For the upstream 2.5km of the reach superficial geology is very limited with peat and head deposits identified and for the last 0.5km superficial geology is composed of alluvium beneath the channel with scattered river terrace deposits. Soil types along the reach are composed of freely draining, slightly acid loamy soils. Urbanisation increases towards the end of the reach as the channel enters Ripponden.

	Supplementary Information
Catchment Area at Assessment Point	15.4km ²
Mean Slope Gradient	1.6°
Length of Reach	3.0km
Additional Catchment Area	4.7km ²
Upstream Reach	N/A
Downstream Reach	Ryburn 2

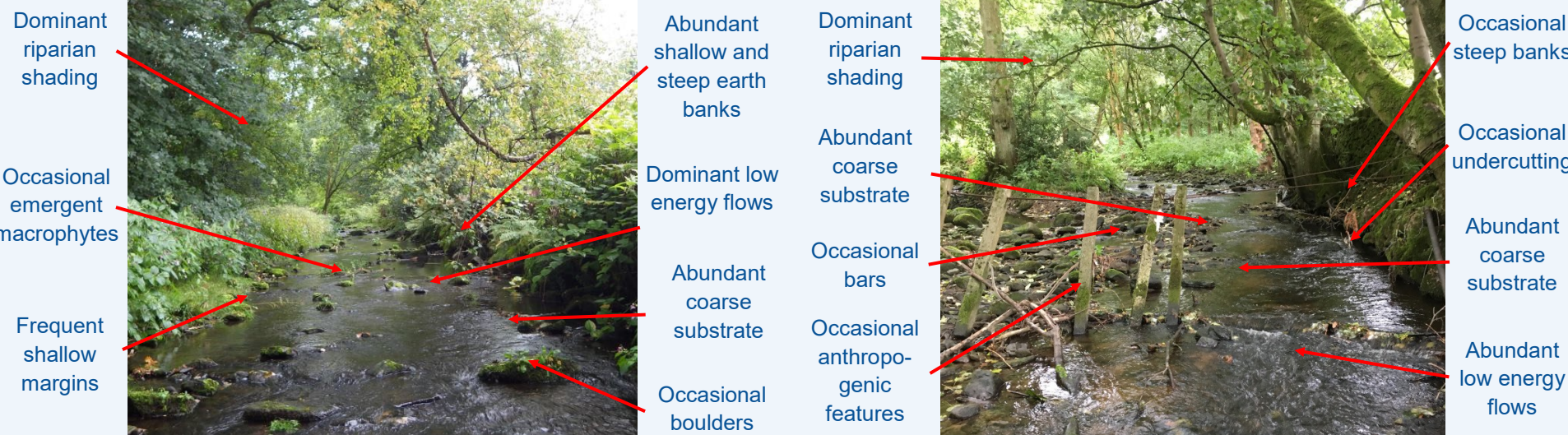
River Flow Regime



	Reference Conditions (Ml/d)	Drought Plan Conditions (Ml/d)	% Reduction	Impact
Q _s 95	3.41	1.13	67	Summer Major
Q _s 99	3.41	1.13	67	
Q95	3.41	1.13	67	Winter Major
Q50	3.41	1.13	67	

There are no significant flow additions/ reductions associated with this reach

River Habitats

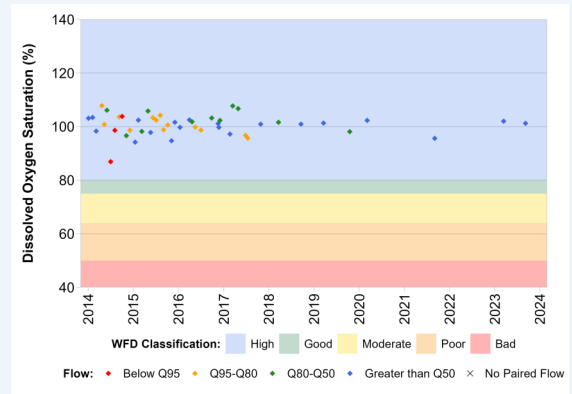
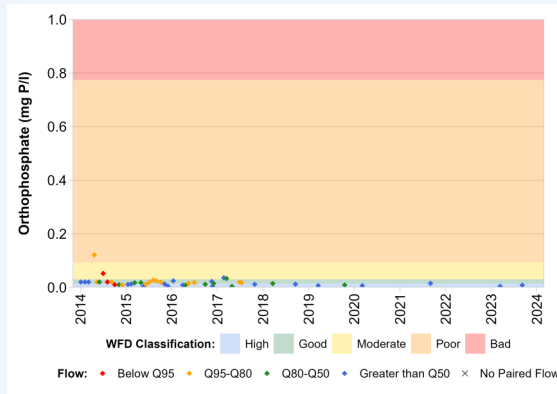
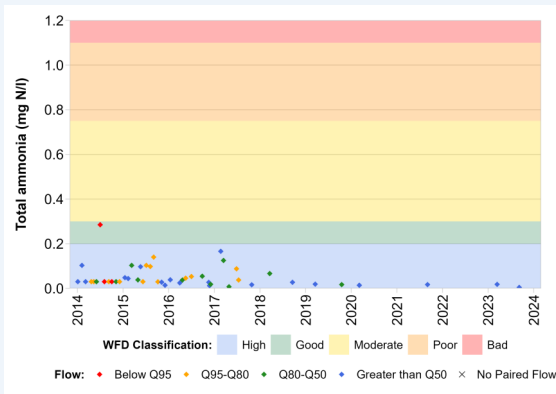


River Water Quality

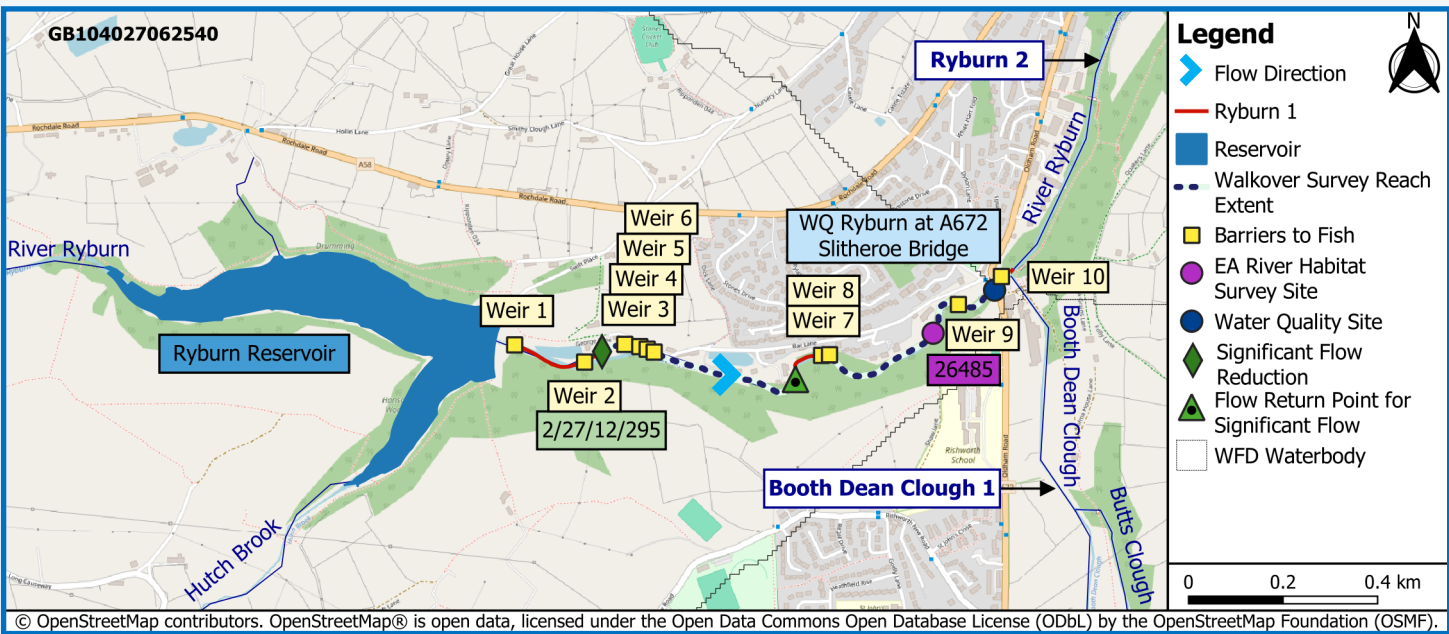
There are no significant water quality pressures associated with this reach

At Booth Dean Clough Above Ryburn Conf (NE-49505154) the average pH between 2014-2023 was 7.6 with a maximum temperature of 14.4°C for the same period.

Figure A4.12
Booth Dean Clough 1
Physical Environment Information



Reach Setting

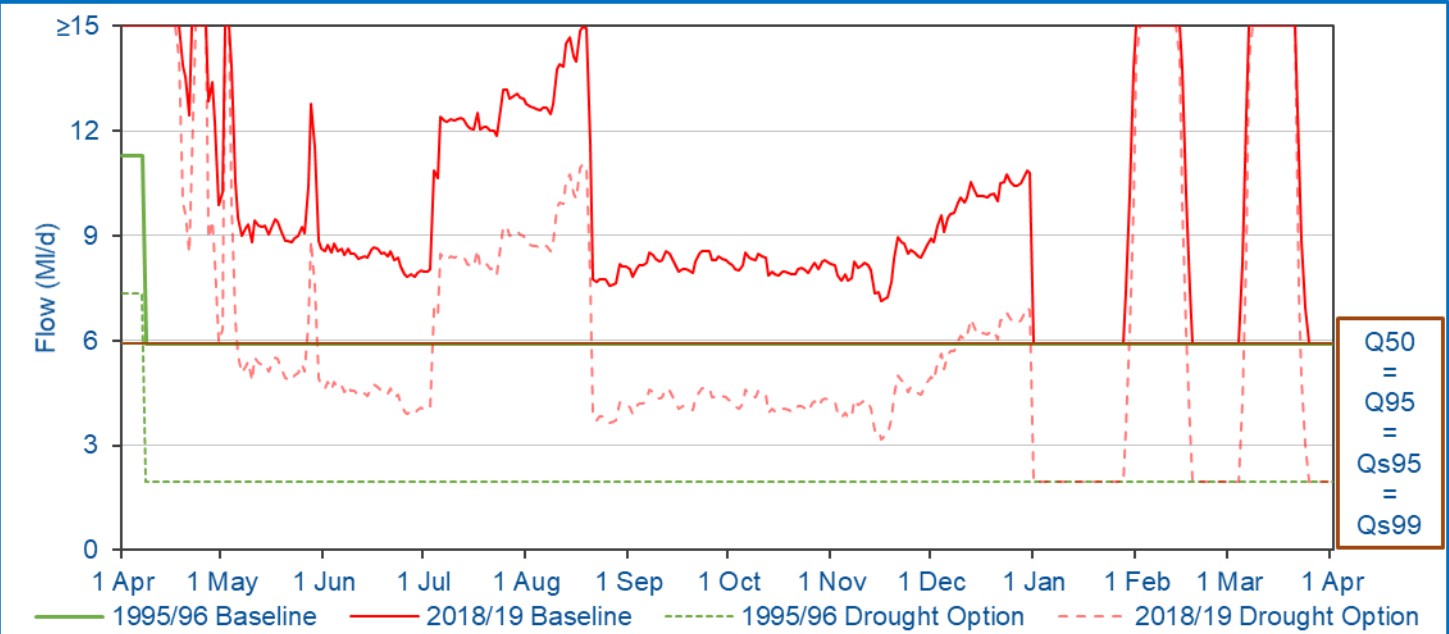


Reach Setting Information:

The bedrock geology is dominated by lithologies of the Millstone Grit Group (mudstone, sandstone and siltstone) and superficial geology is limited with alluvium identified beneath the channel and some peat. Soil types along the reach are composed of freely draining, slightly acid loamy soils. Land use is predominantly urban, especially along the left bank as the channel passes through Ripponden.

	Supplementary Information
Catchment Area at Assessment Point	12.7km ²
Mean Slope Gradient	1.1°
Length of Reach	1.4km
Additional Catchment Area	1.2km ²
Upstream Reach	N/A
Downstream Reach	River Ryburn 2

River Flow Regime



	Reference Conditions (Ml/d)	Drought Plan Conditions (Ml/d)	% Reduction	Impact
Q _s 95	5.90	1.95	67	Summer Major
Q _s 99	5.90	1.95	67	
Q95	5.90	1.95	67	Winter Major
Q50	5.90	1.95	67	

Significant Flow Additions/Reductions	Flow Rate (Ml/d)	Abstraction / Discharge
RIVER RYBURN (Fish farm) 2/27/12/295	1.36	Abstraction

River Habitats



River Water Quality

Significant Water Quality Pressures	Permit Conditions
RIVER RYBURN fish farm (No discharge permit)	(No permit)

At River Ryburn At A672 Slitheroe Bridge (NE-49500672) the average pH between 2014-2023 was 7.8 with a maximum temperature of 14.6°C for the same period.

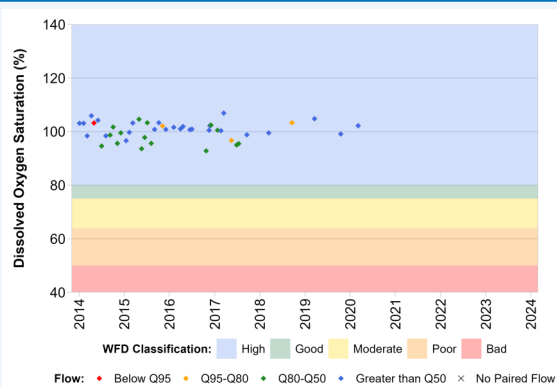
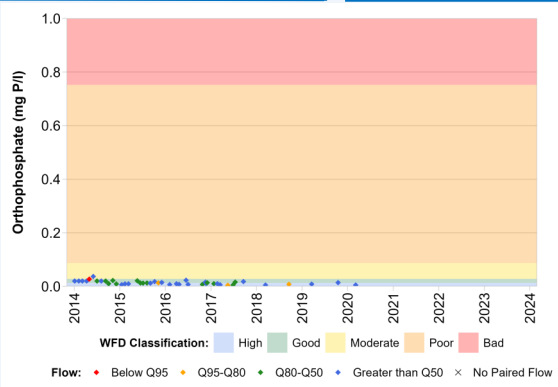
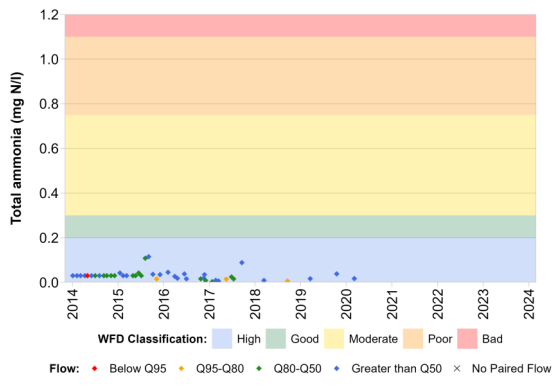
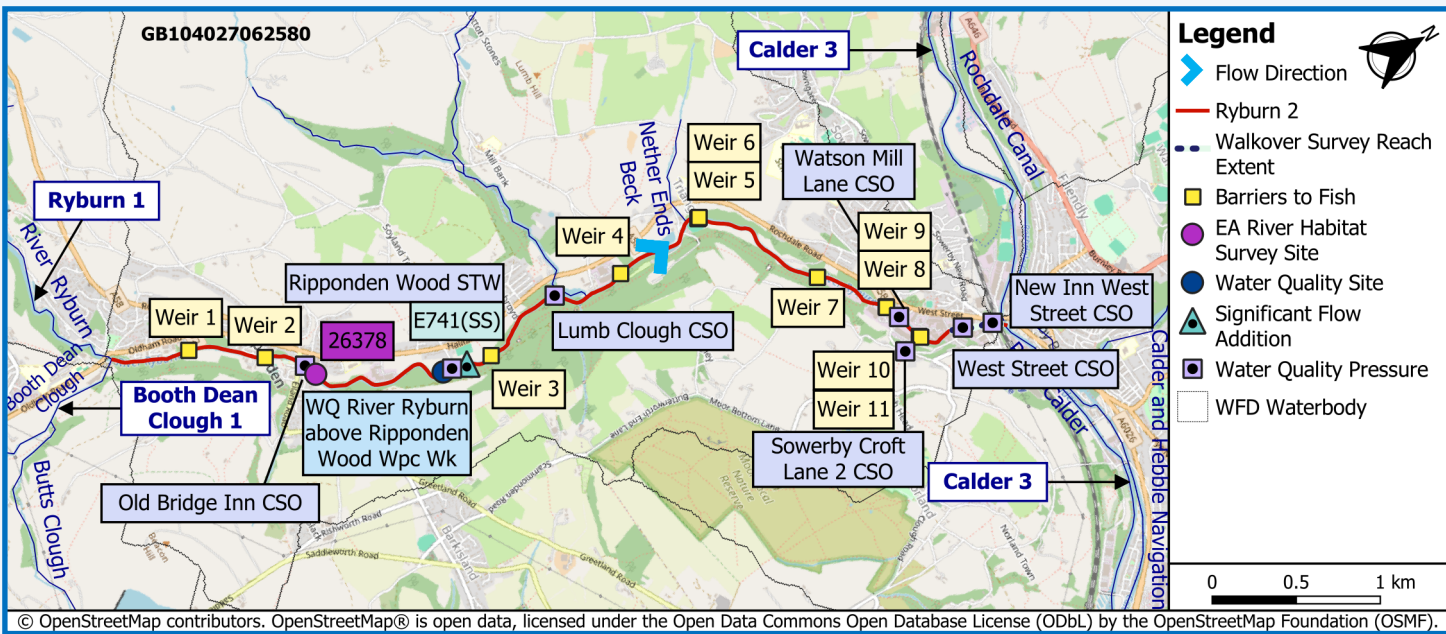


Figure A4.13
River Ryburn 1
Physical Environment Information

Reach Setting

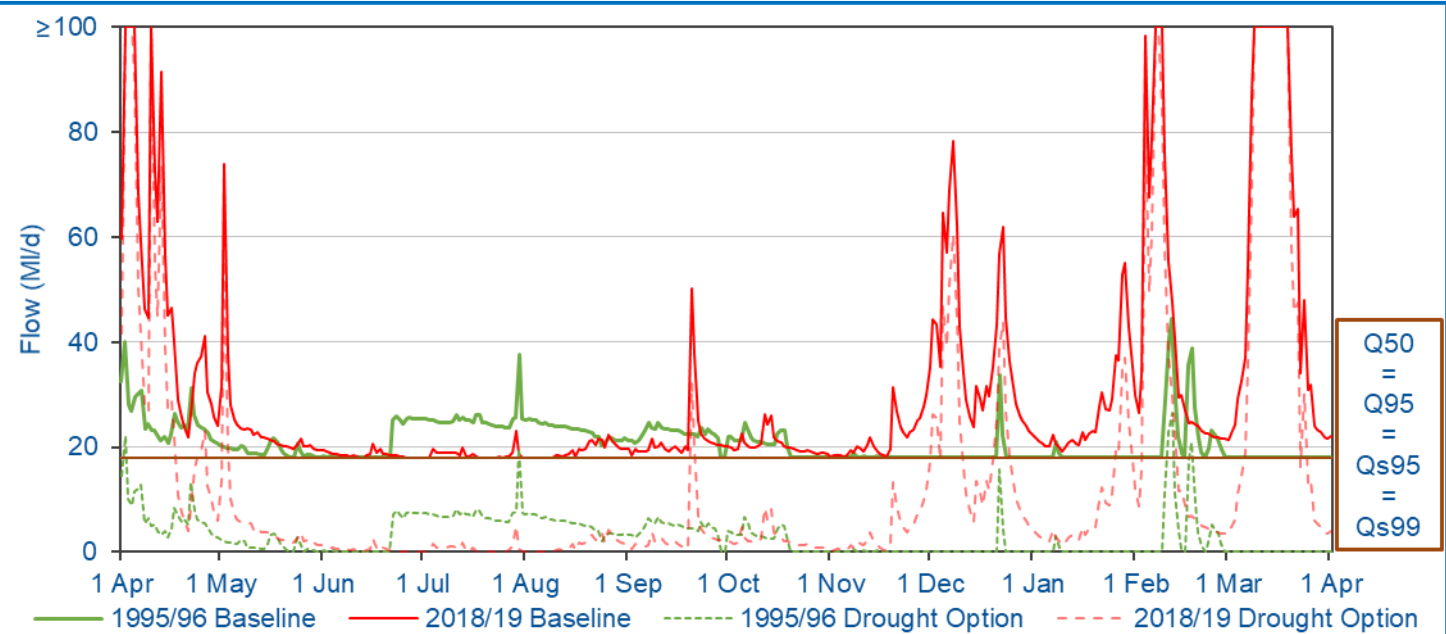


Reach Setting Information:

The bedrock geology is dominated by lithologies of the Millstone Grit Group (mudstone, sandstone and siltstone) and superficial geology is generally composed of alluvium beneath the channel with some head deposits towards the mid sections of the reach. Soil types along the reach are composed of freely draining, slightly acid loamy soils. This reach has a large urban presence as it passes through Ripponden and Sowerby.

	Supplementary Information
Catchment Area at Assessment Point	34.2km ²
Mean Slope Gradient	0.6°
Length of Reach	6.2km
Additional Catchment Area	18.4km ²
Upstream Reach	Booth Dean Clough 1/River Ryburn 1
Downstream Reach	River Calder 3

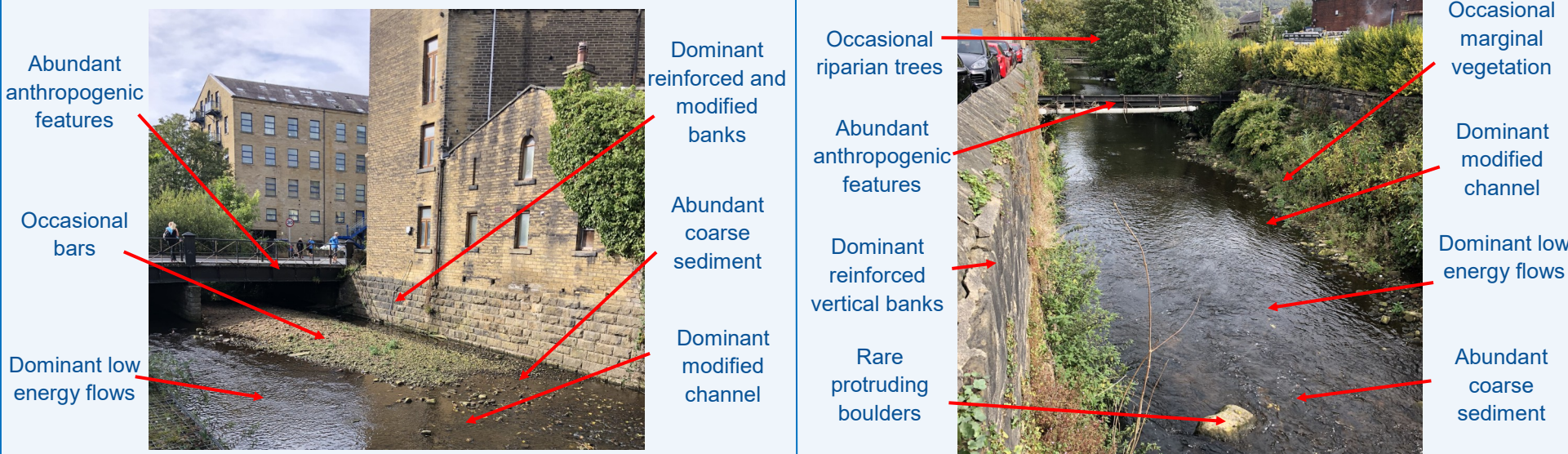
River Flow Regime



	Reference Conditions (MI/d)	Drought Plan Conditions (MI/d)	% Reduction	Impact
Q _s 95	18.00	6.00	67	Summer Major
Q _s 99	18.00	6.00	67	
Q95	18.00	6.00	67	Winter Major
Q50	18.00	6.00	67	

Significant Flow Additions/Reductions	Flow Rate (MI/d)	Abstraction / Discharge
Ripponden Wood STW E741(SS)	1.64 (Dry Weather Flow)	Discharge

River Habitats



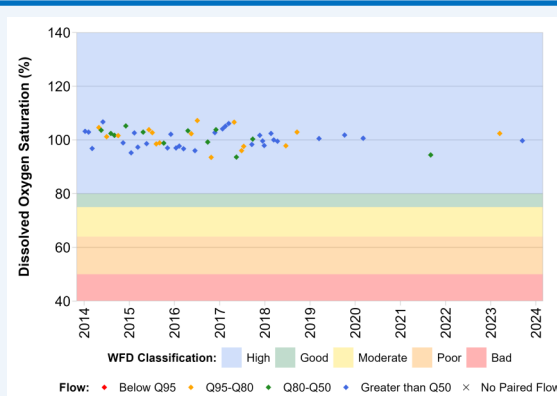
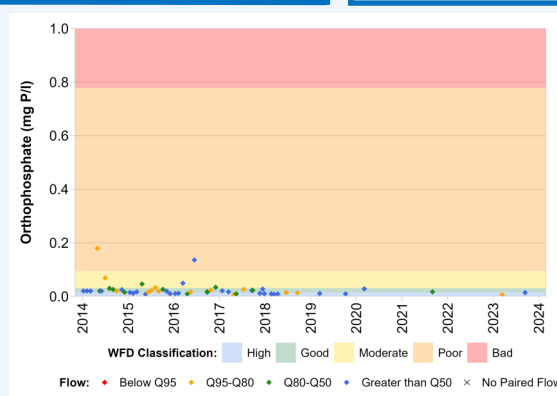
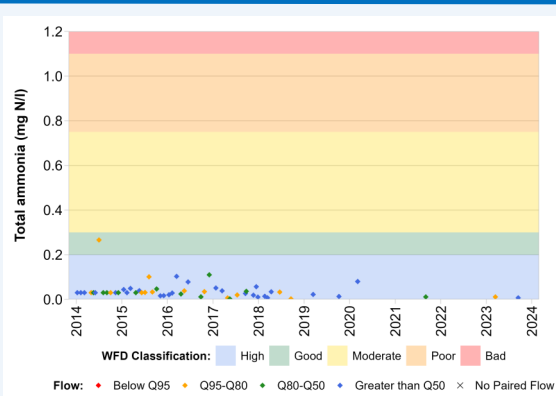
River Water Quality

Significant Water Quality Pressures	Permit Conditions
Ripponden Wood STW E741(SS)	1.64MI/d Dry Weather Flow 7 mg/l Ammonia (N) (95th percentile) 70 mg/l BOD ATU (95th percentile)
There are 7 CSOs that could be considered intermittent water quality pressures in this reach, each with descriptive consents.	Intermittent discharges

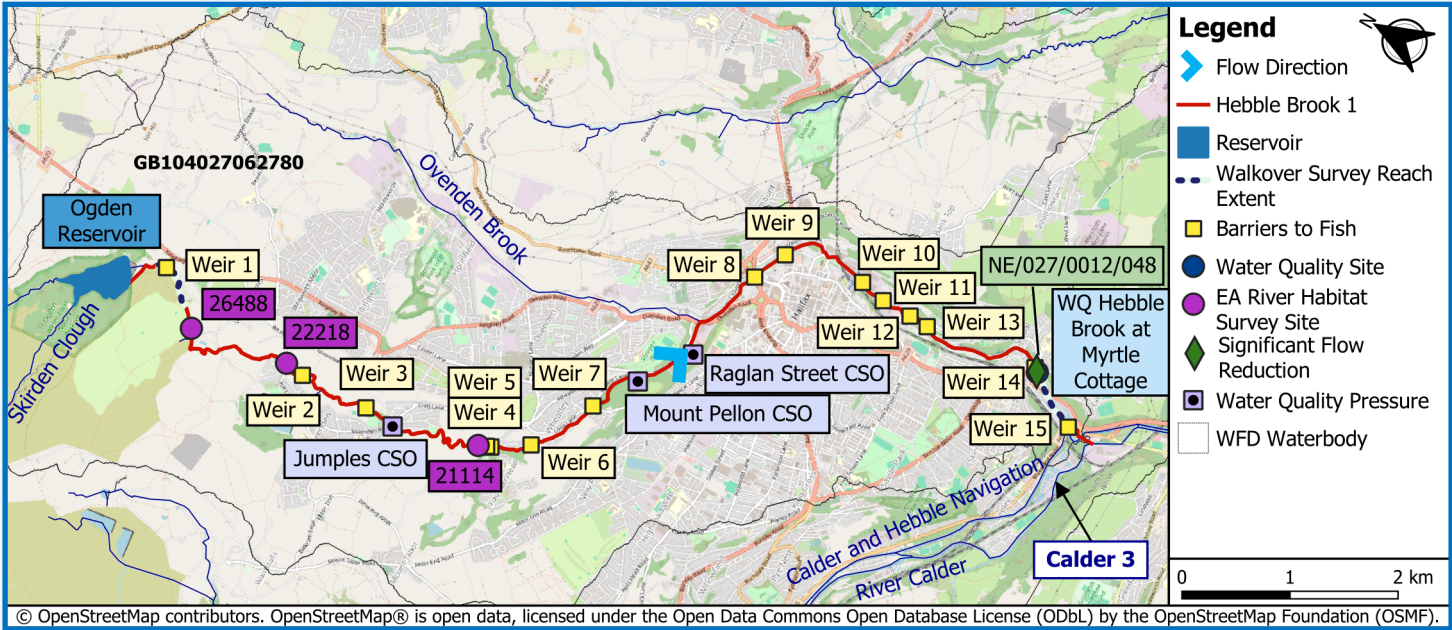
At the River Ryburn Above Ripponden Wood Wpc Wk (NE-49500668) the average pH between 2014-2025 was 7.8 with a maximum temperature of 15°C for the same period.



Figure A4.14
River Ryburn 2
Physical Environment Information



Reach Setting

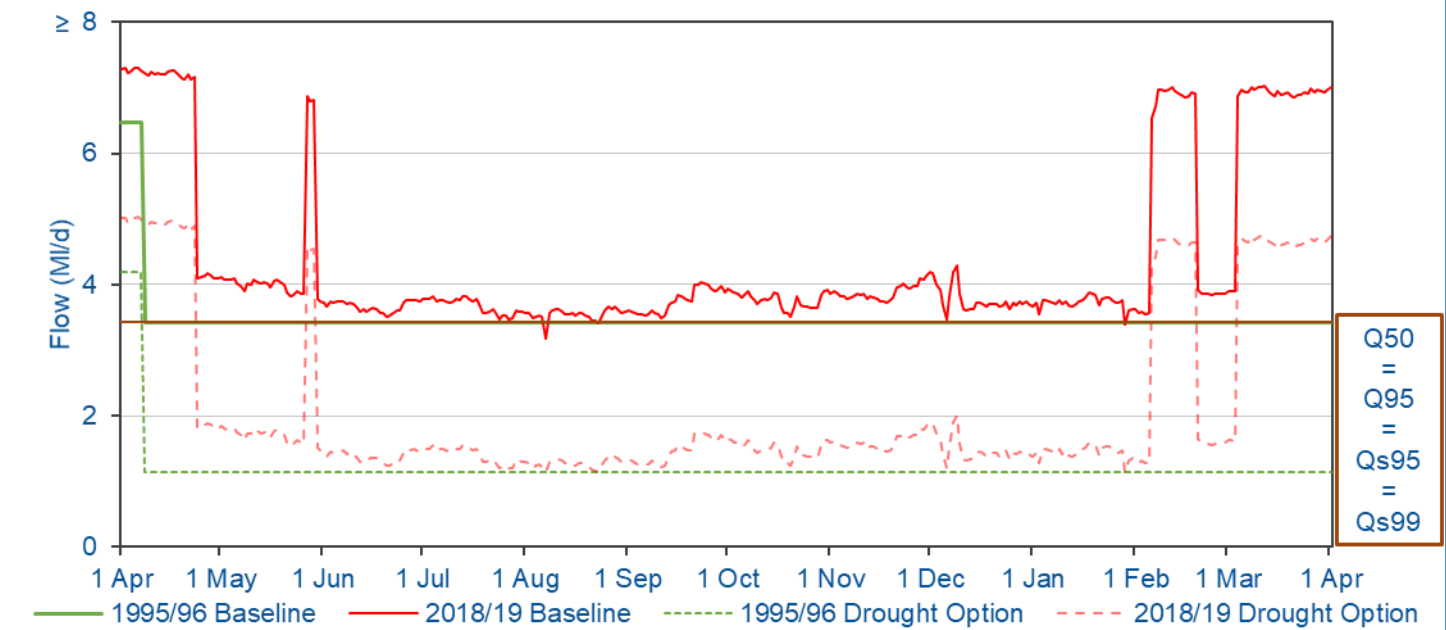


Reach Setting Information:

The bedrock geology is dominated by the Millstone Grit Group. No significant superficial deposits are identified beneath the reach. Soil types along the reach are composed predominantly of freely draining, slightly acid loamy soils with some very acid, loamy upland soils concentrated around the reservoir outflow. Urbanisation increases from the mid to lower reaches as the reach passes through Halifax.

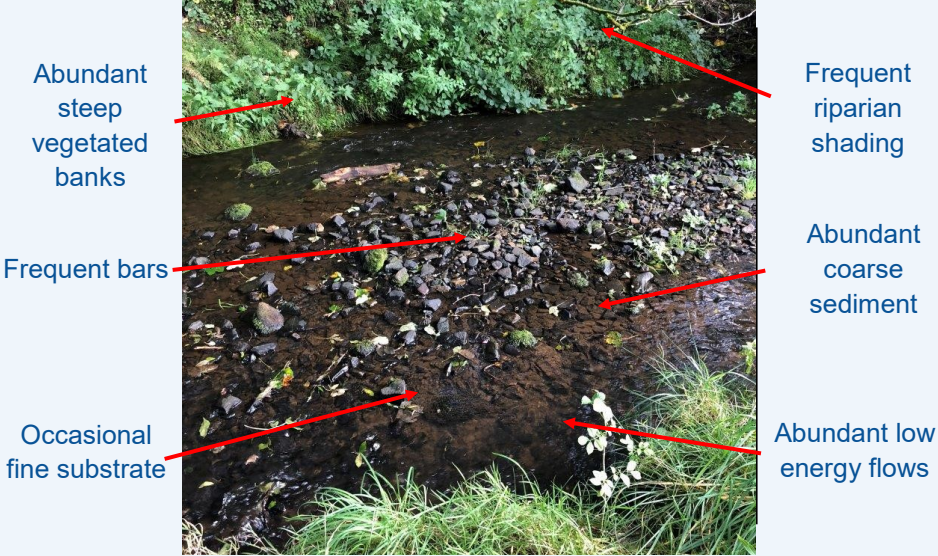
	Supplementary Information
Catchment Area at Assessment Point	3.6km ²
Mean Slope Gradient	1.1°
Length of Reach	12.4km
Additional Catchment Area	30.9km ²
Upstream Reach	N/A
Downstream Reach	River Calder 3

River Flow Regime



	Reference Conditions (ML/d)	Drought Plan Conditions (ML/d)	% Reduction	Impact	Significant Flow Additions/Reductions	Flow Rate (ML/d)	Abstraction / Discharge
Q _s 95	3.42	1.13	67	Summer Major	Canal and River Trust NE/027/0012/048	No value	Abstraction
Q _s 99	3.42	1.13	67				
Q95	3.42	1.13	67	Winter Major			
Q50	3.42	1.13	67				

River Habitats



River Water Quality

Significant Water Quality Pressures	Permit Conditions
Jumples CSO	Intermittent discharge
Mount Pellon CSO	Intermittent discharge
Raglan Street CSO	Intermittent discharge

At Hebble Brook At Myrtle Cottage (NE-49500374) the average pH between 2014 -2024 was 7.7 with a maximum temperature of 14.8°C for the same period.



Figure A4.15
Hebble Brook 1
Physical Environment Information

