

# River Wear Sediment Assessment

Water Framework Directive Assessment

## Final Report

October 2020

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**DURHAM REGATTA**

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## Contract

This report describes work commissioned by Nigel van Zwanenberg, on behalf of Durham Regatta. Lucy Sumner and Matthew Hemsworth of JBA Consulting carried out this work.

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## Purpose

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## Abbreviations

DARC	Durham Amateur Rowing Club
DrWPA	Drinking Water Protected Area
EA	Environment Agency
NVZ	Nitrate Vulnerable Zone
RBD	River Basin District
RBMP	River Basin Management Plan
SgZ	Safeguard Zone
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
UWWTD	Urban Waste Water Treatment Directive
WFD	Water Framework Directive

# 1 Introduction

## 1.1 WFD Overview

The Water Framework Directive (WFD) came into force in 2000 and is the most substantial piece of EU water legislation to date. All new activities in the water environment will need to take the Directive into account. The Directive imposes legal requirements to protect and improve the water environment.

### 1.1.1 Scope of the WFD Assessment

The EU Water Framework Directive was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The 2003 regulations were consolidated and replaced with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The Directive requires that Environmental Objectives be set for all surface and ground waters in England and Wales to enable them to achieve Good Status (or Good Ecological Potential for Heavily Modified and Artificial Water Bodies) by a defined date. These Environmental Objectives are listed below:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters.
- Aim to achieve at least good status/potential for all water bodies by 2021. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status/potential by 2027.
- Meet the requirements of Water Framework Directive Protected Areas.
- Promote sustainable use of water as a natural resource.
- Conserve habitats and species that depend directly on water.
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment.
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants.
- Contribute to mitigating the effects of floods and droughts.

### 1.1.2 Preventing Deterioration in Status

Any activity which has the potential to have an impact on the ecology of a water body will need consideration in terms of whether it could cause deterioration in its Ecological Status or Potential<sup>1</sup>.

For each water body, three different status objectives are identified within the RBMP. These are the overall status objective, the ecological status or potential objective and the chemical status objective. A default objective for all water bodies is to prevent the deterioration in the Ecological Status (or Ecological Potential for Heavily Modified and Artificial Water Bodies) of the water body. Note, the Ecological Status applies only to surface water bodies, and not ground water bodies. A separate assessment may be required to assess the impacts on the chemical and quantitative status of a ground water body, if the proposed activity is likely to cause impact.

The Ecological Status of a water body is determined through analysis of its constituent Biological Quality Elements. These elements are in turn supported by a series of Physico-Chemical and Hydromorphological Quality Elements. These Quality Elements are taken from

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<sup>1</sup> Environment Agency (2010) Assessing new modifications for compliance with WFD: detailed supplementary guidance: 488\_10\_SD01



Annex V of the Directive and are listed below. The overall Ecological Status is determined by the lowest element status.

The Biological Quality Elements assessed in the WFD include:

- Fish
- Invertebrates
- Macrophytes
- Phytobenthos

The WFD defines the flow, shape and physical characteristics of a watercourse as its 'hydromorphology'. Any in-channel works can impact upon the shape of a watercourse and the natural processes that occur within it, including:

- Flow patterns
- Width and depth of a channel
- Features such as pools, riffles, bars and bank slopes
- Sediment availability/ transport
- Interaction between a channel and its floodplain
- Ecology and biology (i.e. habitats which support plants and animals)

The WFD considers the chemistry of a watercourse through general water quality (physico-chemical measurements) and chemical pollutants. All three environmental components; morphology, hydrology and chemistry, support the Biology of a water body.

Any activity that has the potential to have an impact upon any of the Quality Elements will need consideration in terms of whether it could cause a deterioration in the status of a water body. The activity will also need to be considered in terms of whether it will compromise the ability of the water body to reach Good Ecological Status or Good Ecological Potential by the date specified in the Catchment Data Explorer.

Any adverse impacts can cause a water body's ecology to deteriorate and prevent environmental improvements from being undertaken. Nevertheless, in-channel works can also be beneficial if they can be designed to help achieve environmental improvements included in the RBMP, thus enhancing the water environment for plants and animals.

### **1.1.3 Artificial or Heavily Modified Water Bodies**

Whilst good ecological status is defined as a slight variation from undisturbed natural conditions in natural water bodies, artificial and heavily modified water bodies are unable to achieve natural conditions. Instead, artificial and heavily modified water bodies have a target to achieve Good Ecological Potential, which recognises their important uses, whilst making sure ecology is protected as far as possible. Ecological potential is also measured on the scale high, good, moderate, poor and bad. The chemical status of these water bodies is measured in the same way as for natural water bodies.

Specific mitigation measures have been identified for each Artificial and Heavily Modified Water body and are listed in the RBMP. These mitigation measures are necessary to reduce the existing hydromorphological impacts on the water body and all measures need to be in place in order for the water body to achieve Good Ecological Status or Potential.

## **1.2 Purpose of this WFD Assessment**

JBA Consulting was commissioned by Durham Regatta to undertake a WFD assessment to support an environmental permit application. This application relates to a single dredge activity of the main bar adjacent to, and downstream of the Durham Amateur Rowing Club (DARC). The activity will remove sediments for disposal and redistribute sediments from the River Wear to improve recreation along the racing stretch of the river used for the Durham Regatta and by other parties for recreation.

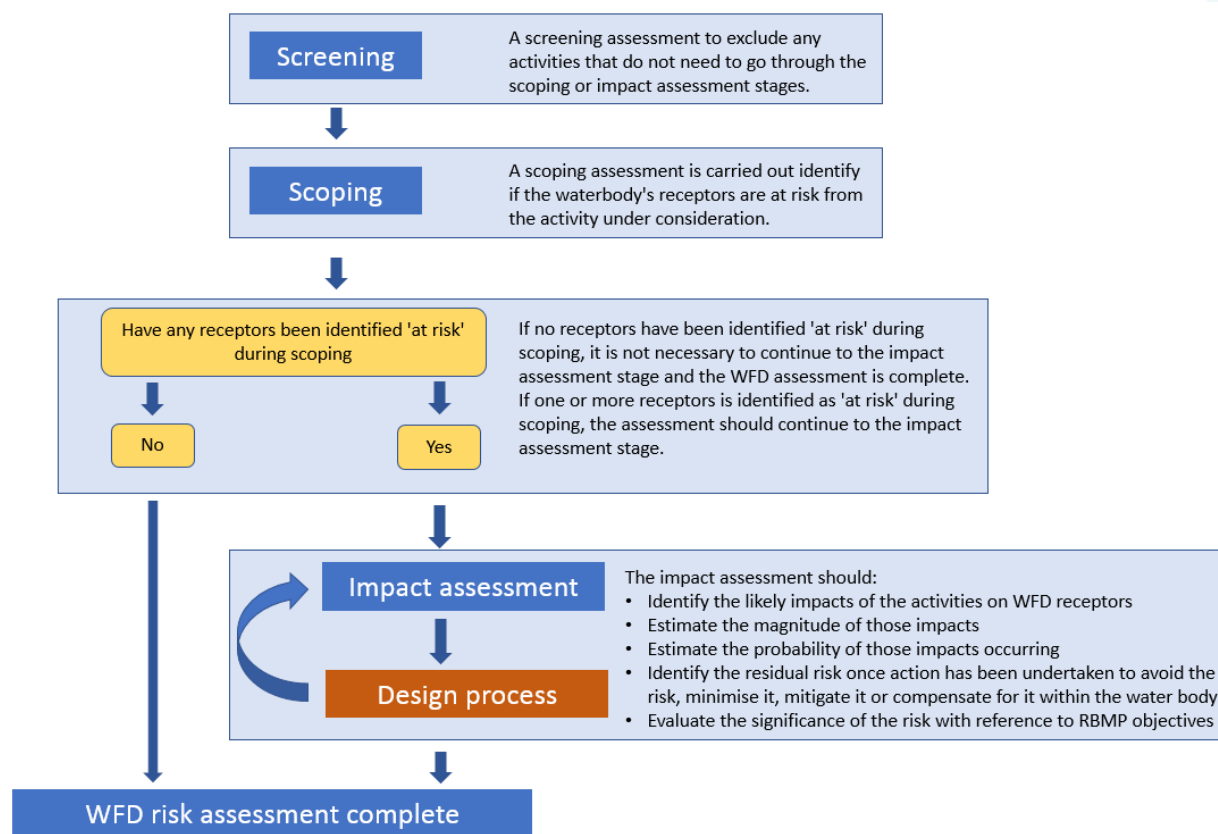
This WFD assessment aims to determine the effects of the proposed sediment removal and redistribution on ecological, hydromorphological and chemical quality and identify any potential impacts that could cause deterioration in the current status of the water body or could hinder the water body from meeting its WFD objectives in the future.

The site of works is located on and adjacent to the Wear from Croxdale Beck to Lumley Park Burn water body and falls within the Northumbria River Basin District (RBD). The Environmental Objectives, together with the specific actions (mitigation measures) necessary to enable the water body to meet these objectives, are set out in the Northumbria RBD river basin management plan (RBMP) (Environment Agency (EA), 2015) and Catchment Data Explorer (EA, 2020).

## 2 Assessment Methodology

### 2.1 Overview

The following flow chart summarises the WFD Assessment process.



**Figure 2-1: WFD assessment process flow chart**

### 2.2 Screening Assessment

The Screening Assessment aims to exclude any activities that do not need to go through the scoping or impact assessment stages.

The Northumbria RBMP and the Environment Agency's web-based Catchment Data Explorer were used to determine which water bodies could be potentially affected by the proposed works. The names, ID numbers, designation, status classification and objectives for all relevant water bodies were obtained and downloaded from the EA's Catchment Data Explorer.

The initial stage of the assessment screens the proposed works against the Ecological and Chemical Status objectives for the water bodies potentially affected by the works, together with their Quality Elements. The aim of this process is to determine whether the works could have an impact upon any of these criteria. Those criteria for which no potential adverse effects are identified are not considered further in the assessment. Any potential adverse effects are screened into the assessment and are carried forward to a detailed assessment.

### 2.3 Scoping Assessment

A detailed assessment is then undertaken to determine the effects that the proposed works could have upon those Quality Elements screened into the assessment. Any impacts identified are then considered in relation to the Ecological Status of the water body, which



comprises biology, hydrology, hydromorphology and water chemistry, and the water body objectives.

The following assessment objectives are then used to determine whether the proposed works comply with the overarching objectives of the WFD. These objectives were therefore derived from the Environmental Objectives of the Directive (as listed in section 1.2).

- Objective 1: The proposed scheme does not cause deterioration in the Status of the Ecological Elements of the water body.
- Objective 2: The proposed scheme does not compromise the ability of the water body to achieve its WFD status objectives.
- Objective 3: The proposed scheme does not cause a permanent exclusion or compromised achievement of the WFD objectives in other bodies of water within the same RBD.
- Objective 4: The proposed scheme contributes to the delivery of the WFD objectives.

In order to establish whether the strategy complies with the WFD it is necessary to ascertain whether the preferred options have the potential to result in:

- Failure of a water body to achieve Good Ecological Status or Potential; or
- Failure to prevent a deterioration in the Ecological Status or Potential of a water body

If the answer to these questions is 'no' the strategy can be considered WFD compliant. If either of these failures is identified and if any receptors are identified as 'at risk', further assessment may be required to identify if the strategy meets all of the conditions set out by the WFD Legislation.

## 2.4 Impact Assessment

The third stage of the WFD Assessment, if determined as necessary from the Screening and Scoping Assessments, is to undertake an Impact Assessment to consider the impacts of the proposed scheme in more detail and recommend necessary mitigation measures. An impact assessment must be carried out for each receptor identified during scoping as being at risk from your activity.

The Impact Assessment describes how any identified impacts from the proposed scheme will be mitigated, to either avoid or minimise the impacts. The assessment shows how any impact on WFD receptor caused by the proposed activity fits with the objectives of any affected WFD water bodies. After the works have been amended to try and avoid, minimise, mitigate or compensate for the risks to WFD receptors the following questions will need to be answered:

- Could the activity still cause a water body to deteriorate from one WFD status class to another or cause significant localised impacts that could contribute to this happening?
- Could the activity prevent or undermine action to get water bodies to good status?

When these questions are answered, the following should be borne in mind:

- A water body deteriorates in status when one WFD receptor (an "element") is affected such that it drops from one WFD status class to another.
- A significant localised impact on an element is one that is either long-lasting; causes severe harm; or affects a wide area within a water body. These are likely to contribute to a water body dropping from one status to another and highly likely to prevent action to get water bodies to good status.

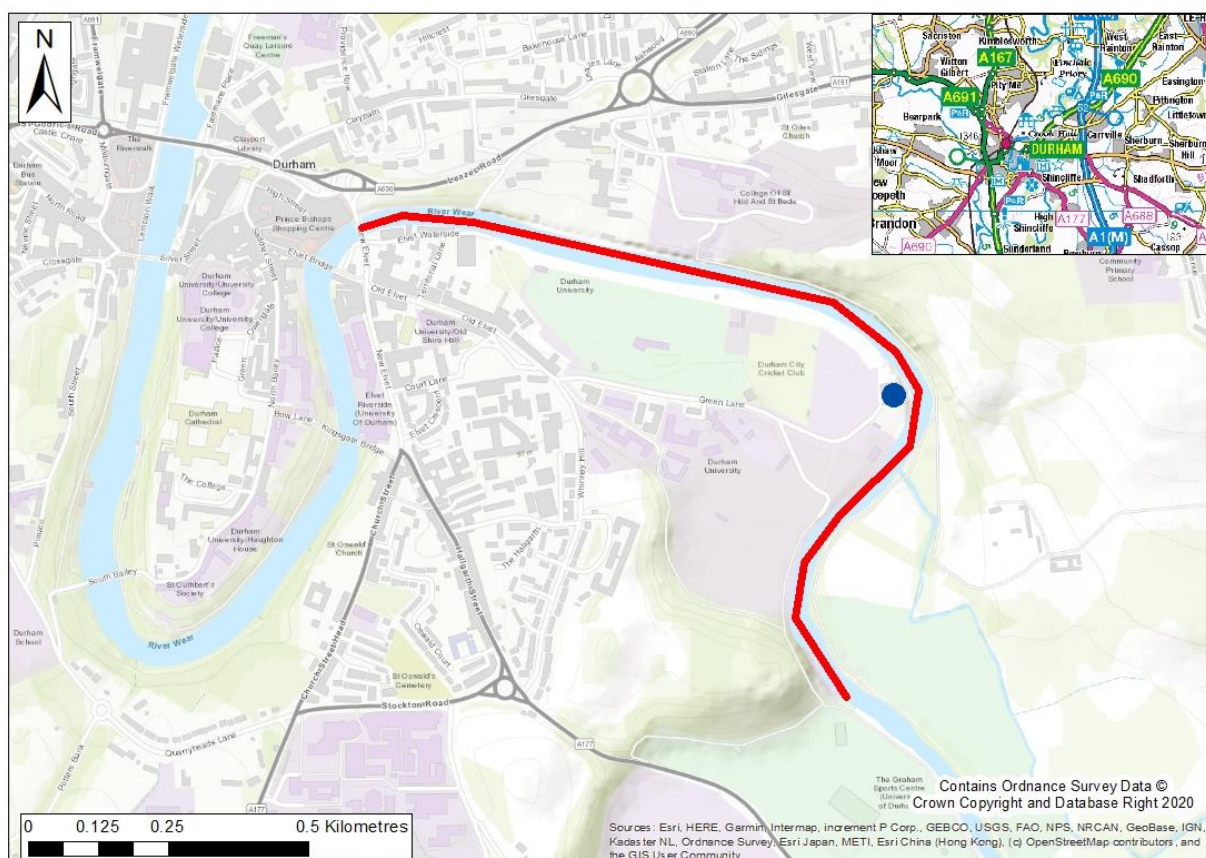
- Elements at high status are very sensitive. The assessment will need to demonstrate that there will be a negligible impact on those aspects of the water environment
- Elements at bad status must not be made worse.

If it cannot be demonstrated with a high level of confidence that the activity supports RBMP objectives, then in order for the Environment Agency to permit the activity it must be shown that the activity meets the criteria set out in Article 4(7) of the WFD. Article 4(7) sets out stringent environmental and socio-economic tests to assess if a scheme meets structural environmental and sustainability criteria.

### 3 Project Description

#### 3.1 Project Overview

This project focuses on a stretch of the River Wear between New Elvet Bridge and Maiden Castle footbridge, in Durham (Figure 3-1). The proposed works to remove and redistribute will follow the existing Gravel Management Plan (GMP) which was developed in 2010 (JBA, 2010). The GMP provided options to manage the sediments/gravels in a sustainable manner as the existing modified watercourse experiences deposition and sediment accumulation within this reach. Management options were also considered within the wider catchment area of the River Wear.

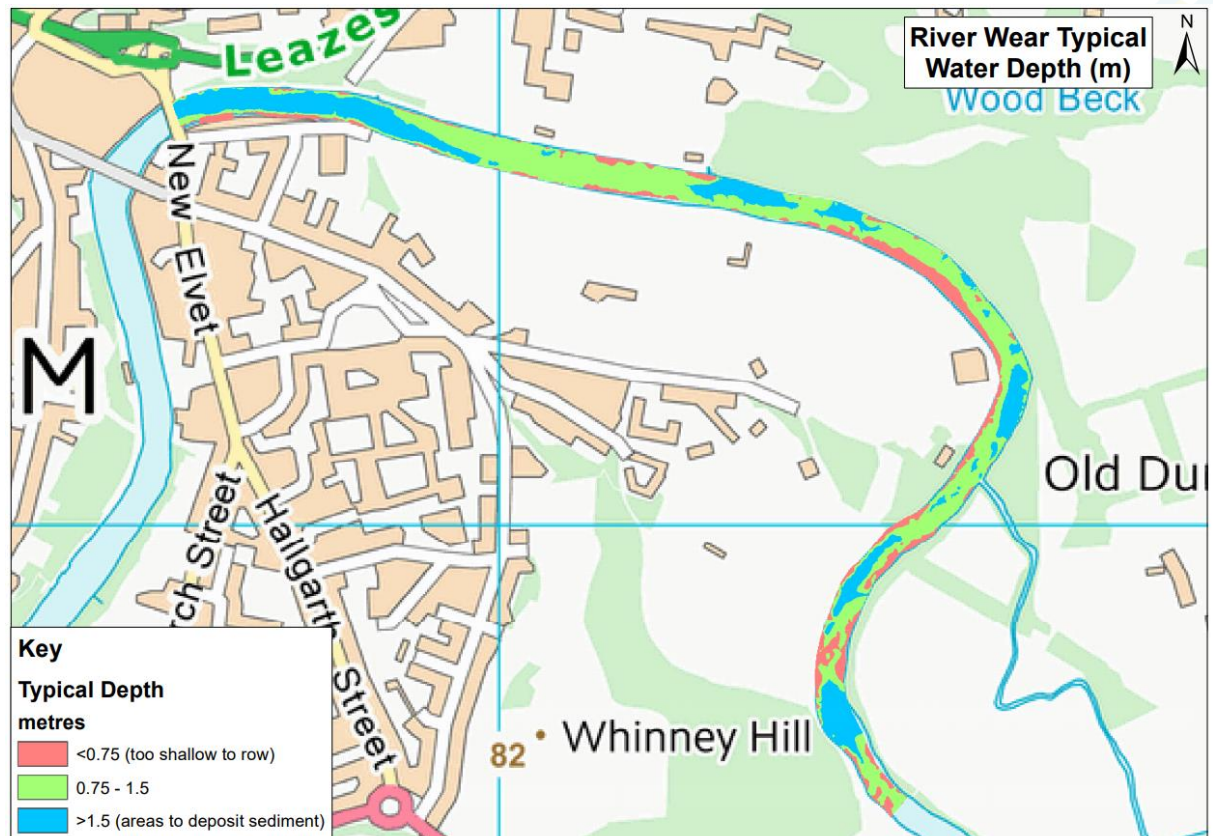


**Figure 3-1: Project focus on the reach of the River Wear indicated by the red line. Durham Amateur Rowing Club (DARC) is indicated by the dark blue circle.**

The GMP recommended the relocation of gravels across the inner bank shoal in the vicinity of the DARC, to move material into the thalweg and encourage downstream transport whilst minimising disruption to the sediment regime. Removal of gravels for disposal was not required at the time of the publishing of the GMP, but it was acknowledged that this would be required should recreation prove difficult within the vicinity of the DARC. The repeated removal of gravel and relocation/redistribution is anticipated to be required as deposits build up following floods. This build up should be monitored by the DARC and shoaling that inhibits recreation should be removed by hand, where possible. This practice does not require Environment Agency consent. Following high winter flows, the reach between Maiden Castle footbridge and Baths Bridge should map any areas of significant shoaling likely to impact on recreation and Environment Agency consent applied for to remove the material for disposal during February or March (JBA, 2010).



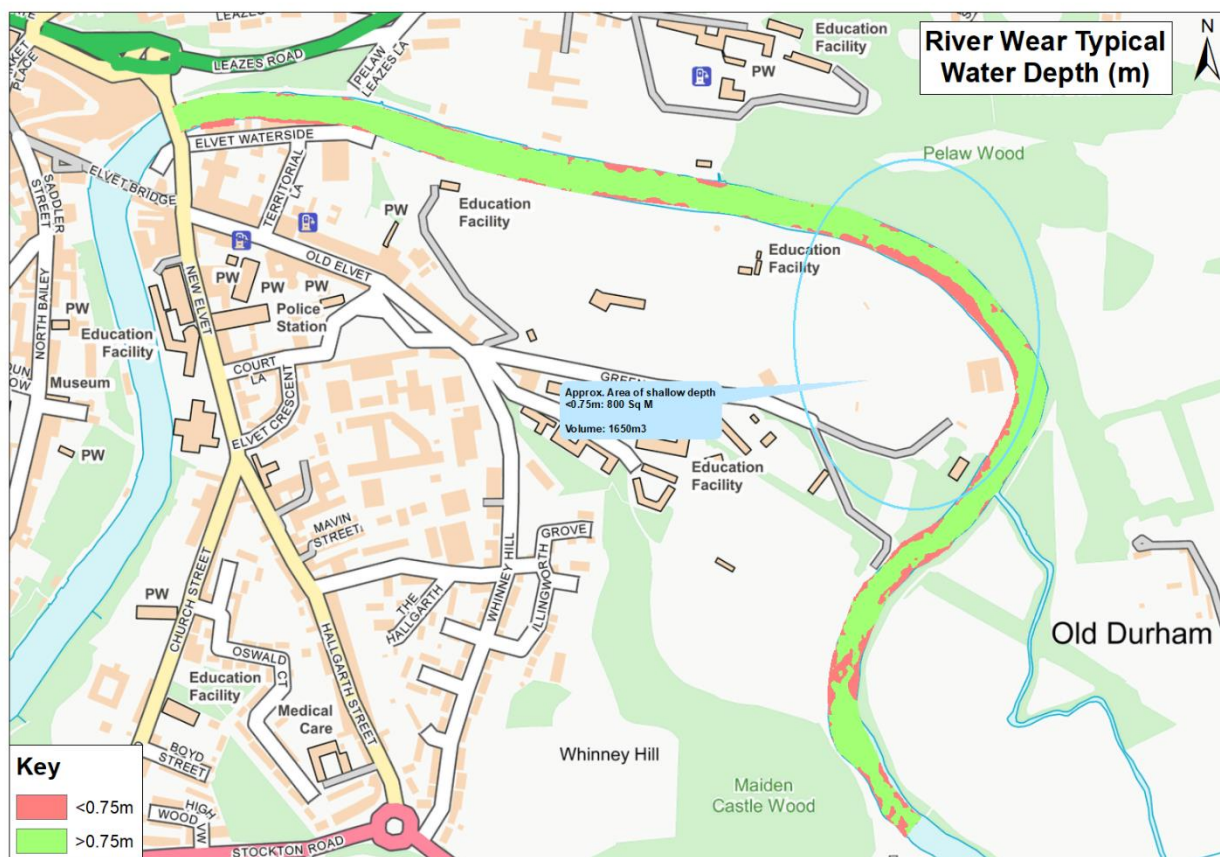
JBA Consulting was commissioned by Durham Regatta in 2020 to undertake further assessments as there was evidence of significant shoaling which was inhibiting safe recreation. The results shown below indicate the current water depths along this stretch (Figure 3-2). A depth of 0.75m has been a key driver and aim for this project as this water depth will enable safe recreation for rowers. Depths were estimated from typical surface water levels (31.25mAOD) recorded during the bathymetric and topographic survey in July 2020.



**Figure 3-2: Typical water depths for the River Wear.**

### 3.2 Proposed Works

The proposed works will involve the localised removal for disposal and redistribution of sediments from shallow water areas, indicated in red to create a water depth of 0.75m along the straightened section, downstream of the DARC and also ensure access to the boat club and its associated landing stages. Initial indications show that a maximum of 1650m<sup>3</sup> of sediments will be removed for disposal (Figure 3-3); however, it is likely that volumes removed will be much lower as sediments will also be redistributed, in line with the GMP (Figure 3-2; JBA, 2010). The proposed works will not involve works to areas upstream of the DARC. Discussion with various teams in the EA, identified that these areas are important spawning beds and also support diverse aquatic vegetation. Therefore, these areas have been withdrawn from the current scope as a more detailed survey, assessment and monitoring will be required prior to any works in these locations.



**Figure 3-3: Areas of shallow depths along this reach of the River Wear.**



## 4 WFD Screening Assessment

### 4.1 Overview

This screening assessment aims to screen in any works that require WFD Assessment and to identify which WFD water bodies are within and near to the proposed works.

The results of the assessment are presented below. A full and detailed WFD assessment would be required should it be concluded that the scheme could cause deterioration in the status of the water body or prevent it from achieving its status objectives. The baseline status of elements within water bodies screened into the assessment are discussed in this chapter.

### 4.2 WFD water bodies

#### 4.2.1 WFD water bodies

The study reach is an approximately 2km long stretch of the River Wear, between New Elvet Bridge and Maiden Castle footbridge, in Durham (Figure 3-1). This reach is part of the WFD water body, Wear from Croxdale Beck to Lumley Park Burn (ID: GB103024077621). This water body is approximately 34km long, its upstream extent is located 3.3km south east and extends 9.6km north in Chester-Le-Street. This water body is joined by the Old Durham Beck from Chapman Beck to Wear water body (ID: GB103024077470) at Grid Reference NZ 28590 42056, where it flows westwards past the DARC towards Durham city centre. The study reach is also located within the Wear Carboniferous Limestone and Coal Measures groundwater body (ID: GB40302G701600).

#### 4.2.2 Current status

Details of these three water bodies' classification, status and objectives, as described by the EA Catchment Data Explorer, are summarised in Table 4-1 below.

**Table 4-1: Current WFD status**

Water body ID	Name of water body	Hydromorphological designation	Current Overall Status/ Potential (2016)	Overall Status Objective
GB103024077621	Wear from Croxdale Beck to Lumley Park Burn	Heavily modified river	Moderate	Good by 2027
GB103024077470	Old Durham Beck from Chapman Beck to Wear	River (not designated artificial or heavily modified)	Poor	Poor in 2015 – No known technical solution is available
GB40302G701600	Wear Carboniferous Limestone and Coal Measures	Groundwater body	Poor	Poor in 2015 – No known technical solution is available

### 4.3 Screening Outcome: water bodies

Table 4-2 indicates which water bodies have been screened in or out of the assessment and the reasons for this decision.

**Table 4-2: Water body screening outcome**

Water body/ies	Reason	Screening outcome
Wear from Croxdale Beck to Lumley Park Burn	The proposed works directly impact on this water body.	Screened in
Old Durham Beck from Chapman Beck to Wear	This upstream water body will not be impacted by the proposed works as the works are minor and localised to the areas highlighted in Figure 3-3. There are two areas to the south of the DARC which are located upstream of the confluence between Old Durham Beck and the River Wear. Given the direction of flow northwards, it is highly unlikely that Old Durham Beck will be impacted.	Screened out
Wear Carboniferous Limestone and Coal Measures	In general, works to remove bed material can open up pathways between groundwater contamination and the river. However, in this instance this is not anticipated as materials being removed consist of sand and gravels, which are of moderate to high permeability. Therefore, they do not currently limit connectivity between the two water bodies and so the proposed works will not significantly impact the pathway between the two. Please refer to the Groundwater and Minewater Risk Review (JBA, 2020a).	Screened out

#### 4.4 Baseline Status of screened-in water bodies

For each water body screened into the assessment, details on the status of each element, as described by the EA Catchment Data Explorer, are given below.

##### 4.4.1 Wear from Croxdale Beck to Lumley Park Burn

The tables below describe the current status of the Ecological Elements according to the most recent WFD cycle.

**Table 4-3: Biological Quality Elements**

Biological Quality Element	Current Status (2016)	Objective
Macrophytes and Phytobenthos Combined	Good	Good in 2015
Fish	Good	Good in 2015
Invertebrates	Good	Good in 2015

**Table 4-4: Hydromorphological Quality Elements**

Hydromorphological Quality Element	Current Status (2016)	Objective
Hydrological Regime	Supports Good	Supports Good in 2015

**Table 4-5: Physico-Chemical Quality Elements**

Physico-Chemical Quality Element	Current Status (2016)	Objective
Acid Neutralising Capacity	High	Good in 2015
Ammonia (Phys-Chem)	High	Good in 2015
Biochemical Oxygen Demand (BOD)	High	-
Dissolved Oxygen	High	Good in 2015
pH	High	Good in 2015
Phosphate	Moderate	Good by 2027
Temperature	Good	Good in 2015

**Table 4-6: Specific Pollutants**

Specific pollutants	Current Status (2016)	Objective
Triclosan	High	High in 2015
Arsenic	High	High in 2015
Copper	High	High in 2015
Iron	High	High in 2015
Zinc	High	High in 2015

The current status of the Chemical Elements is described below.

**Table 4-7: Priority substances**

Priority substances	Current Status (2016)	Objective
1,2-dichloroethane	Good	Good in 2015
Lead and Its Compounds	Good	Good in 2015
Nickel and Its Compounds	Good	Good in 2015
Pentachlorophenol	Good	Good in 2015
Trichloromethane	Good	Good in 2015

**Table 4-8: Other Pollutants**

Other Pollutants	Current Status (2016)	Objective
Aldrin, Dieldrin, Endrin & Isodrin	Good	Good in 2015
Carbon Tetrachloride	Good	Good in 2015
DDT Total	Good	Good in 2015

Para – para DDT	Good	Good in 2015
Tetrachloroethylene	Good	Good in 2015
Trichloroethylene	Good	Good in 2015

Priority hazardous substances	Current Status (2016)	Objective
Cadmium and Its Compounds	Good	Good in 2015
Di(2-ethylhexyl)phthalate (Priority hazardous)	Good	Good in 2015
Hexachlorocyclohexane	Good	Good in 2015
Mercury and Its Compounds	Good	Good in 2015
Nonylphenol	Good	-
Tributyltin	-	-

#### 4.5 Protected Areas

The WFD specifies that areas requiring special protection under other EC Directive and waters used for the abstraction of drinking water are identified as protected areas. These areas have their own objectives and standards. Article 4 of the WFD requires Member States to achieve compliance with the standards and objectives set for each protected area by 22<sup>nd</sup> December 2015, unless otherwise specified in the community legislation under which the protected area was established.

##### 4.5.1 Urban Waste Water Treatment Directive

The water body, Wear from Croxdale Beck to Lumley Park Burn, is linked to the River Wear Urban Waste Water Treatment Directive (ID: UKENRI79). This Directive aims to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors and concerns the collection, treatment and discharge of these waste waters.

##### 4.5.2 Nitrate Vulnerable Zones (NVZ)

The European Commission Nitrates Directive requires areas of land that drain into waters polluted by nitrates to be designated as Nitrate Vulnerable Zones (NVZs). The Wear from Croxdale Beck to Lumley Park Burn is associated with two NVZs, 238 (NVZ12SW012380) and 239 (NVZ12SW012390). The Wear Carboniferous Limestone and Coal Measures groundwater body is also associated with NVZ 98 (NVZ12GW010980).

##### 4.5.3 Drinking Water Groundwater Safeguard Zones (SgZ)

Drinking Water Protected Areas (DrWPA) are designated under the Water Framework Directive, with the aim of avoiding deterioration in their quality in order to reduce the level of purification treatment required in the production of drinking water. SgZs are areas where actions will be targeted to address the causes of DrWPA objective failure/risk of failure.

The whole of the site area falls within the Wear from Croxdale Beck to Lumley Park Burn DrWPA (ID: UKGB103024077621). The Wear Carboniferous Limestone and Coal Measures groundwater body is also designated as a DrWPA (UKGB40302G701600).

#### 4.6 Summary

To conclude the Screening Assessment, the Ecological and Chemical Elements of the Wear from Croxdale Beck to Lumley Park Burn heavily modified river need to be considered further within the Scoping Assessment. Protected Areas will also be considered in the

Scoping Assessment. As the proposed works will be localised to the study reach, downstream water bodies have not been considered given their distance from the site.

Old Durham Beck has been screened out as it is located upstream of the proposed works area and the natural flow of the River Wear means that this waterbody is highly unlikely to be impacted by the works. The Wear Carboniferous Limestone and Coal Measures groundwater body has also been screened out as the proposed works will not significantly change the connectivity between this water body and the Wear from Croxdale Beck to Lumley Park (JBA, 2020a).



## 5 WFD Scoping Assessment

### 5.1 Overview

This scoping assessment identifies whether the water body's receptors, identified during the screening assessment, are at risk from the proposed works discussed in Chapter 3. This assessment is supported by the evidence in the Groundwater and Minewater Risk Review and Integrated Riparian Survey Report (JBA, 2020a; JBA, 2020b). The proposed development works are being appraised in terms of their impact on WFD status and objectives.

Article 4.7 of the Directive defends deterioration in status or failure to meet WFD objectives resulting from new modifications or sustainable human development activities (if all conditions set out under this Article are met). If the assessment procedure predicts that an activity will cause deterioration in water body status or prevent a water body from meeting its ecological objectives, then an assessment is also required against the conditions listed in Article 4.7 of the WFD. European Member States will not be in breach of the WFD if all the assessment conditions are met.

### 5.2 Scoping Assessment

#### 5.2.1 Wear from Croxdale Beck to Lumley Park Burn Biological Quality Assessment

Table 5-1 presents an assessment of the proposed works against the biological quality elements of the Wear from Croxdale Beck to Lumley Park Burn water body.

**Table 5-1: Assessment of works against the biological elements**

WFD Quality Element	Current Status	Potential Impact	Consider in impact assessment?
Macrophytes and Phytobenthos Combined	Good	The proposed works will involve sediment removal for disposal and redistribution within the watercourse. This has the potential to directly impact these elements through disturbance and damage to habitats and macrophyte species. Sediment removal will result in localised losses of habitat for these species, however sediments are naturally carried downstream in high flows and sediments will also be redistributed within the channel.  The proposed works have the potential to impact on Salmonids, European Eels, coarse fish and lamprey species (JBA, 2020b).	Yes
Fish	Good		
Invertebrates	Good		

#### Hydromorphological Quality Assessment

Table 5-2 presents an assessment of the proposed works against the hydromorphological quality elements of the Wear from Croxdale Beck to Lumley Park Burn water body.

**Table 5-2: Assessment of works against the hydromorphological quality elements**

WFD Quality Element	Potential Impact	Consider in Impact Assessment?
Hydrology: Quantity and Dynamics of flow	The proposed works will alter the dynamics of flow as flow will no longer be reduced in the depositional areas.	Yes
Hydrology: Connection to ground water bodies	The moderate to high permeable nature of the sand and gravel bed material being removed should not significantly change the connectivity. Therefore, no impacts are anticipated.	No
River Continuity	The removal of sediment for disposal and redistribution from areas of temporary sediment storage is likely to impact the transfer of sediment to downstream reaches.	Yes
Morphology: River width and depth	The removal of sediments for disposal and redistribution will alter the variable river depths along this stretch of the River Wear. The river width will not be impacted as removal of sediments will be from within the river channel.	Yes
Morphology: Structure and substrate of the river bed	The structure of the river bed will be altered by the sediment removal for disposal and redistribution.	Yes
Morphology: Structure of the riparian zone	There is potential for the riparian zone to be impacted as the plant accesses the work areas.	Yes

### Physico-Chemical Quality Assessment

Table 5-3 presents an assessment of the proposed works against the physico-chemical quality elements of the Wear from Croxdale Beck to Lumley Park Burn water body.

**Table 5-3: Assessment of works against the physico-chemical quality elements**

WFD Quality Element	Potential Impact	Consider in Impact Assessment?
Thermal conditions	The proposed works may release materials into the water body which will affect the physico-chemical quality elements. There is also potential for accidental pollution events to negatively impact these quality elements.	Yes
Oxygenation conditions		
Salinity		
Acidification status		
Nutrient conditions		
Specific pollutants: Pollution by all priority substances identified as being discharged into the body of water Pollution by other substances identified as being discharged in significant quantities into the body of water		

### 5.3 Impacts of works on protected sites

Table 5-4 presents an assessment of the proposed works against any protected sites.

**Table 5-4: Assessment of works on protected sites**

Name	Potential Impact	Consider in Impact Assessment?
River Wear Urban Waste Water Treatment Directive	The proposed works will not discharge waste water into the Wear from Croxdale Beck to Lumley Park Burn water body. Therefore, no impacts are anticipated.	No
NVZs: 238, 239 and 98	The proposed works do not fall within any of these NVZs; therefore, no impacts are anticipated.	No
Wear from Croxdale Beck to Lumley Park Burn DrWPA Wear Carboniferous Limestone and Coal Measures DrWPA	The proposed works are located within both of these DrWPAs. No impacts are anticipated as the removal of the permeable sands and gravels will not significantly change the pathway to these DRWPAs and therefore no impacts are anticipated (JBA, 2020a).	No

## 6 WFD Impact Assessment

### 6.1 Overview

The Scoping Assessment presented in Chapter 5 identified some receptors may potentially be at risk from the proposed works. An Impact Assessment is therefore required to describe how these identified impacts will be mitigated.

The Impact Assessment needs to consider if there is a pathway linking the pressure to the receptor. If there is no pathway there can be no impact on the receptor and there is no need for any further assessment of that receptor to be carried out. If there is a potential pathway the assessment should consider if the activity, and the pressure it creates, may cause deterioration of the receptor.

In order to effectively assess the potential impacts of the proposed works and decide upon suitable mitigation measures, a good understanding of the proposed scheme and design is required. Should any revisions be made to the proposed works that could impact any of the WFD Quality Elements, this section should be revised.

### 6.2 Impact Assessment

Table 6-1 discusses each of the receptors identified as being potentially at risk in the scoping assessment. Mitigation measures are recommended to mitigate the effects of the proposed works. It should be noted that these mitigation measures differ to the Mitigation Measures identified for any Heavily Modified water body.

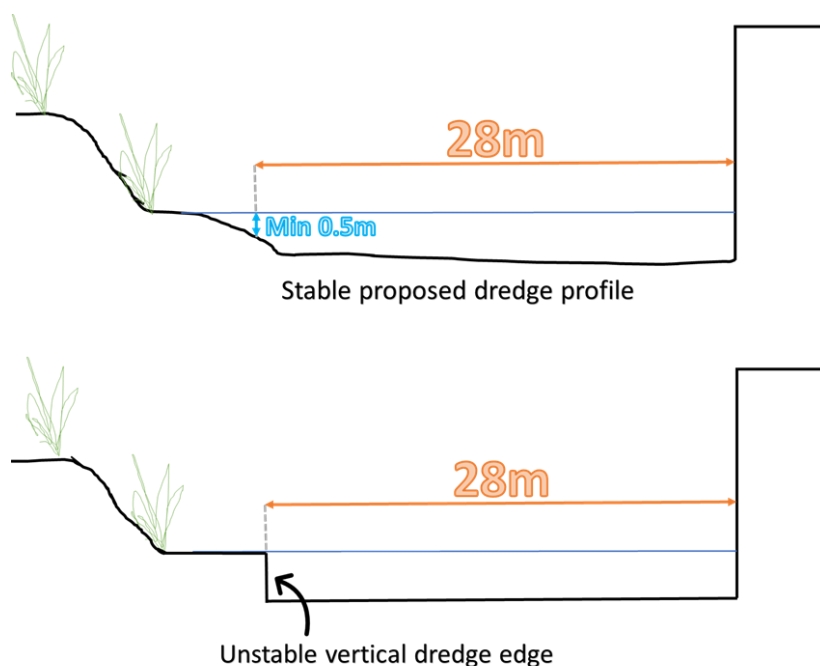
**Table 6-1: Impacts and mitigation measures**

WFD Quality Element	Pathway (direct / indirect/ none)	Potential impacts	Mitigation measures
Macrophytes and Phytobenthos Combined	Direct and Indirect	Macrophytes present on the river banks may be damaged/disturbed as the proposed work areas are accessed by plant. There will be minor losses to phytobenthos attached to sediments removed from the river, which will be taken for disposal.	Bankside movements should be minimised. The volume of materials removed from the site should also be minimised to reduced losses of phytobenthos and macrophytes attached to sediments.  A detailed dredge plan will be produced, and an Environmental Permit will be obtained from the Environment Agency.
Fish, Eels and Lamprey	Direct and Indirect	There will be a loss of habitat for juvenile fish species, which is provided in the depositional area adjacent to the DARC. There will be localised disturbance to fish species present during the works; however works will be programmed to take place in February or March to minimise these impacts.	To maintain a stable dredge profile, materials removed should create a gradual bank, whilst maintaining an overall width of approximately 28m with a minimum depth of 0.5m on the left bank (Figure 6-1).  The top layer of silt or mud if identified by the ECoW preconstruction survey will be marked using canes and should be redistributed

WFD Quality Element	Pathway (direct / indirect/ none)	Potential impacts	Mitigation measures
			<p>locally by pushing it underwater to ensure this habitat, which may contain ammocetes of lamprey species remains present within this reach.</p> <p>An Environmental Permit will be obtained from the Environment Agency.</p>
Invertebrates	Direct and Indirect	Sediment removal of the bar from the site will remove habitat for invertebrates and disturb these species. The redistribution of sediments may also cover habitat for these species; however this is likely to be similar impacts experienced as sediments are naturally moved in high flows.	<p>Sediments removed for disposal must be temporarily stored on the river bank prior to loading. This will allow any invertebrates present within the sediments to return to the river.</p> <p>An Environmental Permit will be obtained from the Environment Agency.</p>
Hydrology: Quantity and Dynamics of flow	Direct	Sediment present in the depositional areas will be removed from the site, which currently slows flows. Sediments will also be redistributed within the channel.	<p>A stable dredge profile must be maintained, which provides habitat for juvenile fish and also prevents excessive erosion of the left bank (Figure 6-1).</p> <p>The proposed works must include redistribution to encourage downstream transport and also minimise disruption to the sediment regime.</p>
Morphology: River width and depth	Direct	River depths will be altered as a result of sediment removal for disposal and redistribution.	<p>A stable dredge profile must be maintained, which provides habitat for juvenile fish and also prevents excessive erosion of the left bank (Figure 6-1).</p> <p>The proposed works must include in-channel redistribution of sediment to the thalweg areas encourage downstream transport and also minimise disruption to the sediment regime.</p>
River Continuity	Direct	The proposed works may prevent sediment which is in a state of temporary storage	The proposed works must include in-channel redistribution of sediment to the thalweg areas encourage



WFD Quality Element	Pathway (direct / indirect/ none)	Potential impacts	Mitigation measures
		from reaching downstream reaches.	downstream transport and also minimise disruption to the sediment regime.
Morphology: Structure and substrate of the river bed	Direct	The proposed works will alter the structure of the river bed as sediments will be removed for disposal and redistributed.	A stable dredge profile must be maintained, which provides habitat for juvenile fish and also prevents excessive erosion of the left bank (Figure 6-1).  The proposed works must include in-channel redistribution of sediment to the thalweg areas encourage downstream transport and also minimise disruption to the sediment regime.
Morphology: Structure of the riparian zone	Direct	The riparian zone may be damaged or disturbed as plant access the work areas. This is restricted to the true left bank and comprises predominantly amenity grassland.	Disturbance to riparian vegetation must be minimised wherever possible, utilising a single access track to gain water entry.  Opportunities to replace lost habitats, such as woody debris, will be sought in areas "off-site" such as Old Durham Beck and upstream areas working with the local Rivers Trust to identify suitable areas.



**Figure 6-1: Sketches of proposed dredge profile to maintain a stable bank and minimum depths for 28m width suitable for recreation**

### 6.3 Water body Mitigation Measures

There are mitigation measures contributing to better ecological potential for the water body identified in the EA's Catchment Planning System. The ability of the proposed works to deliver these mitigation measures, or the risk that the works could prevent their implementation, is considered further in Table 6-2. Note, only the measures considered within the scope of the proposed works have been considered.

**Table 6-2: Assessment of proposed works against the water body's mitigation measures**

Water body	Heavily modified water designated use	Impacts of the proposed works on mitigation measures
Wear from Croxdale Beck to Lumley Park Burn	Recreation Flood protection	The proposed activities are in channel and restricted to the main bar. They should not impact the proposals within the Water Body Level Action Measure for actions to address modification, improve fish passage or create new water dependent habitat (OM4) with adjacent land owners.

### 6.4 WFD Assessment Objectives

Following consideration of the potential impacts and recommended mitigation measures, as well as the appraised Mitigation Measures for the water body, Table 6-3 assesses whether the proposed works comply with the overarching objectives of the WFD.

**Table 6-3: Assessment of proposed works against WFD objectives**

WFD Assessment Objectives	Assessment of works
Objective 1: The proposed works do not cause deterioration in the Status of the Ecological Elements of the water body	The Wear from Croxdale Beck to Lumley Park Burn is assessed as having Moderate ecological potential. The proposed works should not deteriorate the current status as long as the mitigation measures described above are implemented. Implementation of the GMP has the potential to aid improvements to the biological element's potential as soft bank protection will enhance bank side biodiversity and reduce local sediment sources.
Objective 2: The proposed works do not compromise the ability of the water body to achieve its WFD status objectives	The Wear Carboniferous Limestone and Coal Measures groundwater body has one objective to achieve Good by 2027 for Chemical Dependent Surface Water Body Status. Practical technical constraints prevent implementation of the measure by an earlier deadline, but the proposed works will not compromise the achievement of this objective. The Wear from Croxdale Beck to Lumley Park Burn largely aims to maintain its current status with a few objectives to improve the statuses of the physico-chemical quality elements. Implementation of the mitigation measures described in Table 6-1 will ensure this can be achieved; however it is acknowledged that there are disproportionate burdens.
Objective 3: The proposed works do not cause a permanent exclusion or compromised achievement of the WFD objectives in other bodies of water within the same RBD	The impacts of the proposed works are localised to this reach and will remain within the Northumbria RBD as long as the mitigation measures are followed. The proposed activities are unlikely to comprise achievement of WFD objectives set for this water body for others within the same RBD. The proposals will not impact opportunities to achieve actions set to address issues relating to modification and fish passage.
Objective 4: The proposed works contribute to the delivery of the WFD objectives	There is limited potential for the proposed works to contribute to the delivery of the WFD objectives. Implementation of the mitigation measures will ensure the current statuses can be maintained. Implementation of the GMP, in particular the wider catchment requirements, has the potential to contribute to the delivery of the WFD objectives as this will reduce sediment supply to this reach and improve the physico-chemical quality elements. It is acknowledged

	<p>that there are disproportionate burdens. Durham Regatta will take on a coordination role to engage with other stakeholders along the River Wear to ensure this water body can achieve good ecological potential.</p>
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## 7 Discussion and Conclusions

### 7.1 Assessment Summary

#### 7.1.1 Biological Assessment

The Wear from Croxdale Beck to Lumley Park Burn has Moderate ecological potential, which may be negatively impacted by the proposed works through damage and disturbance to the Biological Quality Elements. Following the works, no further impacts are anticipated.

#### 7.1.2 Hydromorphological Assessment

The key impacts to the Hydromorphological Quality Elements include alterations to river flows, depths, the structure of the river bed and riparian zone as a result of the proposed works. The maintenance of a shelf (as wide as possible whilst permitting the 28m wide recreational channel) will help maintain some of these features which provide habitat for juvenile fish and prevent excessive erosion on the inner bend by the DARC. The redistribution of sediment within the river channel will maintain existing sediment continuity.

#### 7.1.3 Physico-Chemical Assessment

There is potential for the proposed works to directly impact the Wear from Croxdale Beck to Lumley Park Burn, through the removal and redistribution of sediments. Following the works, no further impacts are anticipated.

### 7.2 Scheme Recommendations/Key Considerations

The impact assessment determines whether the proposed works have the potential to significantly impact any of the quality elements screened into the assessment. Any mitigation measures that need to be considered to make the works compliant with the WFD are presented in Table 6-1; however the critical ones are listed below:

- A bespoke Environmental Permit will be obtained from the EA
- Bankside movements should be minimised
- A stable dredge profile must be maintained, which provides habitat for juvenile fish and also prevents excessive erosion of the left bank (Figure 6-1)
- The top layer of mud or silt must be locally redistributed within the channel to maintain this lamprey habitat
- Temporarily store sediments on the bank prior to removal off site to allow freshwater invertebrates to return to the river
- Lost habitats, such as woody debris, will be replaced outside the rowing course and also "off-site" with suitable locations to be agreed with the local Rivers Trust

Implementation of the GMP (JBA, 2010) will ensure that impacts to the Biological Quality Elements are avoided. The key aspects are highlighted below:

- The works will be undertaken in February or March to avoid impacts to fish
- Gravel/sediment redistribution into the thalweg to encourage downstream transport whilst minimising disruption to the sediment regime
- Gravel/sediment removal from site may require repeated removal as deposits build up following floods and its essential the the GMP "little and often" approach is implemented
- Pollution Prevention Guidance should be followed



### 7.3 Conclusions

The Wear from Croxdale Beck to Lumley Park Burn has an overall classification of moderate, whilst the Wear Carboniferous Limestone and Coal Measures is assessed as poor. This WFD assessment and supporting reports have developed appropriate mitigation measures, which will ensure that no significant negative impacts result from the proposed removal and redistribution of sediments adjacent to the DARC. These must be adhered to as well as the guidance in the GMP to ensure the proposed works will be compliant with the WFD objectives.

## References

EA (2015) Part 1: Northumbria river basin district River basin management plan. Available online at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/718333/Northumbria\\_RBD\\_Part\\_1\\_river\\_basin\\_management\\_plan.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718333/Northumbria_RBD_Part_1_river_basin_management_plan.pdf) [Accessed: 07/05/2020]

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JBA (2010) River Wear: Sustainable Gravel Management Plan.

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