South Bank WFD Compliance Assessment

Final Report

October 2021

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This report describes work commissioned by James Brown, on behalf of Faithful and Gould, by an email dated 27 May 2021. Alice Gent, Jennine Evans and Laura Hodgkinson of JBA Consulting carried out this work.

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Purpose

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Executive summary

Requirement for WFD assessment

The Water Environment (Water Framework Directive (WFD) (England and Wales) Regulations 2017 impose legal requirements to protect and improve the water environment. The regulations set objectives for all surface and ground waters to enable them to achieve Good Status (or Good Ecological Potential for Heavily Modified and Artificial Water Bodies).

The planning application for the outline proposal of development at the South Bank site was submitted in July 2020 and the Environment Agency (EA) noted in their consultation response letter (dated 29 October 2020) that they had no objection in principle to the development but proposed six conditions. One of these conditions was the requirement for submission of a high level WFD assessment (to be followed by a detailed WFD assessment when further details of the development were confirmed).

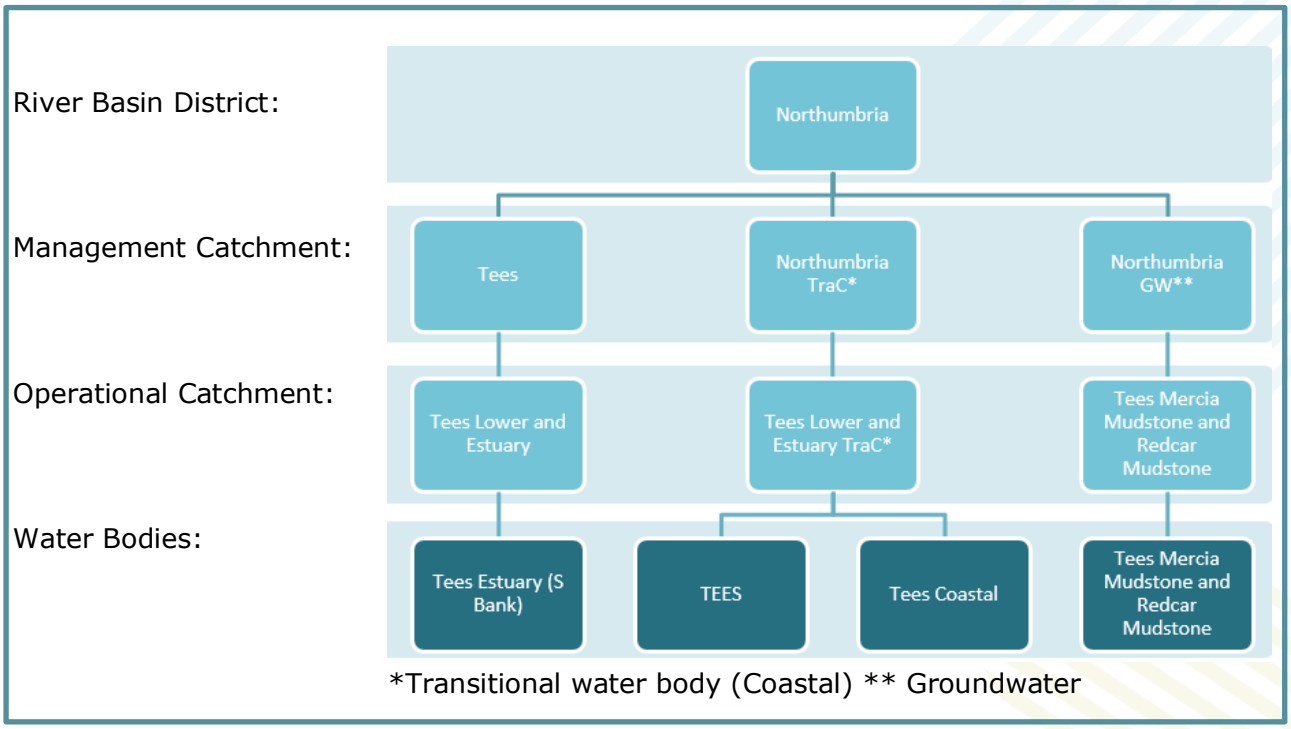
Scope of WFD assessment

This report is a high level WFD assessment and has been prepared for the purpose of meeting the condition of planning from the EA. As the assessment is based on the concept design, it will also provide the opportunity to guide the design process as it develops, in order to ensure compliance and steer the project to avoid impacts and reduce the need for costly mitigation or compensation measures.

WFD assessment process

This WFD assessment has three stages: screening, scoping and impact assessment.

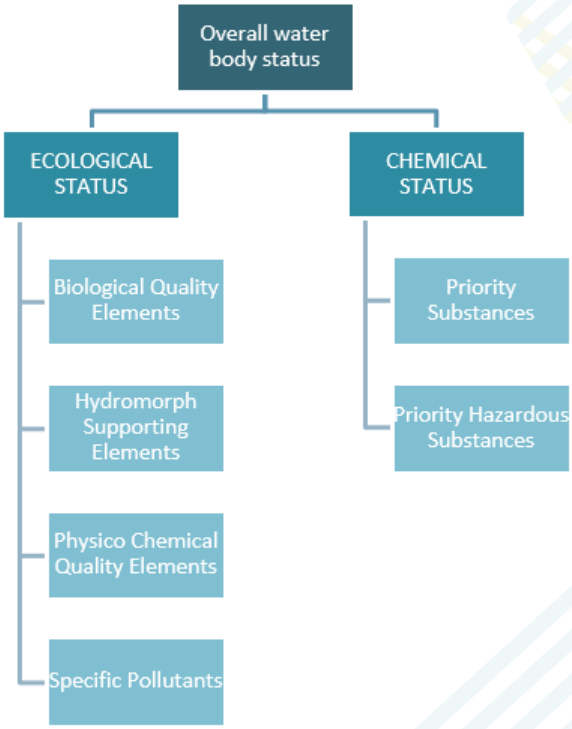
Screening:- to determine which WFD water bodies could be potentially affected by the works. The site of works is located within the 'Tees Lower and Estuary' operational catchment within the Northumbria River Basin District (RBD). The site itself is not located within a river water body catchment (it is a non reportable site) but it is in close proximity to the following waterbodies in dark blue in the figure below:



*Transitional water body (Coastal) ** Groundwater

The screening conclusion was for the Tees Transitional water body to be scoped in as well as the site location. Whilst the site and non main water courses that run through the site (the Holme Beck, Cleveland and Lackenby Channels) do not fall into a WFD water body, they are located within the Northumbria River Basin District which has overall objectives for WFD statuses of water bodies.

Scoping – to determine the effects that the proposed works could have on the ecological and chemical elements that determine the water body status. These elements are shown in the diagram to the right.



Impact assessment – to describe how any identified impacts from the proposed scheme will / could be mitigated to avoid or minimise impacts on the WFD status of the water bodies and to conclude whether the works meet the WFD objectives.

For the TEES Transitional water body there could be a local scale temporary impact on ecological and chemical elements. Long term localised impacts at the outfall of the Holme Beck could contribute to cumulative impacts of physical modifications and compound the morphological status of the Tees transitional waterbody and thus designs should be sympathetic to the waterbody***.*** An open channel will therefore be an opportunity to bring betterment to the current system and positively contribute to the morphological status and delivery of WFD objectives.

For the site itself, since it is not located in a WFD water body, the proposals have been assessed against the Northumbrian River Basin District high levels strategic objectives, as WFD applies to all water bodies. The objectives in the Northumbrian River Basin District include alleviating key pressures identified as preventing the attainment of good ecological status/potential in the basin and are relevant to water bodies on the development site. Appropriately designed open channels, in contrast to culverted channels, have the potential to contribute to the delivery of these objectives.

Conclusions and next steps

The current conditions of the South Bank site comprise of a number of constraints including utilities, hazardous leachate and ground conditions as well as culverted water bodies. The current proposed outlines for water management and drainage at the site aim to provide the best practical way forward for the site design in working within these constraints whilst also providing betterment to the current water bodies in terms of ecology, hydromorphology and water quality/chemistry to support WFD objectives and measures outlined in the Northumbria River Basin Management Plan.

Since the South Bank site is located outwith a WFD waterbody we have assessed the condition against the Northumbria RBMP objectives however, discussion and engagement with the Environment Agency will be required to confirm the way forward for the detailed WFD assessment and the meeting of the planning conditions.

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1 Introduction

1.1 WFD Overview

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 impose legal requirements to protect and improve the water environment.

The planning application for the outline proposal of development at the South Bank site within the wider Teesworks site, was submitted in July 2020 and the Environment Agency (EA) noted in their consultation response letter (dated 29 October 2020) that they had no objection in principle to the development but proposed six conditions.

One of these conditions was the requirement for submission of a high level WFD assessment (to be followed by a detailed WFD assessment when further details of the development were confirmed).

1.1.1 Scope of the WFD Assessment

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 were consolidated and replaced with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The Water Environment Regulations require 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 Potential1.

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1 Environment Agency (2010) Assessing new modifications for compliance with WFD: detailed supplementary guidance: 488_10_SD01

For each water body, three different status objectives are identified within the River Basin Management Plan (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 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 Faithful and Gould to undertake a WFD assessment for the proposed development on the South Bank site which is part of the wider Teesworks site. It has been prepared for the purpose of meeting the condition of planning from the EA. As the assessment is based on the concept design, it will also provide the opportunity to guide the design process as it develops, in order to ensure compliance and steer the project to avoid impacts and reduce the need for costly mitigation or compensation measures.

This WFD assessment aims to determine the effects of the proposed development 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 within the 'Tees Lower and Estuary' operational catchment within the Northumbria River Basin District (RBD). The site itself is not located within a river water body catchment (it is a non-reportable site) but it is in close proximity to the following waterbodies: Tees Estuary (S Bank) - river[2], TEES - transitional water body[3], Tees Coastal – coastal water[4], Tees Mercia Mudstone and Redcar Mudstone – groundwater body[5].

A map of the WFD water bodies is provided in Section 4.2. The Environmental Objectives, together with the specific actions (mitigation measures) necessary to enable to water body to meet these objectives, are set out in the Northumbria River Basin Management Plan (RBMP) (Environment Agency 2009) with details about the water bodies provided in the online Catchment Data Explorer (EA, 2019). The diagram below shows the four water bodies that will be considered within this report

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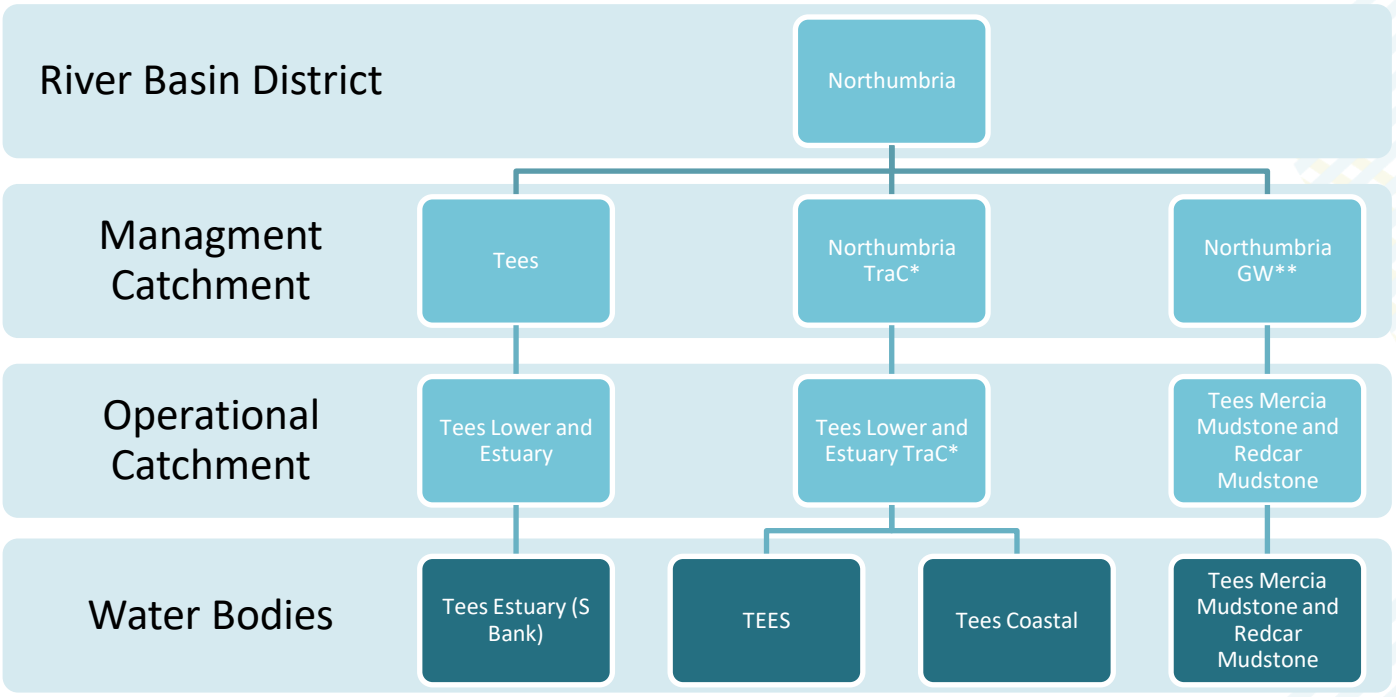
2 Tees Estuary (S Bank) - Catchment Data Explorer http://environment.data.gov.uk/catchment-planning/WaterBody/GB103025072320

3 TEES - Catchment Data Explorer http://environment.data.gov.uk/catchment-planning/WaterBody/GB510302509900

4 Tees Coastal - Catchment Data Explorer https://environment.data.gov.uk/catchment-planning/WaterBody/GB650301500005

5 Tees Mercia Mudstone and Redcar Mudstone – Catchment Data Explorer https://environment.data.gov.uk/catchment-planfning/WaterBody/GB40302G701300

as well as the area of the site which, although doesn't fall within a WFD water body, is within the RBMP district:



*Transitional water body (Coastal) ** Groundwater

Figure 1-1: WFD water bodies relevant to this study

2 Assessment Methodology

2.1 Overview

The following flow chart summarises the WFD Assessment process.

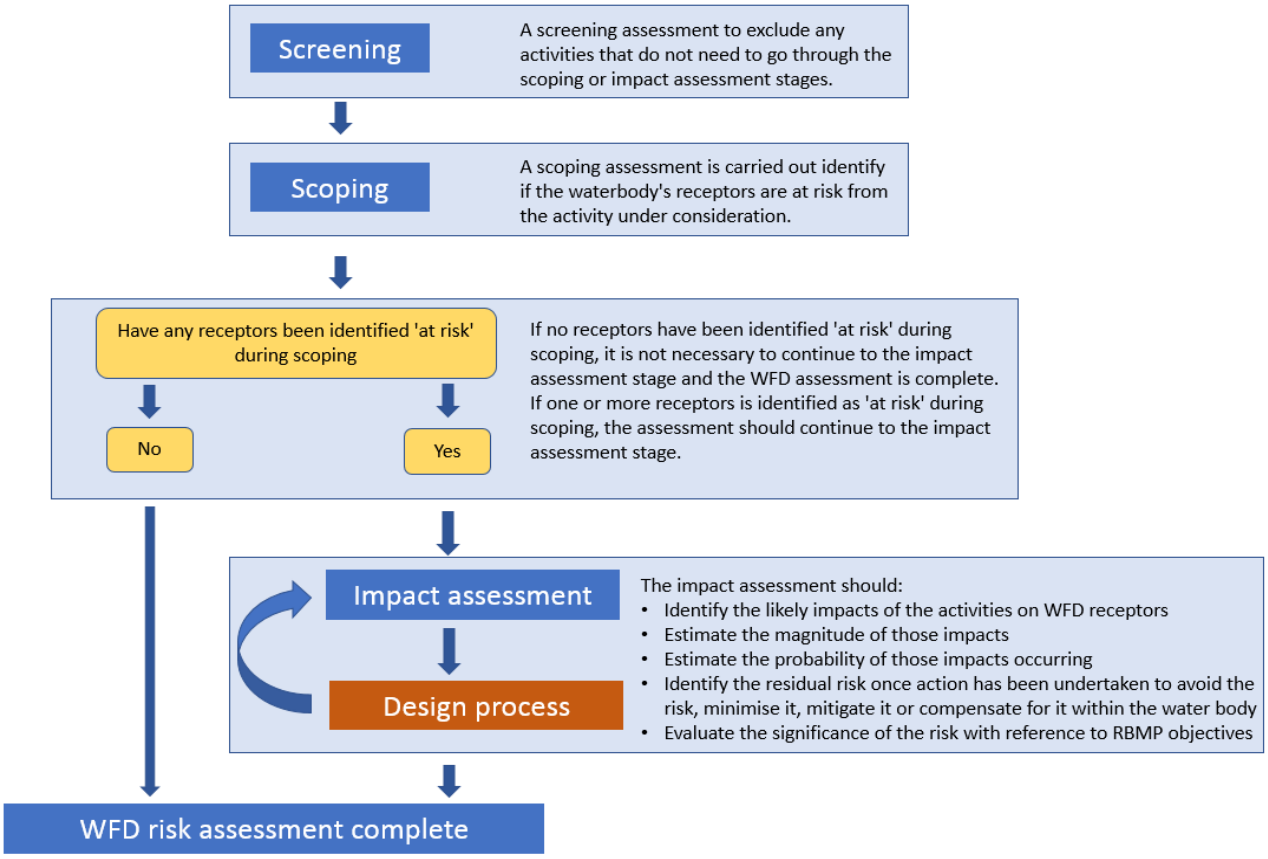


Figure 2-1: WFD assessment process flow chart

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 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 this source.

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 the proposed 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 struct environmental and sustainability criteria.

3 Project Description

3.1 Project Overview

The site is located in the Teesworks area and is part of the South Industrial Zone 1 (SIZ1). The site is 174ha (1,740,000m^2) in size and comprises brownfield land on the banks of River Tees estuary, 5km to the west of Redcar (Figure 3-1). The site area excludes four areas within the outer boundary, which relate to industries /businesses still present. The 1m Lidar DTM shows the elevations at the site are mostly between 6-12 mAOD. There is a large, raised area in the centre of the site, to the east of the unnamed channel, which rises to 27 mAOD.

The current conditions of the South Bank site comprise of a number of constraints including utilities, hazardous leachate and contaminated ground conditions as well as culverted water bodies. The current proposed outlines for water management and drainage at the site aim to provide the best practical way forward for the site design in working within these constraints whilst also providing betterment to the current water bodies.

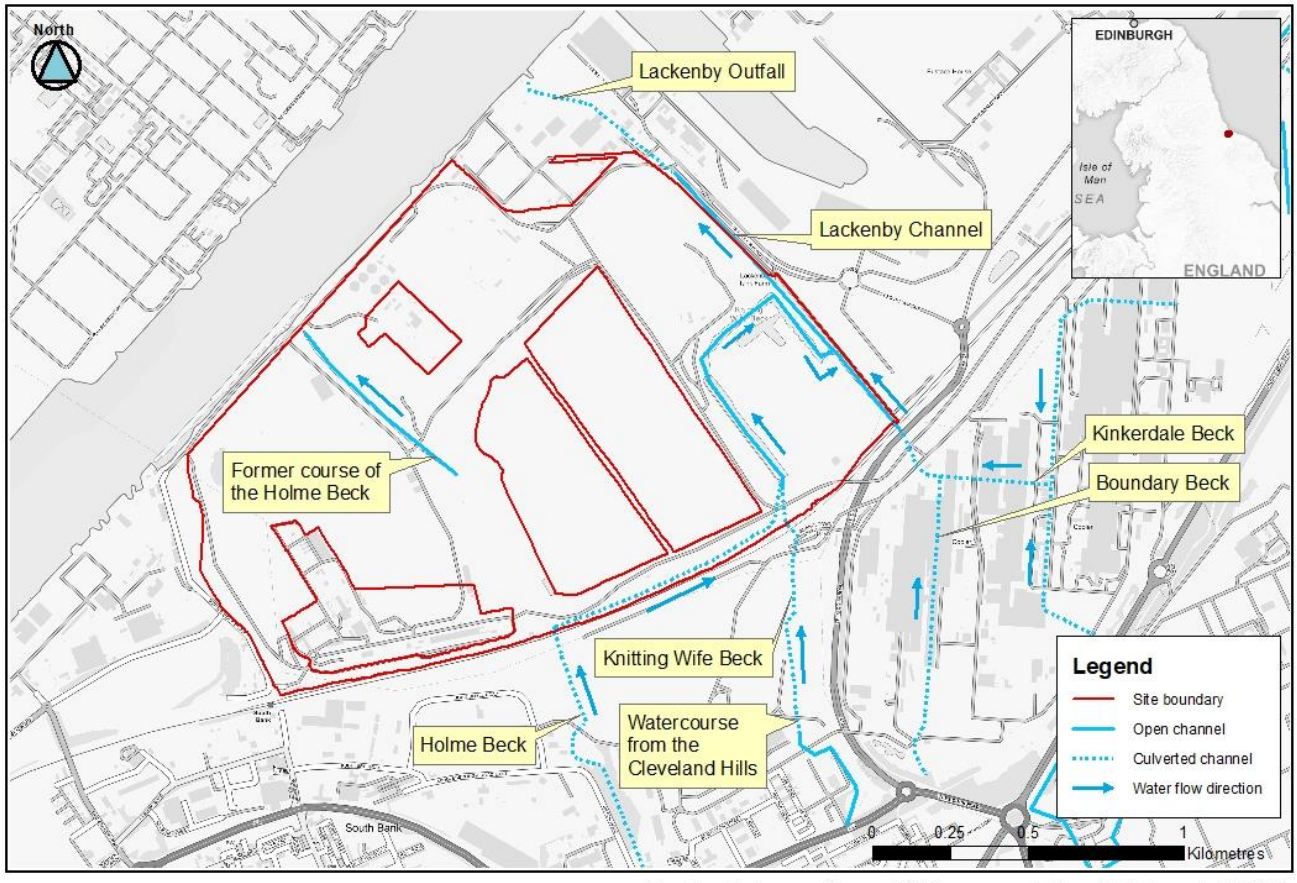


Figure 3-1: Site boundary and watercourses through and surrounding the site

The site lies within the catchment of the River Tees that lies adjacent to the northern boundary of the site. Parts of the site are within sub-catchments of the River Tees:

- The Lackenby channel (that incorporates the Cleveland channel)

- The unnamed channel that was historically part of the Holme Beck watercourse

The Lackenby Channel, which flows along the eastern boundary of the development zone, receives flow from Boundary Beck and Kinkerdale culverts as well as the Cleveland channel. The Cleveland channel is a large open channel which receives flows from the Holme Beck and Knitting Wife Beck culverts at the southern boundary of the development parcel. Flows in the Cleveland Channel are conveyed to Lackenby Channel around an area associated with iron and steel production recycling.

The Cleveland Channel is artificial and was created in order to drain the land at that part of the site as part of the materials recycling process. The banks of the channel are relics of a crane pad and are formed with sheet piling. There are weirs within the channel designed to trap sediments and the bed (and surrounding land) is heavily contaminated from the historical industrial land use.

In the Lackenby Channel downstream of the confluence with the Cleveland channel there is an in-channel structure assumed to act as a tidal weir. Beyond the weir the Lackenby channel is a deep large open channel that drains to a culvert of unknown dimension which conveys flows below Teesport to an outfall on the River Tees.

The hydrological catchment of the Lackenby Channel, down to NZ 54600 22950, has an area of approximately 8.3km^2. The catchment drains from the south-east to the north-west. It rises on Eston Moor to the south east of the site at elevations of 240mAOD and drains north west, declining to an elevation of approximately 50 mAOD at the site. The FARL value of 0.844 for the catchment indicates there is capacity for water storage within the catchment, this includes the reservoirs either side of the A174 and the wide open Cleveland Channel that runs parallel to the Lackenby Channel within the development site.

The catchment (that is unnamed on the Flood Estimation Handbook (FEH) website) at the downstream extent of the former course of the Holme Beck, at NZ 53400 22500 has an area of approximately 4.9km2. At present, the Holme Beck is culverted and flows are directed to the Cleveland channel. The unnamed channel is adjacent to the Lackenby Channel catchment and, like the Lackenby channel, also originates on Eston Moor and is highly urban.

The site is located within the tidal range of the River Tees, with the tidal limit defined by the Tees Barrage at Stockton, located approximately 8.5 km to the west, upstream of the site. The section of the Tees adjacent to the site has a width of approximately 350 m. The tidal water level in the Tees has been monitored at the Tees Dock gauging station 200m northeast of the site. The levels observed are between approximately -2.6 and 3.15 mAOD (with the 'normal level' in average weather conditions being -2.3 and 2.89 mAOD). As this reach of the Tees is tidal the water level fluctuates on a roughly 12-hour cycle. The gauge has been operational since January 1992 and has Environment Agency Station ID 8372.

3.2 Proposed works

The current proposals at South Bank from Teesworks (02/06/21) are outlined in Figure 3-2 and are as follows:

3.2.1 Holme Beck

- Holme Beck will be realigned, removing 540 m of the culverted channel along the southern boundary of the South Bank site and will be replaced by approximately 1.8 km of channel. This will comprise ~1.6 km of open channel

divided into four reaches by three box culverts (for access across the site) totalling approximately 200m.

- The open channel corridor will consist of a concrete U shaped channel with naturalised invert. A wider section of open channel will be located above the U shaped channel to form a 'two stage' channel that will contain high flood flows. Depending on the land take available for the channel and utilities services, the upper part of the two stage channel may be formed by a grass slope (where the channel corridor would be approximately ~25-30m in width) or a gabion retaining wall (where the channel corridor would be approximately ~10-15m in width).
- The channel will convey the waterbody around proposed building at NZ 54282 22622. The final ~250 m of the open channel down to the outfall to the Tees, is proposed to be an intertidal channel to dissipate velocities in the channel down to $1m^3/s$ and provide habitat.
- The outfall of Holme Beck into the Tees is to be realigned from NZ 53367 22457, towards the Lackenby outfall, 0.7 km north west at NZ 53884 23035.

3.2.2 Knittingwife Beck

- The Knittingwife Beck channel is currently culverted and is conveyed under the railway to the Cleveland Channel but is to be realigned and conveyed in an open channel (the same design as described above for the Holme Beck channel) outwith the South Bank site and along the southern side of the railway, where it will join with the Holme Beck and conveyed under the railway line at NZ 54172 21495 and into the South Bank site.

3.2.3 Cleveland Channel

- The Cleveland channel will be infilled and disconnected from the Lackenby channel. The Holme Beck and Knittingwife Beck which previously flowed into the Cleveland channel will be realigned as described above.

3.2.4 Lackenby Channel

The Lackenby channel will remain in the same location and convey flows from the Boundary Beck and Kinkerdale Beck (but not flows from the Knittingwife and Holme Becks due to the realignment noted above). There are proposals to improve and remediate the site from NZ 55330 22202 to NZ 54925 22654 as the watercourse and bank materials are heavily contaminated in this area and as noted above the Cleveland Channel is artificial and formed from sheet piling.

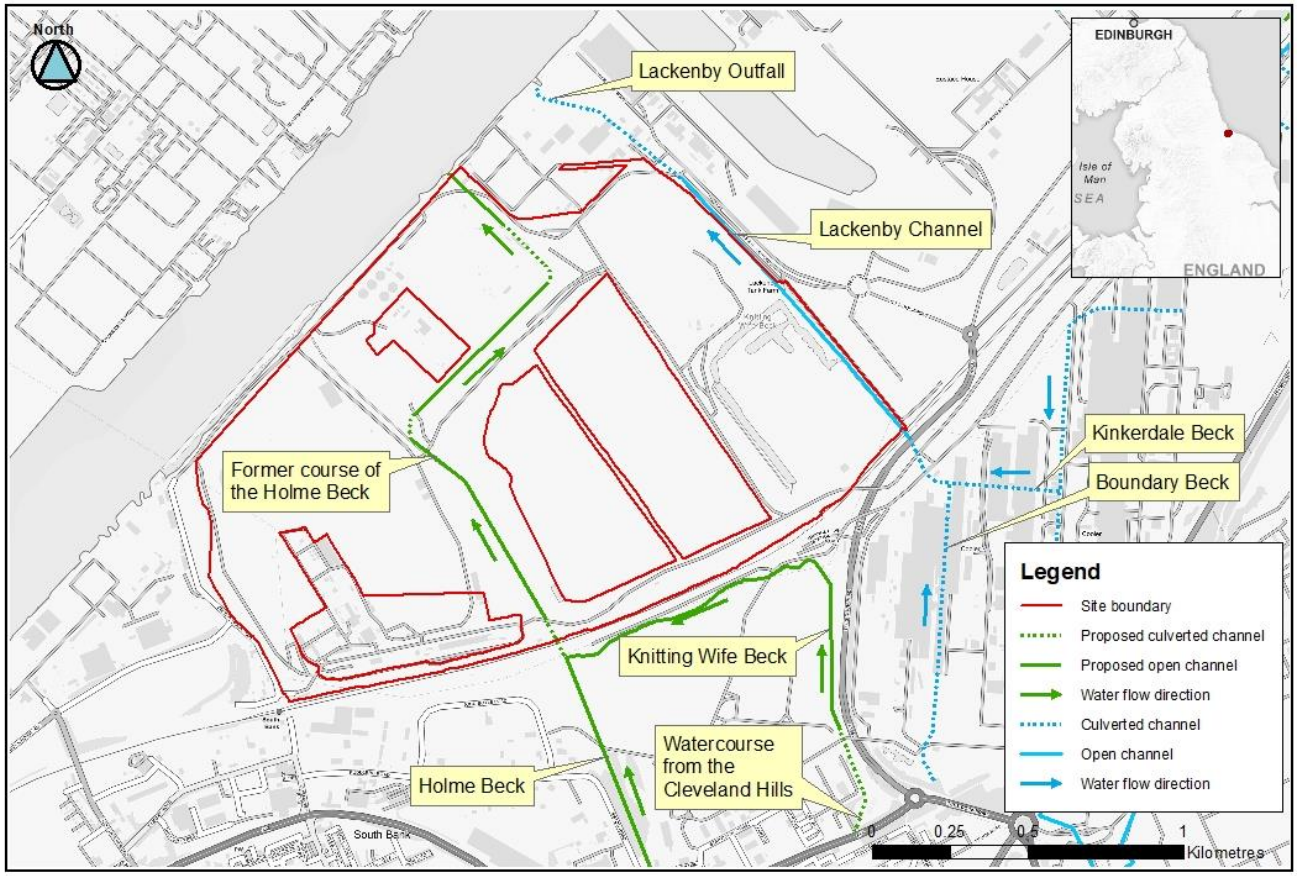


Figure 3-2: Proposals for watercourses on site

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. Catchments above a threshold of 10km2 can be designated as a WFD waterbody. Smaller catchments below this threshold are termed non-reportable waterbodies. The site is located in an area outwith a WFD waterbody but is located 0.02km south east of the TEES Transitional water body, 1km south west of the Tees Estuary (S Bank) water body and 5km south west of Tees Coastal water body. The site is underlain by the Mercia Mudstone and Redcar Mudstone groundwater body. The site lies within the 'Tees Lower and Estuary' operational catchment within the Northumbria River Basin District (RBD)

The results of the assessment are presented below. A full and detailed WFD assessment will 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 body details and status

4.2.1 WFD water bodies

The following water bodies are considered within this screening assessment and shown in the map below:

- Tees Estuary (S Bank) - river
- TEES - transitional water body
- Tees Coastal – coastal water
- Tees Mercia Mudstone and Redcar Mudstone – groundwater body
- Area of the site not within a river WFD water body

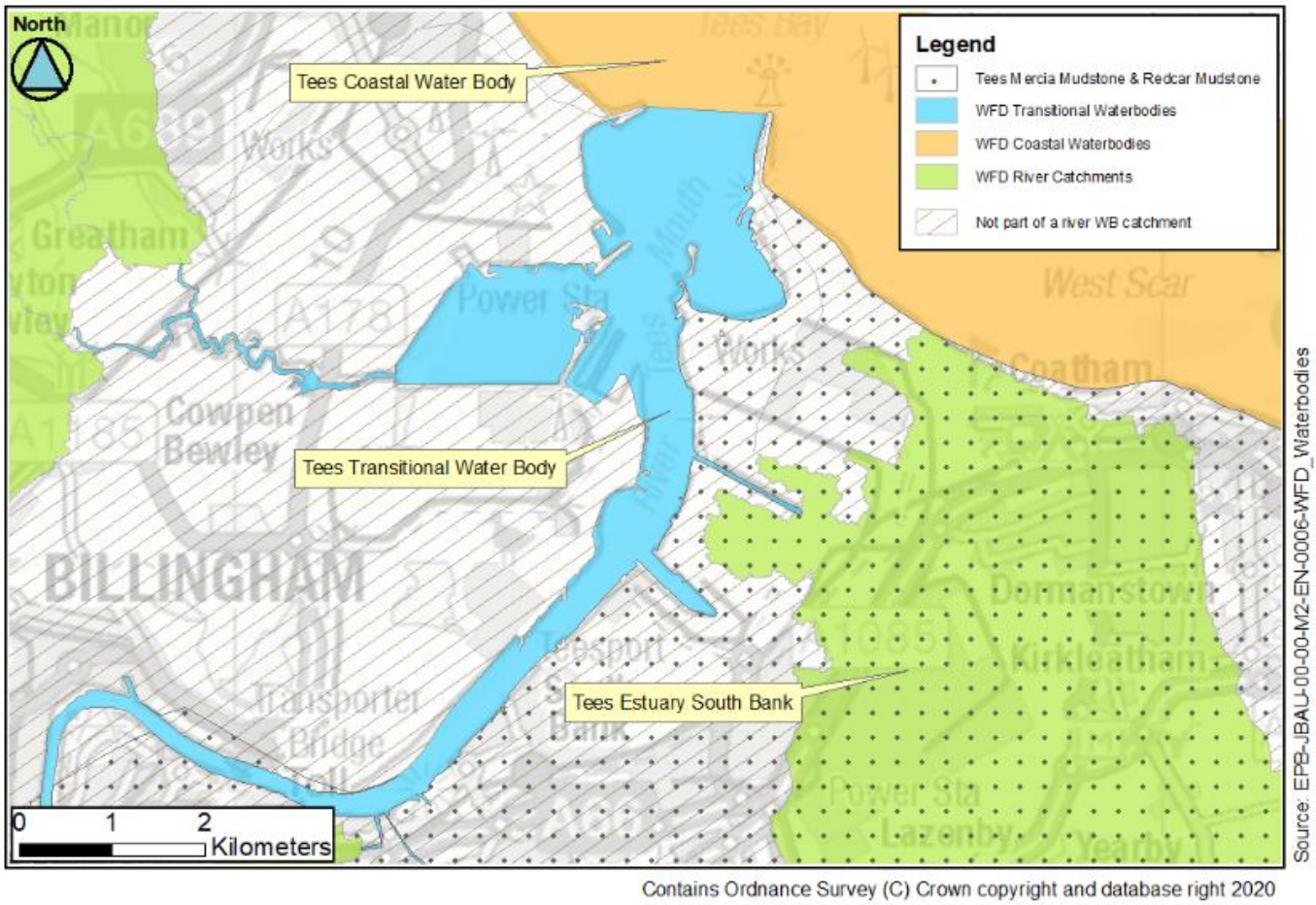


Figure 4-1: WFD water bodies to be assessed

4.2.2 Current status

Details of the most recent 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	Overall Status Objective
GB103025072320	Tees Estuary (S Bank)	Heavily modified	Moderate	Good by 2027
GB510302509900	TEES	Heavily modified	Moderate	Moderate 2015
GB650301500005	Tees Coastal	Heavily modified	Moderate	Good by 2027
GB40302G701300	Tees Mercia Mudstone and Redcar Mudstone	N/A	Poor	Good by 2027

The key pressures which the EA have identified to be responsible for the statuses above for the four water bodies are as follows:

Table 4-2: Current Reasons for not achieving good status (RNAGS)

Water body	Reasons for not achieving good status
Tees Estuary (S Bank)	This waterbody is not achieving good status due to modifications in the catchment. It is deemed at risk of deteriorating due to urbanisation and development by industry and transportation.
TEES Transitional	Urbanisation and physical modification from industry is a key RNAG causing coastal squeeze. Modifications in the catchment for flood protection, ports, harbours and recreation are reducing available habitat and space for water. These are impacting angiosperms, mitigation measures assessment and macroalgae. Additionally, industrial discharge, sewage and contaminated waterbody bed sediments are impacting on water quality. These are impacting tributyltin compounds, dissolved inorganic nitrogen, macroalgae and invertebrates. Diffuse source pollution from poor nutrient management in agriculture and rural land management is also listed and impacting dissolved inorganic nitrogen and macroalgae.
Tees Coastal	Physical modification for multiple uses is a key RNAG for this waterbody. Listed physical modifications are coast and flood protection use; navigation, ports and harbours. These are impacting the mitigation measures assessment.
Tees Mercia Mudstone and Redcar Mudstone	Point source pollution from abandoned mine. The Catchment Data Explorer notes that this water body has a chemical dependent surface water body status

4.3 Screening Outcome: water bodies

The following Table 4-3 indicates which water bodies have been screened in or out of the assessment and the reasons for this decision.

Table 4-3: Screening Outcome: water bodies

Water body	Reason	Screening outcome
Tees Estuary (S Bank)	The Tees Estuary (S Bank) is not connected to the development site. The hydrological catchments of the Holme Beck and the Knittingwife Beck that currently drain to the Cleveland and then Lackenby channel are located outside the Tees Estuary S Bank WFD catchment. The Boundary Beck and the Kinkerdale Beck are within the Tees Estuary S Bank and drain to the Lackenby channel but post-development the Holme Beck and Knitting Wife Beck won't be connected to the Lackenby Channel. Thus post development there won't be a connection between the proposed works and the Tees Estuary (S Bank) water body.	Screened out.
TEES Transitional	The surface waterbodies within the red line boundary are connected to the Tees Estuary. The proposed development includes a new outfall for the	Screened in.

	combined flows from the Holme Beck and Knittingwife Beck.	
Tees Coastal	The surface waterbodies within the red line boundary are 5 km away from Tees coastal water body and therefore unlikely to impact this waterbody.	Screened out.
Tees Mercia Mudstone and Redcar Mudstone	As discussed in the introduction (Section 1), this report assesses the impacts of the proposed works on the Ecological Status and Chemical Status of surface water bodies. The potential for the works to impact the connectivity between surface water and groundwater bodies will be assessed in the hydromorphological quality elements of the WFD scoping and assessment but a full groundwater body WFD assessment is outwith the scope of this report.	Screened out.
Area of the site not within a river WFD water body	The site is not located within a river WFD water body according to the EA Catchment Data Explorer (and as shown in Figure 4-1). However, the WFD stipulates that ecological protection should apply to all waters so it is required that the environment is protected to a high level in its entirety.	Screened in

4.4 Baseline Status of screened-in water bodies

For the water body screened into the assessment, details on the status of each element, as described by EA Catchment Data Explorer, are given below. The flow chart in Figure 4-2 describes the process for the assessment.

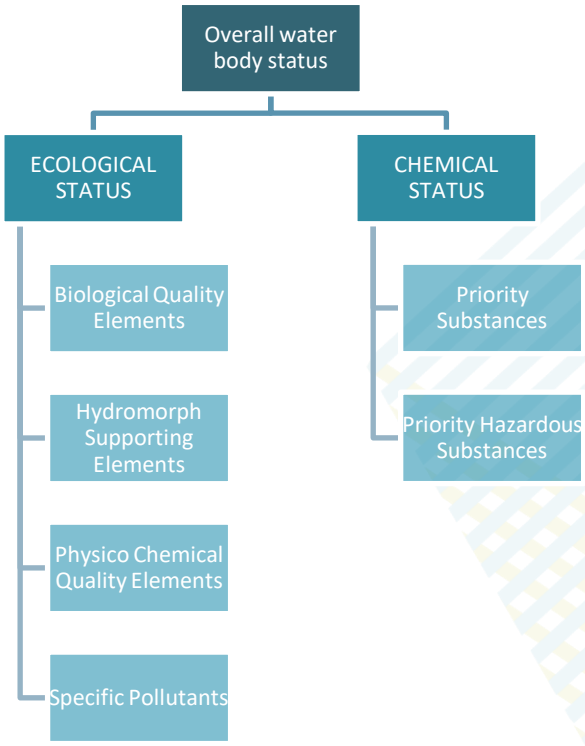


Figure 4-2: Baseline Status of screened-in water bodies flow chart

4.4.1 WFD water body status – TEES transitional

The current ecological status is Moderate and the current chemical status is Fail. The tables below describe the elements for the ecological status and chemical status according to the most recent data collected in 2019.

4.4.1.1 Ecological Status

Details on the ecological status of each element, as described by EA Catchment Data Explorer, are given below in

Table 4-4.

Table 4-4: Ecological status

Biological	Current Status (2019)
Overall biological status	Bad
Angiosperms	Moderate
Chironomids	No assessment of this element is available on the Environment Agency Catchment Data Explorer website
Fish	Moderate
Invertebrates	Good
Littoral invertebrates	No assessment of this element is available on the Environment Agency Catchment Data Explorer website
Macroalgae	Moderate
Phytoplankton blooms	Good

Hydromorphological Quality Element	Current Status (2019)
Overall hydromorphological status	Supports Good
Hydrological Regime	Supports Good
Morphology	No assessment of this element is available on the Environment Agency Catchment Data Explorer website

Physico-Chemical Quality Element	Current Status (2019)
Overall physico-chemical status	No assessment of these elements is available on the Environment Agency Catchment Data Explorer website
Acid Neutralising Capacity	
Ammonia	
BOD	
Dissolved Inorganic Nitrogen	Moderate
Dissolved Oxygen	High
pH	No assessment of these elements is available on the Environment Agency Catchment Data Explorer website
Phosphate	
Temperature	

Total Phosphorus	

Specific Pollutants	Current Status (2019)
2,4- Dichlorophenol	High
2,4- Dichlorophenoxyacetic acid	High
2,4- Dichloroaniline	High
Arsenic	Not assessed
Benzyl butyl phthalate	Not assessed
Carbendazim	Not assessed
Chlorine	Not assessed
Chlorothalonil	High
Chromium (III)	Not assessed
Chromium (VI)	High
Copper	High
Cyanide	Not assessed
Diazinon	High
Dimethoate	High
Glyphosate	Not assessed
Iron	High
Linuron	High
Manganese	Not assessed
Mecoprop	High
Methlocarb	Not assessed
Pendimethalin	High
Permethrin	High
Phenol	High
Tetrachloroethane	Not assessed
Toluene	High
Triclosan	High
Zinc	High
Un-ionised ammonia	Not assessed

4.4.1.2 Chemical Status

Priority Hazardous Substances	Current Status (2019)
Priority substances overall status	Fail
1,2-dichloroethane	Good
Atrazine	Good
Benzene	Good
Alachlor	Good
Chlorpyrifos	Good
Cypermethrin (Priority hazardous)	Fail
Octylphenol	Good
Dichlorvos (Priority)	Good
Aclonifen	Good
Bifenox	Good
Chlorfenvinphos	Good
Cybutryne (Irgarol®)	Good
Terbutryn	Good
Dichloromethane	Good
Diuron	Good
Fluoranthene	Good
Isoproturon	Good
Lead and Its Compounds	Good
Napthalene	Good
Nickel and Its Compounds	Good
Pentachlorophenol	Good
Simazine	Good
Trichlorobenzenes	Good
Trichloromethane	Good

Other pollutants	Current status (2019)
Other Pollutants overall status	Good
Aldrin, Dieldrin, Endrin & Isodrin	Good
Carbon Tetrachloride	Good
DDT Total	Good
para - para DDT	Good
Tetrachloroethylene	Good
Trichloroethylene	Good

Priority Hazardous Substances	Current status (2019
Overall status priority hazardous substances	Fail
Anthracene	Good
Polybrominated diphenyl ethers (PBDE)	Fail
Perfluorooctane sulphonate (PFOS)	Not assessed
Benzo (b) and (k) fluoranthene	Not assessed
Benzo (ghi) perelyene and indeno (123-cd) pyrene	Good
Benzo(a)pyrene	Good
Cadmium and Its Compounds	Good
Dioxins and dioxin-like compounds	Good
Benzo(b)fluoranthene	Fail
Benzo(g-h-i)perylene	Good
Benzo(k)fluoranthene	Good
Heptachlor and cis-Heptachlor epoxide	Good
Hexabromocyclododecane (HBCDD)	Good
Quinoxyfen	Good
Di(2-ethylhexyl)phthalate (Priority hazardous)	Good
Endosulfan	Good
Hexachlorobenzene	Good
Hexachlorobutadiene	Good
Hexachlorocyclohexane	Good
Mercury and Its Compounds	Fail
Nonylphenol	Good
Pentachlorobenzene	Good
Tributyltin Compounds	Fail
Trifluralin (Priority hazardous)	Good

N.B. There are additional chemicals which can be assessed to inform the chemical status but they have not been assessed for this water body.

4.5 Protected Areas

The Water Environment Regulations recognises protected areas lying (wholly or partly) within the district, which includes drinking water protected areas (DrWPAs), shellfish waters and an "area or body of water for the time being designated or otherwise identified as requiring special protection under any EU instrument providing for the protection of surface water and groundwater or for the conservation of habitats or species directly depending on water, or any enactment implementing such an EU instrument, including, in particular—

(i)areas designated for the protection of economically significant aquatic species (including shellfish water protected areas);

(ii)bodies of water designated as recreational waters;

(iii)nutrient-sensitive areas;

(iv)areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in the protection of the habitats or species."

The Tees Transitional water body is designated as part of the Teesmouth and Cleveland Coast Site of Special Scientific Interest (SSSI). The SSSI is designated for its nationally important geology and mosaic of coastal and freshwater habitats, which support a diverse assemblage of birds, invertebrates associated with sand dunes and breeding harbour seals *Phoca vitulina*. Areas of habitat adjacent to the estuary and along the coast are also designated as part of the Teesmouth and Cleveland Coast Special Protection Area (SPA) and Ramsar site due to the important water bird assemblages that these sites are able to support.

4.5.1 Drinking Water Groundwater Safeguard Zones (SgZ)

DrWPAs are designated under the Water Environment Regulations, 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 catchment areas that influence water quality for their respective DrWPAs, where actions will be targeted to address the causes of DrWPA objective failure/risk of failure. Development is not within or connected to a SgZ.

4.6 Summary

To conclude the Screening Assessment, the following quality elements need to be considered further within the Scoping Assessment:

- TEES transitional water body
  - Biological Elements – development has the potential to affect the biological elements of the waterbody which are at moderate potential.
  - Hydromorphological Elements – currently supports good however could be impacted by change of outfalls and the development on the estuary edge.
  - Physico-chemical Elements and pollutants – During construction, consideration is required to ensure that there is no impact on the physico-chemical and pollutants from the contaminated land or any construction materials and fuels. Consideration can be made in a Construction Environmental Management Plan (CEMP).
- Area of the site not within a river WFD water body
  - Biological Elements
  - Hydromorphological Elements
  - Physico-chemical Elements and pollutants
- Protected Areas – Teesmouth and Cleveland Coast SSSI, SPA and Ramsar

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 Appendix. The proposed development works are being appraised in terms of their impact on WFD status and objectives.

Some WFD Quality Elements have not been formally assessed as part of the classification for this water body. However, due to the scale and nature of the proposed works, all WFD Quality Elements have been included in the previous screening and any identified impacts have been considered in relation to the ecological status of the water body and the status objectives.

5.2 TEES transitional water body

5.2.1 Biological Quality Assessment

Table 5-1 presents an assessment of the proposed works against the biological quality elements, based on the findings and conclusions within the ecology assessment which forms an appendix to this report.

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

WFD Quality Element	Current Status 2019	Potential Impact	Consider in impact assessment?
Invertebrates	Good	The proposed development involves the deculverting and realignment of Holme Beck into an open channel with small sections of culvert to convey access, with discharge of flows from the Holme Beck and Knittingwife Beck into a new outfall to the Tees. The Cleveland channel will be infilled. Any discharge from construction has the potential to reach the Tees Estuary and negatively impact fish, invertebrates, phytoplankton and other aquatic flora through accidental pollution events (sediment release, fuel leaks etc.). Discharged materials which reach the waterbody may be deposited, covering fish gravels or smother benthic invertebrate habitat. Undertaking the realignment and disconnection works may block or affect the watercourse flow through existing channels and therefore could impact upon fish passage. During the operational phase, the design for the discharge of the Holme Beck outfall to the Tees via the proposed open channel corridor	Yes
Fish (and fish barrier)	Moderate		
Other aquatic flora (macroalgae, angiosperms)	Angiosperms were moderate Macroalgae were good		
Phytoplankton	Good		

WFD Quality Element	Current Status 2019	Potential Impact	Consider in impact assessment?
		with area for intertidal habitat and the replacement of the culverted Holme Beck with an open channel, could bring improvements to the water body condition and a connection between the Tees and the Holme Beck for species. In addition the separation of the channel from the contaminated land through the concrete channel banks and bed with naturalised invert would have a positive impact from the current condition where the watercourse is connected to the contaminated bed and banks of the Cleveland and Lackenby channels.	

5.2.2 Hydromorphological Quality Elements

Table 5-2 presents an assessment of the proposed works against the hydromorphological quality elements of the TEES transitional water body. The overall hydromorphological status is 'Supports Good'.

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

WFD Quality Element	Current Status 2019	Potential Impact	Consider in Impact Assessment?
Morphology	No assessment of this element is available on the Environment Agency Catchment Data Explorer website	The proposal includes a realignment of the Holme Beck and introducing an open channel to the currently culverted channel, with an outfall along the Tees estuary. This is likely to have a localised impact but not necessarily impact on the Tees itself. Details of the design for development along the estuary edge are not yet known so impacts directly to the Tees are unknown, but it is understood that the outfall will comprise a corridor with sinuous open channel with space for intertidal habitat creation. The sediment regime locally onsite will be currently impacted due to culverting and physical	Yes

		modification. This will be affecting the sediment erosional, depositional and transport processes. The sediment regime into the Tees is unlikely to be impacted during construction and operation phases. The proposed open channel and intertidal habitat at the outfall could positively impact the habitat and morphology of the Tees estuary, local to the outfall. Scour or morphological impacts should be considered in design of the new Holme Beck channel, conveying the Holme Beck and the Knittingwife Beck due to the combined flows that could have a local cumulative impact. The proposed open channel corridor at the outfall with the space for intertidal habitat, could attenuate flows. Some in-channel improvements have been proposed for the Lackenby channel however details are unknown at this point.	
Hydrological Regime	Supports Good	The volume of water will change in the watercourses on site. The Lackenby channel will have a lower volume of water as the Cleveland channel (conveying flows from the Holme Beck and Knittingwife Beck) will be disconnected. The proposed channel through the site conveying the Holme Beck will have an increased volume of water as the Knittingwife Beck will be connected to the Holme Beck. These changes will have a localised effect on the ordinary water courses on site but unlikely to have a significant impact on the Tees. The realignment of the outfall may have a localised effect on the Holme Beck and the Tees.	

		The ground surfaces of the proposed development are not confirmed but will likely largely comprise impermeable surfaces. This will increase runoff from these surfaces.	

5.2.3 Physico-Chemical Assessment

Table 5-3 presents an assessment of the proposed works against the biological quality elements of the TEES transitional water body.

Table 5-3: Assessment of works against the Physico-Chemical elements

WFD Quality Element	Current Status	Potential Impact	Consider in Impact Assessment?
Acid Neutralising Capacity	No assessment of these elements is available on the Environment Agency Catchment Data Explorer website	Currently there are no detailed designs or methodologies for works on site during construction. This scoping assessment is a high level assessment of the impacts to physico-chemical elements of the water body and a more detailed assessment will be required at a future date in a detailed WFD Assessment. Due to the levels of contamination on site and the activities will require the movement of contaminated material and realignment of the Cleveland channel, there is potential for significant impact on the water bodies on site during the construction phase, however the likely impact on the Tees is small. During the operational phase, the design for the new open channel is a concrete U shaped channel that will remove the pathway from the source of contaminated ground to the receptor of the watercourse. This would have a positive impact.	Yes
Ammonia		Activities to connect, disconnect and infill parts of the Cleveland channel could cause sediment disturbance and the release of ammonia or dissolved inorganic nitrogen (there may be other contaminants and nutrients in	
BOD			
Dissolved Inorganic Nitrogen	Moderate		

		sediment), affecting BOD. This impact is likely and activities will require assessment due to the low flow/dilution potential in the channel.	
Dissolved Oxygen	High	Realigning the Cleveland channel will reduce flows and could impact upon dissolved oxygen levels. Connecting the new channel online could cause sediment disturbance and temporarily reduce DO on site. May have a localised effect on the Tees during the construction phase.	
pH Phosphate Temperature Total Phosphorus	No assessment of these elements is available on the Environment Agency Catchment Data Explorer website	Realigning the Cleveland channel will reduce flows in the Lackenby channel and could impact upon these quality elements due to reduced dilution. Connecting the new channel online could cause sediment disturbance and temporarily affect these quality elements on site. Soil testing is advised to identify phosphate within the soil. When the water flow is connected to the new channel, there is likely to be an initial spike in phosphate levels. Monitoring these levels is recommended as these levels will adjust over time.	

5.2.4 Specific Pollutants

Table 5-4 presents an assessment of specific pollutants for the TEES Transitional water body.

Table 5-4: Assessment of works against the specific pollutants elements

WFD Quality Element	Current Status	Potential Impact	Consider in Impact Assessment?
Chlorothalonil	High	Realigning the Cleveland channel will reduce flows and could impact upon these quality elements. Connecting the new channel online could cause sediment disturbance and temporarily affect these quality elements on site and into the Tees estuary during the construction phase. Soil testing is recommended to identify specific pollutants in order to assess potential impacts. When the water flow is connected to the new channel, there is likely to be an initial spike in these pollutants. Monitoring of pollutants in the water before, during and post construction is recommended due to low flow in the channel. During the operation phase of the proposed development, the new open channel will prevent the connection between the contaminated ground and the water body and the specific pollutants within the new channel will adjust over time, thus having a positive impact.	Yes
Pendimethalin	High		
Triclosan	High		
Chromium (VI)	High		
2,4-dichlorophenol	High		
2,4-dichlorophenoxyacetic acid	High		
Arsenic	High		
Copper	High		
Diazinon	High		
Dimethoate	High		
Iron	High		
Linuron	High		
Mecoprop	High		
Permethrin	High		
Phenol	High		
Toluene	High		
Un-ionised ammonia	High		
Zinc	High		

5.2.5 Chemical

Table 5-5 presents an assessment of the proposed works against the chemical quality elements of the TEES transitional water body water body.

Table 5-5: Assessment of works against the chemical elements

WFD Quality Element	Current Status 2019	Potential Impact	Consider in Impact Assessment?
Priority substances	Fail	Realigning the Cleveland channel will reduce flows and could impact upon these quality elements. Connecting the new channel online could cause sediment disturbance and temporarily affect these quality elements on site	Yes
1,2-dichloroethane	Good		
Atrazine	Good		
Benzene	Good		
Alachlor	Good		

Chlorpyrifos	Good	and into the Tees estuary during the construction phase. Soil testing is recommended to identify chemicals to assess potential impacts. When the water flow is connected to the new channel, there is likely to be an initial spike in these pollutants. Monitoring of pollutants in the water before, during and after construction is recommended due to low flow in the channel. During the operation phase of the proposed development, the new open channel will prevent the connection between the contaminated ground and the water body and the specific pollutants within the new channel will adjust over time, thus having a positive impact.	
Cypermethrin (Priority hazardous)	Fail		
Octylphenol	Good		
Dichlorvos (Priority)	Good		
Aclonifen	Good		
Bifenox	Good		
Chlorfenvinphos	Good		
Cybutryne (Irgarol®)	Good		
Terbutryn	Good		
Dichloromethane	Good		
Diuron	Good		
Fluoranthene	Good		
Isoproturon	Good		
Lead and Its Compounds	Good		
Napthalene	Good		
Nickel and Its Compounds	Good		
Pentachlorophenol	Good		
Simazine	Good		
Trichlorobenzenes	Good		
Trichloromethane	Good		
Other Pollutants	Good		
Aldrin, Dieldrin, Endrin & Isodrin	Good		
Carbon Tetrachloride	Good		
DDT Total	Good		
para - para DDT	Good		
Tetrachloroethylene	Good		
Trichloroethylene	Good		
Priority hazardous substances	Fail		
Anthracene	Good		
Polybrominated diphenyl ethers (PBDE)	Fail		
Perfluorooctane sulphonate (PFOS)	Not assessed		
Benzo (b) and (k) fluoranthene	Not assessed		
Benzo (ghi) perelyene and indeno (123-cd) pyrene	Good		

Benzo(a)pyrene	Good		
Cadmium and Its Compounds	Good		
Dioxins and dioxin-like compounds	Good		
Benzo(b)fluoranthene	Fail		
Benzo(g-h-i)perylene	Good		
Benzo(k)fluoranthene	Good		
Heptachlor and cis-Heptachlor epoxide	Good		
Hexabromocyclododecane (HBCDD)	Good		
Quinoxyfen	Good		
Di(2-ethylhexyl)phthalate (Priority hazardous)	Good		
Endosulfan	Good		
Hexachlorobenzene	Good		
Hexachlorobutadiene	Good		
Hexachlorocyclohexane	Good		
Mercury and Its Compounds	Fail		
Nonylphenol	Good		
Pentachlorobenzene	Good		
Tributyltin Compounds	Fail		
Trifluralin (Priority hazardous)	Good		

5.3 Area not within a WFD water body

Whilst the site lies within an area not within a WFD water body (a non-reportable area), the proposed works will have an impact on the water bodies which are conveyed through the site. Therefore the WFD elements, combined with identified 'significant water management issues' of Northumbrian River Basin District (RBD), which are strategic high level objectives, are considered for the impact of the proposed development on the watercourses of the Holme Beck, Knittingwife Beck, Cleveland Channel and Lackenby channel:

5.3.1 Biological elements

Table 5-6 presents an assessment of the proposed works against the biological elements of the watercourses on site.

Table 5-6: Assessment of works on biological elements

WFD Quality Element	Potential Impact	Consider in impact assessment?
Invertebrates Fish (and fish barrier) Macrophytes and Phytobenthos	The proposed development involves the realignment and de culverting of Holme Beck and the infilling of the Cleveland channel. As detailed in the ecology site visit notes (Appendix A) the watercourses are highly turbid, choked with algal growth indicating poor water quality and it is known that the sediments and bank/ground conditions are contaminated. Whilst it is not anticipated that large stock of fish species would be present, there is potential to negatively impact fish, invertebrate, macrophyte and Phytobenthos populations during construction through accidental pollution events (sediment release, fuel leaks etc.) and local disturbance at channel infill points. Infilling of the existing Cleveland channel would modify passage of species present and damage any existing fish and invertebrate habitat. However the tidal gate on the Lackenby channel currently restricts movement and so daylighting the currently culverted Holme Beck and providing a connection to the Tees could have a positive impact for species. The new Holme Beck channel will predominantly be deculverted and an open channel established. It is understood that there will be three culverts within this section of open channel for site access and physical modifications to the watercourse will impact the sediment and flow regime locally on site. This may alter the natural flow levels, causing an excessive build-up of sediment in surface water bodies due to lower velocities at the locations of the culverts. The inability to transport any fine sediment away may result in increased sediment suspension, potentially resulting in reduced oxygen levels adversely impacting fish and invertebrate populations, albeit it is not anticipated that large stocks of fish species are	Yes

	present due to the poor quality of the channel. The improvement and remediation of Lackenby channel and the creation of 1.6km of open channel with naturalised invert within Holme Beck with a connection to the Tees offers the opportunity to improve the waterbody and habitat for invertebrate and fish population and also remove existing pollution pathways between the site and waterbodies. Therefore, the Holme Beck and Lackenby Channel could ultimately support a greater invertebrate and fish population than currently exists. This could improve the overall future biological quality of the waterbody.	

5.3.2 Hydromorphological elements

Table 5-7 presents an assessment of the proposed works against the hydromorphological elements of the watercourses on site .

Table 5-7: Assessment of works on Hydromorphological elements

WFD Quality Element	Potential Impact	Consider in impact assessment?
Hydrological Regime	The proposed development involves the realignment and culverting of Holme Beck and the infilling of the Cleveland channel. There is potential to negatively impact the hydrological regime through the reduction in flow in the Lackenby channel, since the flows from the Holme Beck and Knittingwife Beck will now be conveyed down the new open channel for the Holme Beck. Some in-channel improvements have been proposed for the Lackenby channel to reduce pollution pathways, however details are unknown at this point. The Northumbrian RBD has highlighted physical modifications to be of significant concern in the catchment as these modifications alter natural flow levels, cause excessive build up of sediment in surface water bodies, and result in the loss of habitats. In many cases the uses and associated physical modifications need to be maintained. In these circumstances it may not be possible to achieve good ecological status. Sections of the new Holme Beck channel will need to be culverted to provide access to the site, however, the majority of the Holme Beck at the site will be deculverted, reducing the physical modifications and thus having a positive impact on current conditions. Changes to flow through climate change mean that the impact of physical structures may become exacerbated as climate change research shows that by 2050 England can expect significant seasonal variations, with higher winter	Yes

	and lower summer flows, and a reduction in flow overall[6]. Therefore, there is a need to implement measures that are flexible or increase resilience to extreme weather events and future warming.	
Morphology	The proposed development involves the realignment and daylighting of the majority of the Holme Beck at the site and the infilling of the Cleveland channel. There is potential to negatively impact the morphology of the water bodies on site through the culverted section. However, the daylighting of other sections will have an overall improvement to the conditions in those reaches since the Holme Beck is currently fully culverted. The proposed watercourse realignment and culverting could cause a deterioration compared to current conditions if not completed with sufficient mitigation such as ensuring enough space for water and other geomorphic restoration techniques such as those found in the River Restoration Centres 'Manual of River Restoration Techniques' (https://www.therrc.co.uk/guidance). Currently 1.6 km of open channel will have an added 0.3 km length. The Cleveland channel is currently open with significant reedbed habitat and highly biodiverse banks on the surface, in a wide valley but narrow stream/thalweg which has potential for natural recovery. Although uniform in shape, the banks are currently terraced and actively slumping. The Cleveland Channel is artificial (created for historic industry) and the banks formed from sheet piling and sediments contaminated from the pollutin pathway that exists from contaminated ground. There is space for flood waters and habitat and scope to improve flow diversity and channel morphology. The sediment regime locally onsite will be impacted by the realignment and physical modification during the construction phase. During the operational phase the culverts within the open channel of the Holme Beck will affect the sediment erosional, depositional and transport reaches as well as riparian habitat. However, the majority of the Holme Beck will be deculverted which will have a positive impact.	Yes

6 Northumbria_RBD_Part_1_river_basin_management_plan.pdf (publishing.service.gov.uk)

Accessed 23/06/21

5.3.3 Physico-Chemical

Table 5-8 presents an assessment of the proposed works against the physico-chemical elements of the watercourses on site .

Table 5-8: Assessment of works on Physico-Chemical elements

WFD Quality Element	Potential Impact	Consider in impact assessment?
Physico-chemical	Although there is not a baseline for the site available, there is a general baseline for the Northumbrian RBD in which pollution from towns, cities and transport is identified as a key constraint to obtaining good ecological potential. This specifies that pollutants from rainwater washing through polluted surfaces or misconnections are causing a deterioration and these pollutants can impact on thermal conditions, dissolved oxygen, salinity, acidification and nutrient levels. Culverting can exacerbate the effect of pollution from towns, cities and transport as outfalls are hidden from general view, requiring specialist equipment to monitor and maintain culverts to ensure that discharges are clean.	Yes

5.3.4 Specific pollutants

Table 5-9 presents an assessment of the proposed works against the specific pollutants elements of the watercourses on site .

Table 5-9: Assessment of works on specific pollutants elements

WFD Quality Element	Potential Impact	Consider in impact assessment?
Specific pollutants	The site is currently a COMAH site and heavily contaminated by historic industrial chemicals and there is potential for mine water pollution. Mine water pollution and contamination by dissolved metals such as iron, lead, copper, zinc or cadmium is a key concern identified in the Northumbrian RBD. In addition, impacts from the leaching of metals due to ore crushing and settlement lagoons can be of concern because the resulting spoil heaps are often large and close to water. Pollution pathways without mitigation could have a negative impact.	Yes

5.4 Protected Sites

Table 5-10 presents an assessment of the proposed works against any protected sites identified in or near to the works.

Table 5-10: Assessment of works on protected sites

Name	Potential Impact	Consider in Impact Assessment?
Teesmouth and Cleveland Coast Ramsar, SSSI & SPA	The protected sites are located adjacent to the site boundary. Any discharges into the Tees Estuary have the potential to impacts upon the designated sites, causing pollution effects that could adversely impact the coastal habitats and associated bird assemblages.	Yes

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.

The Tees transitional water body will be assessed as well as the area of the site not within a river WFD water body but which lies within the Northumbria RBMP district.

6.2 Impact Assessment – TEES transitional water body

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 Impact/ Mitigation measures
Fish	Direct and indirect	Infilling the Cleveland channel will reduce flows into the Lackenby Channel and could impact upon dissolved oxygen (DO) levels. Additionally, connecting the new open channel (conveying the Holme Beck and Knittingwife Beck) online could cause sediment disturbance and temporarily reduce DO on site adversely impacting fish populations. However, current water quality is likely poor and the channel is highly turbid and choked with algal growth. It is not anticipated large stocks of fish species would be present (Appendix A). There is potential to cause physical harm to fish during in channel works on site. However, the likely impact on the Tees is small. Undertaking the realignment and disconnection works may block or affect the watercourse flow through existing channels and therefore could impact upon fish passage to the Tees waterbody. Mitigation measures: During construction works, fish passage will be considered during the design process to ensure the works do not present a barrier to fish movement. Fish passage should be maintained throughout the works, but details of this would be dependent on ecology surveys to

WFD Quality Element	Pathway (direct / indirect/ none)	Potential Impact/ Mitigation measures
		establish the species present. Standard industry practices such as pollution prevention measures and appropriate silt management should be in place to enable works to take place without the risk of polluting the water body. Machinery checks should be undertaken to ensure any plant used is in good working condition.
Benthic Invertebrate fauna	Direct and indirect	There is a potential to disturb and harm invertebrates during the construction works. Adverse impacts to benthic invertebrates could be caused by increases in suspended sediment, reduced DO levels, mortality and through accidental pollution events. The permanent works could impact invertebrate communities as installation of culverts will lead to a permanent change in the composition of the watercourse, altering the environment for benthic invertebrate species. However, this is likely to have a localised impact but not necessarily impact on the Tees transitional waterbody itself. Mitigation measures: standard industry practices such as pollution prevention measures and appropriate silt containment should be implemented to enable works to take place without the risk of polluting the water body.
Other aquatic flora (macroalgae, angiosperms, sea grass, seaweed salt marsh)	Direct and indirect	Details for development along the estuary edge have not been supplied so impacts directly to the Tees is unknown. Adverse impacts on aquatic flora may occur whilst gaining access along the estuary edge realignment works. The impacts may result from suspended sediment causing increases in nutrients that are subsequently absorbed by the plants, disturbance from displacement of substrate, clearing of aquatic vegetation during backfilling and accidental pollution events. The ecology site survey to inform this WFD (Appendix A) identified Invasive Non-Native species (INNS) on site- stands of Japanese Rose were seen on right bank of Lackenby Beck. Several INNS species within 2km of the site have been identified from ERICNE, including New Zealand Pigmyweed. Appropriate control of this species will be required throughout the works Mitigation measures: standard industry practices such as pollution prevention and silt containment measures will be in place to enable works to take place without the risk of polluting the water body or causing excess silt mobilisation. Machinery checks should be undertaken to ensure any plant used is in good working condition. The Check-clean-dry approach to biosecurity will be required throughout

WFD Quality Element	Pathway (direct / indirect/ none)	Potential Impact/ Mitigation measures
		the works [http://www.nonnativespecies.org/downloadDocument.cfm?id=608 [site accessed:23/06/2021].
Phytoplankton	Direct and indirect	Details for development along the estuary edge are not available at this time as the design is being developed, so impacts directly to the Tees is unknown. Activities to disconnect the Cleveland channel from the Lackenby channel and realign the Holme Beck original outfall may result in temporary sediment suspension in the water body, potentially resulting in localised increases in nutrients suspended in the water column. The increase in nutrients could alter phytoplankton communities or result in phytoplankton blooms. Accidental pollution events when working in a highly contaminated area could also alter the water chemistry and adversely impact upon phytoplankton numbers. This is likely to have a localised impact but not necessarily impact on the Tees itself. Mitigation measures: standard industry practices such as pollution prevention and silt containment measures will be in place to enable works to take place without the risk of polluting the water body or causing excess silt mobilisation. Additional care will be necessary when construction on a heavily contaminated COMAH site to ensure contaminated land material does not enter any water bodies.
Hydromorphology quality elements	Direct and indirect	Details for development along the estuary edge are not available at this time as the design is being developed , so impacts directly to the Tees is unknown. The proposal includes a realignment of the Holme Beck outfall along the Tees estuary which is likely to have a localised impact but not necessarily impact on the Tees itself. The volume of water will change in the watercourses on site. Lackenby channel will have a lower volume of water as the Cleveland channel will be disconnected and infilled (and the flows from the Holme Beck and Knittingwife Beck will be conveyed down the new Holme Beck channel), therefore less flow will be discharged from the Lackenby outfall into the Tees. This should be a neutral impact as the overall flows to the Tees are not anticipated to change. The Holme Beck will have an increased volume of water as the Knitting Wife Beck will be connected to the Holme Beck. These changes will have a localised effect on the ordinary water courses on site but unlikely to have a significant impact on the Tees. However there will be increased flow discharged from the Holme Beck outfall into the Tees at this

WFD Quality Element	Pathway (direct / indirect/ none)	Potential Impact/ Mitigation measures
		location, albeit not overall. The realignment of the outfall may have a localised effect on the Holme Beck and the Tees. See below in morphology for mitigation recommendations.
Morphology: River width and depth	Direct and indirect	The sediment regime into the Tees is unlikely to be impacted. The outfall realignment could affect the habitat and morphology of the Tees estuary, local to the outfall. Scour or morphological impacts should be considered in design as there will be increased flow from the new Holme Beck outfall, causing a cumulative effect impact as the outfll from the Lackenby channel will remain. Some in-channel improvements have been proposed for the Lackenby channel however details are unknown at this point. Mitigation measures: High level recommendations are to inform design with best practice guidelines for outfalls and headwalls to be sympathetic to the water body. Additionally, design principles from Estuary Edges (https://www.estuaryedges.co.uk/design-principles/) can be incorporated to mitigate against impacts caused by physical modification and enhance the estuary edge.
Physico-chem		There is potential during any development from accidental spillage of construction materials. This site requires extra vigilance due to constructing on a COMAH site. Therefore additional care will be necessary to ensure contaminated land material does not enter any water bodies causing impacts to oxygenation conditions, salinity, acidification status and nutrient conditions. Mitigation measures: Any activity where pollution, spills, river realignment or regrading of land has potential to cause material to enter the watercourse, these should be assessed for potential impacts. The source, pathway, receptor system should be assessed to disconnect the source of pollution away from the pathway and receptor by installing boundaries. Additionally any over pumping should consider impacts to water temperature, dissolved oxygen and kept free from contamination. These potential impacts should be considered and managed via a CEMP.
Specific pollutants		Currently there are no details available for works on site during construction. This scoping assessment is a high level assessment of the impacts to specific pollutants elements of the water body and a more detailed assessment will be

WFD Quality Element	Pathway (direct / indirect/ none)	Potential Impact/ Mitigation measures
		required at a future date. There is potential during any development from accidental spillage of construction materials however, constructing on a COMAH site, additional care will be necessary to ensure contaminated land material does not enter any water bodies. Mitigation measures: Any activity where pollution, spills, river realignment or regrading of land has potential to cause material to enter the watercourse, these should be assessed for potential impacts. Soil and water testing would be advised to generate baseline data and targeted at these priority substances to be able to determine risk of potential impact. These potential impacts should be considered and managed via a CEMP
Chemicals		Currently there are no details for works on site during construction. This scoping assessment is a high level assessment of the impacts to specific pollutants elements of the water body and a more detailed assessment will be required at a future date. There is potential during any development from accidental spillage of construction materials however, constructing on a COMAH site, additional care will be necessary to ensure contaminated land material does not enter any water bodies. Mitigation measures: Any activity where pollution, spills, river realignment or regrading of land has potential to cause material to enter the watercourse, these should be assessed for potential impacts. Soil and water testing would be advised to generate baseline data and targeted at these priority substances to be able to determine risk of potential impact. These potential impacts should be considered and managed via a CEMP.

6.2.1 TEES water body Mitigation Measures

There is one mitigation measure contributing to better ecological potential for the water body identified in the Catchment Data Explorer and presented in Table 6-2. The ability of the proposed works to deliver this mitigation measure, or the risk that the works could prevent its implementation, is considered further in the table below.

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

Mitigation Measure	Current Status	Assessment of proposed works/ Recommended action
Tees Id 481289 flood protection use; physical modification.	Ongoing	Proposals which reinforce banks or add physical modifications will compound and impact on the physical modification elements of the Tees water body. The use of methods to soften the edge or improve the ecology of the estuary as per best practice guidelines from https://www.estuaryedges.co.uk/design-principles/ could provide mitigation without impacting on the use of the estuary as a port/harbour or flood protection.

6.2.2 WFD Assessment Objectives for TEES Transitional water body

Following consideration of the potential impacts and recommended mitigation measures, as well as the appraised Mitigation Measure 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	There could be a local scale temporary impact on the ecological and chemical elements of the Tees transitional waterbody. A CEMP is recommended during the construction which will mitigate these impacts. Long term localised impacts at the outfall could contribute to cumulative effects on the estuary and designs for outfalls should be sympathetic to the water body and not cause scour or other adverse impacts.
Objective 2: The proposed works do not compromise the ability of the water body to achieve its WFD status objectives	Cumulative impacts of the physical modifications can compound the morphological status of the Tees estuary and prevent Good Ecological Potential. Mitigation exists to improve the estuary edge without compromising on the use for ports/harbours and flood defences https://www.estuaryedges.co.uk/design-principles/
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	N/A
Objective 4: The proposed works contribute to the delivery of the WFD objectives	No, there is insufficient detail to suggest that the works will contribute to the WFD objectives of the Tees.

6.3 Impact Assessment – Area not within a WFD water body

Table 6-4 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. Whilst the water bodies conveyed through the site do not form a WFD water body, consideration is made of the potential adverse or beneficial impacts which may result from the proposed development.

Table 6-4: Impacts and mitigation measures

WFD Quality Element	Pathway (direct / indirect/ none)	Potential Impact/ Mitigation measures
Morphology	Direct	The proposed development involves the realignment and deculverting of a part of the Holme Beck and the infilling of the Cleveland channel and there is potential to negatively impact the morphology of the water bodies on site. The length of the Holme Beck will increase by 0.3km and 1.6km of the new channel will be open channel, having a positive impact compared to the currently culverted channel. It has been proposed to culvert ~200 m via three culverts to enable site access. Culverts are a financial and maintenance liability for land owners as they: · hide outfalls from view making pollution incidents and misconnections more harmful due to time taken to identify location · make identifying issues and maintaining in the culvert more expensive as they require specialist equipment, health and safety considerations and specialist training to enter or maintain them · are a high risk asset for collapse and would never be allowed to be developed upon · would have to be sized correctly to ensure flood risk is not increased and are resilient to climate change. The watercourse does not have to be considered only for habitat and should be seen as an asset that can provide multiple benefits to the site such as drainage by implementing SUDS. This can be achieved by opening up as much watercourse as possible rather than culverting and thus the design for an open watercourse for large sections of the new Holme Beck channel will have positive impacts. The proposed watercourse realignment could be a deterioration compared to current conditions if not adequately mitigated for. The Cleveland channel is currently open with significant reedbed with a wide valley but narrow stream which has good potential. Although uniform in shape the banks are currently terraced, actively slumping, and with space for flood waters. There is scope to improve flow diversity and channel morphology with economically affordable installations of large woody debris (LWD). The banks currently support biodiverse riparian vegetation. However, the Cleveland Channel is artificial – created for historic industry processes and formed from sheet piles and site ground material which is contaminated and the pollution pathway which exists from the slumping banks and bed conditions, is currently a negative impact on the water quality and biological condition. The infilling of this artificial channel would have a negative impact on the current morphology and there could also be an adverse impact

WFD Quality Element	Pathway (direct / indirect/ none)	Potential Impact/ Mitigation measures
		during construction from the mobilisation and transportation of the underlying sediment throughout the reach if it contains hazardous substances. Establishing the open channel of the Holme Beck with the proposed intertidal corridor at the outfall to the Tees, will restore estuary connectivity and thus be a positive impact. To ensure optimum functioning of the proposed channel, creating variation in the bank slopes (where space allows), will help diversify channel morphology by allowing different parts of the bank to be wetted during different flow conditions. Further geomorphic restoration techniques can be found in the River Restoration Centres 'Manual of River Restoration Techniques' (https://www.therrc.co.uk/guidance). The sediment regime locally onsite will be impacted during construction of the new channel and during operation at the location of the three culverts on the new Holme Beck channel that will locally affect the sediment erosional, depositional and transport processes at these locations.
Hydromorphology	Direct	The volume of water will change in the watercourses on site. The Lackenby channel will have a lower volume of water as the flow from the Holme Beck and Knittingwife Beck via the Cleveland channel will be disconnected. The Holme Beck will have an increased volume of water as the Knitting Wife Beck will be connected to the Holme Beck. These changes will have a localised effect on the ordinary water courses on site. The realignment of the outfall may have a localised effect on the Holme Beck and the Tees. Due to closer proximity and changes in flows, changes in sediment deposition and scour local to the outfall need to be considered during the design. Some in-channel improvements have been proposed for the Lackenby channel however the design team are awaiting hydraulic results to determine opportunities and constraints on site. Therefore details are unknown at this point for improvements to the Lackenby Channel. The Northumbrian RBD has highlighted physical modifications to be of significant concern in the catchment as these modifications alter natural flow levels, cause excessive build-up of sediment in surface water bodies and the loss of habitats. In many cases the uses and associated physical modifications need to be maintained. In these circumstances it may not be possible to achieve good ecological potential. Changes to flow through climate change mean that the impact of physical structures may become exacerbated as climate change research shows that by 2050 England can expect significant seasonal variations, with higher winter and lower summer flows, and a reduction in flow overall. Therefore there is a need to implement measures that are flexible or increase resilience to extreme weather events and

WFD Quality Element	Pathway (direct / indirect/ none)	Potential Impact/ Mitigation measures
		future warming. Mitigation: By increasing the bank roughness with riparian vegetation and space for water retention, the habitat will be more resilient to climate change. In addition the proposed intertidal corridor at the outfall of the Holme Beck to the Tees is proposed to attenuate flows and indirectly address local scour.
Physico-Chem	Direct and indirect	Although there is not a baseline for the site available, there is an assessment for the Northumbrian RBD in which pollution from towns, cities and transport is identified as a key constraint to obtaining good ecological potential. This specifies that pollutants from rainwater washing through polluted surfaces or misconnections are causing a deterioration. Culverting can exacerbate the effect of pollution from towns, cities and transport as outfalls are hidden from general view, requiring specialist equipment to monitor and maintain culverts to ensure that discharges are clean. Options such as keeping the water bodies open and easily viewable, encouraging the reedbeds which provide a cleansing benefits and incorporating SUDS can mitigate for the physico-chemical elements.
Specific Pollutants	Direct	The site is currently a COMAH site and heavily contaminated by historic industrial chemicals and there is potential for mine water pollution. Mine water pollution and contamination by dissolved metals such as iron, lead, copper, zinc or cadmium is a key concern identified in the Northumbrian RBD. In addition, impacts from the leaching of metals due to ore crushing and settlement lagoons can be a concern because the resulting spoil heaps are often large and close to waters edge. This can be managed with soil and water testing, monitoring and a robust CEMP.
Fish	Direct and Indirect	There is potential to cause physical harm to fish during in channel works. Undertaking the realignment and disconnection works may temporarily block or affect the watercourse flow through existing channels and therefore could impact upon fish passage to and from the Tees estuary. A fish rescue will likely be required in the areas which may be de-watered and infilled. Realigning the Knitting Wife Beck and Holme Beck will reduce flows in to the Lackenby Channel and could impact upon dissolved oxygen levels. Additionally, connecting the new channel online could cause sediment disturbance and temporarily reduce DO on site adversely impacting fish populations. However, current water quality is likely to be poor as the channel is highly turbid and choked with algal

WFD Quality Element	Pathway (direct / indirect/ none)	Potential Impact/ Mitigation measures
		growth (Appendix A), therefore any suspended silt is not anticipated to be significantly above normal levels. Mitigation measures: During construction works, fish passage will be considered during the design process to ensure the works do not present a barrier to fish movement. Fish passage should be maintained throughout the works. Standard industry practices such as pollution prevention measures and appropriate silt management should be in place to enable works to take place without the risk of polluting the water body. Machinery checks should be undertaken to ensure any plant used is in good working condition. Additional care will be necessary when construction on a heavily contaminated COMAH site to ensure contaminated land material does not enter any water bodies.
Invertebrates	Direct and indirect	The proposed developments involve the realignment and daylighting of part of the Holme Beck and infilling of the Cleveland channel, there is potential to negatively impact invertebrate populations of the water bodies on site during the construction phase. Adverse impacts to benthic invertebrates could be caused by increases in suspended sediment, disturbance, mortality and through accidental pollution events. The permanent works in the operational phase of the project could impact invertebrate communities as installation of culverts will lead to a permanent change in the composition of the watercourse, altering the environment for benthic invertebrate species. Any works involving infilling and culverting a section of the existing channel are likely to impact on the invertebrate community. However, the daylighting of a large portion of the Holme Beck will improve the conditions in those areas and it is considered in the long term that invertebrates will naturally re-colonise the new channel. Additionally, proposals to improve and remediate the heavily contaminated Lackenby channel could improve invertebrate habitat and ultimately support a greater invertebrate population than currently exists, however details of the remediation are unknown at this point. Mitigation measures: standard industry practices such as pollution prevention measures and appropriate silt containment should be implemented to enable works to take place without the risk of polluting the water body.
Macrophytes and phytobenthos	Direct and indirect	The Holme Beck is currently culverted and the proposals are to deculvert the channel and realign the watercourse so it flows down part of the original open channel fo the Holme Beck. The Cleveland channel is currently open with significant

WFD Quality Element	Pathway (direct / indirect/ none)	Potential Impact/ Mitigation measures
		reedbed present and infilling will be a deterioration compared to the current condition. However, the channel is artificial and water quality is poor, highly turbid and choked with algal growth, limiting the quality of the habitat. No apparent macrophytes were observed at the time of ecological survey (Appendix A). Adverse impacts to macrophytes and phytobenthos may occur whilst gaining access to the channels and during realignment. Infilling of the existing Cleveland channel will directly impact upon macrophytes and phytobenthos currently present in the channel. Daylighting of the Holme Beck and proposals to improve the Lackenby channel have the potential to increase the ecological value of the waterbody. However, details of channel improvements are unknown at this point. Adverse impacts may also result from suspended sediment causing increases in nutrients that are subsequently absorbed by the plants, disturbance from displacement of substrate, clearing of marginal vegetation and accidental pollution events. The site visit undertaken for this study (Appendix A) identified Invasive Non-Native species (INNS) on site - stands of Japanese Rose were seen on the right bank of Lackenby Channel. Appropriate control of this species will be required throughout the works. Mitigation measures: standard industry practices such as pollution prevention and silt containment measures will be in place to enable works to take place without the risk of polluting the water body or causing excess silt mobilisation. Machinery checks should be undertaken to ensure any plant used is in good working condition. Biosecurity measures, such as the Check-clean-dry approach, will be required throughout the works [http://www.nonnativespecies.org/downloadDocument.cfm?id=608 [site accessed:23/06/2021].

6.3.1 WFD Assessment Objectives for area not within a WFD water body

Following consideration of the potential impacts and recommended mitigation measures, Table 6-5 assesses whether the proposed works comply with the overarching objectives of the WFD.

Table 6-5: 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	N/A as area is not part of a WFD water body
Objective 2: The proposed works do not compromise the ability of the water body to achieve its WFD status objectives	N/A as area is not part of a WFD water body
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	No, the proposed works do not impact other WFD water bodies excepting potential localised impacts identified in Tees Transitional Section 5.2.
Objective 4: The proposed works contribute to the delivery of the WFD objectives	The WFD applies to all water bodies and therefore the proposals have been assessed against the Northumbrian River Basin District high levels strategic objectives. The objectives in the Northumbrian RBD include key pressures identified as preventing the attainment of good ecological status/potential in the basin and are relevant to water bodies on the development site. Having assessed the proposals against the high level objectives it is highly recommended to: · use the mitigation identified in this assessment and other geomorphic restoration techniques found in the River Restoration Centres 'Manual of River Restoration Techniques' (https://www.therrc.co.uk/guidance). · actively seek improvements to the watercourse and habitats during design · link the watercourses to drainage SUDS so they are assets to the development and provide multiple benefits · to assess each phase of designs to ensure changes comply with WFD Additional to these recommendations is to emphasise that open channels will contribute to WFD objectives for good status/potential for ecology and hydromorph if installed with sufficient such as ensuring enough space for water and other geomorphic restoration techniques such as those found in the River Restoration Centres 'Manual of River Restoration Techniques (https://www.therrc.co.uk/guidance) and habitat creation.

6.4 Impact Assessment – Protected sites

Table 6-4 discusses protected sites identified as being potentially at risk in the scoping assessment. Mitigation measures are recommended to mitigate the effects of the proposed works.

Table 6-6: Impacts and mitigation measures

WFD Quality Element	Pathway (direct / indirect/ none)	Potential Impact/ Mitigation measures
Teesmouth and Cleveland Coast SPA, Ramsar, and SSSI	Indirect	Activities to realign the Holme Beck and Knittingwife Beck and infill the Cleveland Channel may have a localised effect on the Tees transitional waterbody. - There is potential for localised increases in sediment transport and deposition through sediment disturbance during these works. The temporary works may impact the site through accidental pollution events. - There is potential for direct and indirect impact to these designated sites as a result of changing volumes of water which flow into the Tees from Holme Beck. - A Habitats Regulations Assessment (HRA) is likely to be required to assess the potential for adverse impacts on the SPA and Ramsar sites and consultation is advised with Natural England with regards to the HRA and any additional impacts upon the SSSI Mitigation measures: standard industry practices such as pollution prevention measures and appropriate silt management should be in place to enable works to take place without the risk of polluting the water body. Additional care will be necessary when construction on a heavily contaminated COMAH site to ensure contaminated land material does not enter any water bodies. Best practice biosecurity must be followed to prevent the risk of introducing INNS or damaging biological agents.

7 Discussion and Conclusions

7.1 Summary of proposed works

The current proposals at South Bank from Teesworks are outlined in Section 3.2 however this section will summarise the proposals and planned further works in order to draw conclusions to this assessment.

7.1.1 Holme Beck

- Holme Beck will be realigned, removing 540 m of the culverted channel along the southern boundary of the South Bank site and will be replaced by approximately 1.8 km of channel. This will comprise ~1.6 km of open channel divided four reaches by three box culverts (for access across the site) totalling approximately 200m.
- The open channel corridor will consist of a concrete U shaped channel with naturalised invert. A wider section of open channel will be located above the U shaped channel to form a 'two stage' channel that will contain high flood flows. Depending on the land take available for the channel and utilities services, the upper part of the two stage channel may be formed by a grass slope (where the channel corridor would be approximately ~25-30m in width) or a gabion retaining wall (where the channel corridor would be approximately ~10-15m in width).
- The channel will convey the waterbody around proposed building at NZ 54282 22622. The final ~250 m of the open channel down to the outfall to the Tees, is proposed to be an intertidal channel to dissipate velocities in the channel down to 1m3/s and provide habitat.
- The outfall of Holme Beck into the Tees is to be realigned from NZ 53367 22457, towards the Lackenby outfall, 0.7 km north west at NZ 53884 23035.

7.1.2 Knittingwife Beck

- The Knittingwife Beck channel is currently culverted and is conveyed under the railway to the Cleveland Channel but is to be realigned and conveyed in an open channel (the same design as described above for the Holme Beck channel) outwith the South Bank site and along the southern side of the railway, where it will join with the Holme Beck and conveyed under the railway line at NZ 54172 21495 and into the South Bank site.

7.1.3 Cleveland Channel

- The Cleveland channel will be infilled and disconnected from the Lackenby channel. The Holme Beck and Knittingwife Beck which previously flowed int the Cleveland channel will be realigned as described above.

7.1.4 Lackenby Channel

The Lackenby channel will remain in the same location and convey flows from the Boundary Beck and Kinkerdale Beck (but not flows from the Knittingwife and Holme Becks due to the realignment noted above). There are proposals to improve and remediate the site from NZ 55330 22202 to NZ 54925 22654 as the watercourse and bank materials are heavily contaminated in this area and as noted above the Cleveland Channel is artificial and formed from sheet piling.

7.1.5 Further works

The current proposals for the site are high level and predominantly based upon the planform and whether to open or culvert the watercourses. There is a desire to

improve and remediate the pollution in the Lackenby channel and to provide in-channel enhancements however these have yet to be detailed and agreed upon. Details are still being drawn up for the channel profiles and hydraulic modelling is to be completed for flood risk but should also inform the detailed WFD assessment when available in future.

Regarding the construction works themselves, these are to be detailed at a later date when designs are close to completion. These should include timings and a CEMP to ensure pollution prevention on site, best practice and that any impacts caused by construction are minimised as reasonably possible.

7.2 Assessment Summary

The assessments detailed in this report are, with regards to the ecological WFD quality elements, based on the existing knowledge of the site and the water bodies gained from a combined Ecology and Geomorphology assessment (comprising desk study information and a site visit in June 2021), which are evidenced in the Appendices of this report.

The Tees Transitional water body was screened into this WFD assessment and its quality elements assessed based on the process in Chapter 2. It also considered the area not within a WFD water body in which the site is located as whilst this area is below the 10km^2 threshold above which water bodies are classified under WFD, there are wider considerations for the environment under the RBMP and WFD Regulations. Should the design alter significantly, this report would need to be revised to ensure the mitigation measures and recommendations outlined in this report have been considered and to determine whether the final scheme is WFD-compliant and to continually seek improvements such as ensuring enough space for water and other geomorphic restoration techniques found in the River Restoration Centres 'Manual of River Restoration Techniques (https://www.therrc.co.uk/guidance).

Further to this, a Biodiversity Net Gain (BNG) assessment, through the MoRPH survey will also be useful in highlighting opportunities, constraints and impacts to water bodies on site and ensure an uplift.

7.2.1 Ecological Assessment

Contained within Appendix.

7.2.2 Hydromorphological Assessment

Contained within Appendix.

7.3 Scheme Recommendations/Key Considerations

The impact assessment determines whether the proposed works outlined in Section 7.1 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 Section 6.3; however, the critical ones are listed below:

7.3.1 Pollution Prevention

Appropriate mitigation measures shall be implemented to ensure that habitats within proximity of the works are not degraded as a result of pollution events during the construction phase. Mitigation should include:

- Abiding by industry standard pollution prevention guidelines, such as those given in CIRIA's Control of water pollution from construction sites - Guidance

for consultants and contractors (C532D) (Masters-Williams et al., 2001) should be implemented.

- Drip trays should be placed underneath any standing machinery to prevent pollution by oil/fuel leaks. Where practicable, refuelling of vehicles and machinery should be carried away from any watercourse or drainage (at least 10m).
- Operators should check their vehicles on a daily basis before starting work to confirm the absence of leakages. Any leakages should be reported immediately.
- Daily checks should be carried out and records kept on a weekly basis and any items that have been repaired/replaced/rejected noted and recorded. Any items of plant machinery found to be defective should be removed from site immediately or positioned in a place of safety until such time that it can be removed.

7.3.2 **INNS and Biosecurity**

Appropriate biosecurity measures should be implemented throughout the works to minimise transfer of INNS species across site as well as to off-site locations:

- Ensure all Personal Protective Equipment (PPE) and equipment is clean prior to entering and leaving the site.
- Ensure vehicles are kept clean and do not let mud and debris accumulate on wheels or under wheel arches. Keep vehicular access to a minimum.
- Follow Check-Clean-Dry approach (http://www.nonnativespecies.org/checkcleandry/index.cfm).

7.3.3 **Open Watercourses**

Designs should seek as much as possible to open channels and not culvert. It is highly recommended that mitigation identified in this high level WFD report and to continually seek improvements to the water bodies through the design process to ensure compliance with WFD, such as ensuring enough space for water, geomorphic restoration techniques such as those found in the River Restoration Centres 'Manual of River Restoration Techniques (https://www.therrc.co.uk/guidance). Additional to this recommendation is to emphasise that open channels will contribute to achieving WFD objectives for good status for ecology and hydromorphology if installed with sufficient mitigation such as ensuring enough space for water and other geomorphic restoration techniques found in the River Restoration Centres 'Manual of River Restoration Techniques (https://www.therrc.co.uk/guidance) and habitat creation.

Further to this, a Biodiversity Net Gain (BNG) assessment, through the MoRPH survey will also be useful in highlighting opportunities, constraints and impacts to water bodies on site and ensure an uplift.

Open watercourses have a number of benefits as they:

- Allow for riparian habitat and biodiversity
- Allow space for flood waters
- Provide resilience to climate change
- Improve water quality with reedbeds
- Can be an asset for SUDS on site

Culverts are a maintenance risk and additional cost as they are at risk of:

- Silting up
- Hiding pollution incidents and misconnections as outfalls are out of general view
- Collapse
- Increasing flood risk upstream

7.3.4 Biodiversity Net Gain

The forthcoming Environment Bill will mandate biodiversity net gain (BNG) in England for development. Due to future implications for this project, it is recommended that provisions for BNG are considered early in design. This would comprise a baseline assessment of the site covering both terrestrial and river habitats, noting habitat condition. This assessment would make use of the Defra Biodiversity Metric 2.0 (version 3.0 is anticipated to be available imminently), which requires input from the Rivers and Stream Metric by completing MoRPH surveys to determine the condition of the river habitats. River condition indicators, for the bank top, bank face, channel – water margin and channel bed, are generated and will highlight specific features of the watercourse which could be targeted to improve condition and ensure BNG is achieved.

7.4 Conclusions

This has been a high level WFD assessment based on high level proposals for the development for Teesworks, prepared for the purpose of meeting the condition of planning from the EA. Details of the development and works methodology are largely unknown at this point. The high level proposals have been assessed against Tees Transitional waterbody GB510302509900and also the high level objectives of the Northumbrian River Basin District (RBD) since the site itself lies outwith a WFD catchment as the catchments of the watercourses are below the 10km2 threshold for the designation of WFD water bodies.

With details submitted so far, the conclusions of this report for impacts to the Tees Transitional water body are that there is potential or a local scale temporary impact on ecological and chemical elements at the proposed outfalls. These impacts could be caused by the closer proximity of the outfalls and changes in flows from each outfall and how they affect any sediment or habitat locally, potentially through scour or deposition. Long term localised impacts at the outfall of the Holme Beck could contribute to cumulative impacts of physical modifications and compound the morphological status of the Tees transitional waterbody and thus designs should be sympathetic to the waterbody. It is the recommendation of this report that consideration should be made to Estuary Edges (https://www.estuaryedges.co.uk/) methods of mitigation and that the outfalls or any headwalls are to be designed and constructed in a sympathetic manner to the estuary and further assessed when designs are finalised. An open channel along the currently culveted Holme Beck will be an opportunity to bring betterment to the current system and positively contribute to the morphological status and delivery of WFD objectives.

Regarding the high level WFD Objectives of the Northumbrian RBD, since the site itself is not located within a WFD waterbody, the proposed works could impact or compound the current condition, preventing the achievement of good ecological status/potential for WFD in the RBD. Pressures from the RBD such as:

- physical modification,
- pollution from towns, cities and transport,
- mine water pollutants,
- taking account of climate change morphology,

- negative effects of invasive non-native species

are directly relevant to the development and could impact conditions to water bodies on site such as their hydromorphology, physico-chem and specific pollutants. Appropriately designed open channels, in contrast to culverted channels, have the potential to contribute to the alleviation of pressures listed for the RBMP.

The recommendations and mitigation measures highlighted in this report as well as to seek further mitigation in designs (such as ensuring enough space for water and other geomorphic restoration techniques found in the River Restoration Centres 'Manual of River Restoration Techniques (https://www.therrc.co.uk/guidance)) can be used to offset any harmful impacts of development on site.

The current conditions of the South Bank site comprise of a number of constraints including utilities, hazardous leachate and ground conditions as well as culverted water bodies. The current proposed outlines for water management and drainage at the site aim to provide the best practical way forward for the site design in working within these constraints whilst also providing betterment to the current water bodies in terms of ecology, hydromorphology and water quality/chemistry to support WFD objectives and measures outlined in the Northumbria River Basin Management Plan. The infilling of the artificial Cleveland channel could have adverse impacts locally but the prevention of a pollution pathway in the new proposed Holme Beck channel and the opportunities for an intertidal corridor at the outfall are anticipated to have benefits. A Biodiversity Net Gain (BNG) assessment, through the MoRPH survey will also be useful in highlighting opportunities, constraints and impacts to water bodies on site and ensure an uplift.

This WFD assessment should be revisited and updated when further designs are available to ensure that the final designs are compliant. Discussion and engagement with the Environment Agency will be required to confirm the way forward for the detailed WFD assessment and the meeting of the planning conditions.

Appendices

A South Bank Watercourses Ecological Assessment

A.1 Introduction

A.1.1 Project background

JBA Consulting was commissioned by Faithful and Gould to undertake an ecological assessment to support the Water Framework Directive (WFD) assessment for the proposed works on Lachenby Channel and Cleveland Channel at Teesworks South Bank.

It should be noted that full ecology works on site have been completed by Arup and Inca in 2020 and these should be referred to. As these reports detail the current ecological conditions of the site it was not considered necessary to repeat the findings within this document. The details described below report the conditions of the watercourses observed at the time of survey.

A.1.2 Site location

The site is located in the Teesworks area and comprises brownfield land on the banks of River Tees estuary, 5km to the west of Redcar (Figure A-1).

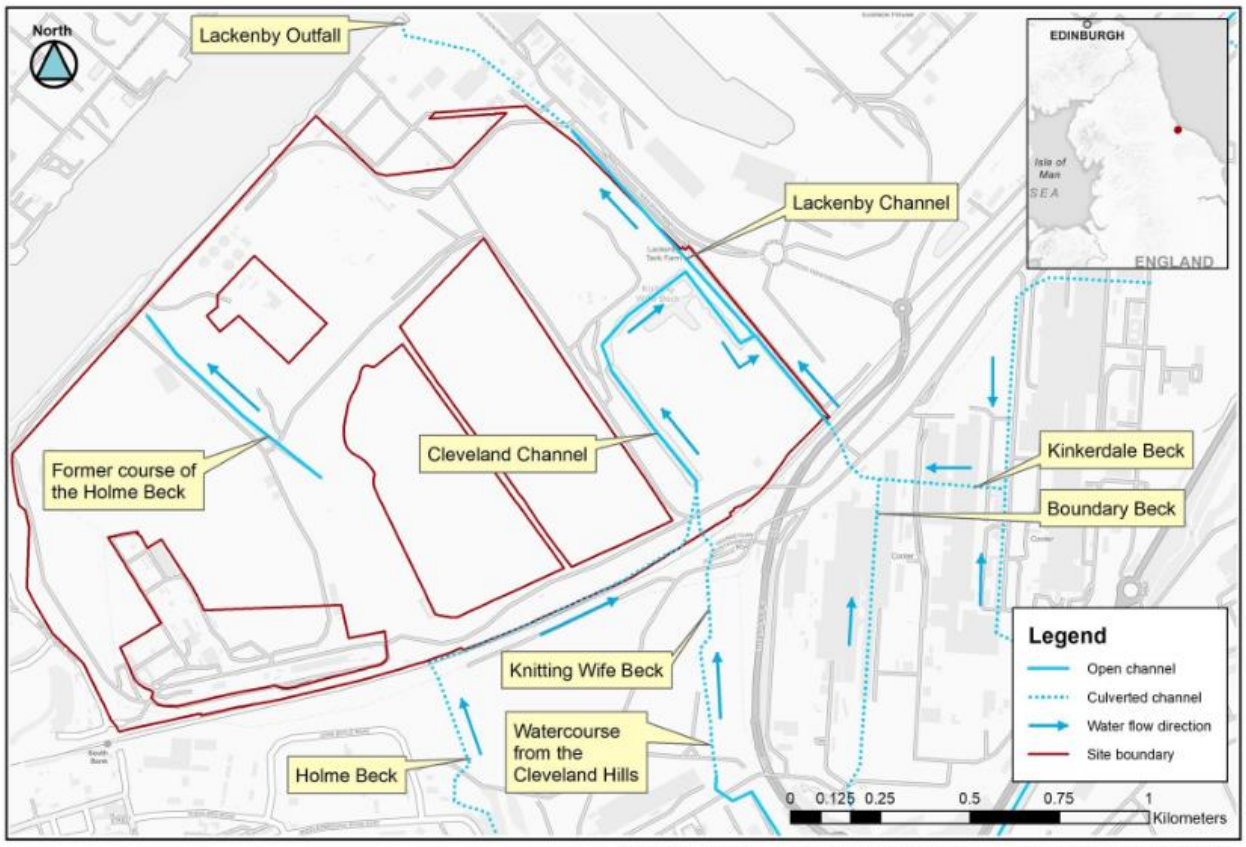


Figure A-1: Site boundary and watercourses through and surrounding the site

A.1.3 Proposed works

The current proposals at South Bank from Teesworks (02/06/21) are outlined in Figure A-2: and are as follows:

Holme Beck

- Holme Beck will be realigned, removing 540 m of its original channel which will be replaced by 1.3 km of open channel followed by right and left bends to convey the waterbody around proposed building at NZ 54282 22622. The final 500 – 600 m of downstream reach may be required to be culverted due to multiple constraints caused by infrastructure and it may be technically and economically infeasible to create open channel.
- The outfall of Holme Beck into the Tees is to be realigned from NZ 53367 22457, towards the Lackenby outfall, 0.7 km north west at NZ 53884 23035.

Cleveland Channel

- The Cleveland channel will be infilled and disconnected from the Lackenby channel and connected instead to the Holme Beck. With the above proposals for the Holme Beck, this will extend the entire watercourse length by 0.3 km with ~ 500 m de-culverted.

Knittingwife Beck

- The Knittingwife Beck channel is currently culverted but is to be realigned to adjoin with the Holme Beck back and deculverted. It will adjoin Holme Beck at NZ 54172 21495.

Lackenby Channel

- The Lackenby channel will remain in the same location and has proposals to improve and remediate the site from NZ 55330 22202 to NZ 54925 22654 as the watercourse and bank materials are heavily contaminated in this area.

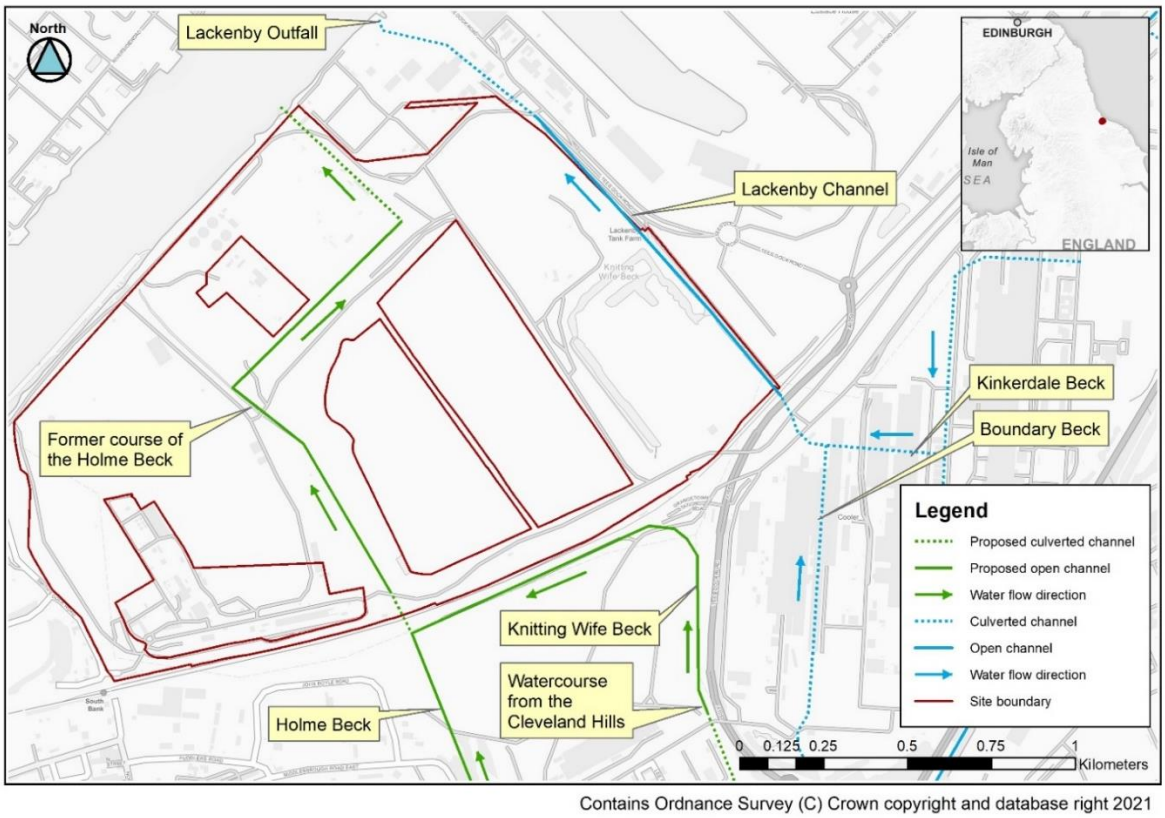


Figure A-2: Proposed works for South Bank site

A.2 Methods

The ecological assessment included a desk-based assessment and site survey to inform the WFD assessment. The desk-based assessment included searches of databases containing ecological records, priority habitats, and information on statutory and non-statutory designated sites. The following sources were included in these searches:

- MAGIC mapping service (www.magic.gov.uk)
- Natural England GIS data (www.gis.naturalengland.org.uk/pubs/gis/GIS_register.asp)
- Environmental Records Information Centre North East (ERICNE)
- Aerial photography
- Environment Agency National Fish Population Data (https://environment.data.gov.uk/ecology-fish/)

Due to the size of the site, it is considered that the zone of influence would be 2 km from the site boundary and therefore the desk-based assessment was conducted within this search area. Site survey

A site survey was undertaken on Wednesday 9th June by Dr Laura Hodgkinson BSc PhD ACIEEM and Dr Jennine Evans BSc (Hons) PhD GradCIWEM. The survey focused on the watercourses and immediate surroundings of the open reaches of Lackenby Beck and Cleveland Beck on Teesworks land, where safely accessible. The focus of the assessment were ecological elements which are considered in the WFD assessment, such as fish and invertebrates. Other factors such as invasive non-native species (INNS), protected species which are often supported by watercourses (e.g. Water Vole *Arvicola amphibius* and Otters *Lutra lutra*), adjacent habitats and land use as well as evident management practices were also noted.

A.2.1 Limitations

The habitats and species present in a given area are subject to change over time. A single field visit of this nature captures and reports the situation at the time of survey. As such, the advice contained within this report is considered valid for a period of 18 months before a review on the need for an updated survey/assessment must be made by an ecologist (CIEEM 2019).

Data from biological records centres or online databases is historical information, and datasets might be incomplete, inaccurate or missing. It is important to note that even where data is held, a lack of records for a defined geographical area does not necessarily mean that the species is absent; the area may simply be under-recorded. As such, records cannot be relied on and serve only as an indication of what might/ might not be found.

On the day of the walkover survey the weather was sunny and dry, and presented no limitations on visibility. Safe access to the whole of the watercourses and areas of proposed new channels could not be arranged on the day, so some areas were not fully assessed; where possible, these sites were viewed from a distance in a safe location, but this was not possible for all areas.

Where safe access was possible the watercourses were walked only from one bank, this presents the possibility that evidence of the presence of a species could have been overlooked. The timing of the survey during a period of prolonged warm, dry weather meant that evidence such as footprints in mud were less likely to be found, and tall vegetation was present on much of the banks and watercourse margins, obscuring the view and potential evidence (e.g. burrows on banksides).

A.3 Results and Evaluation

A.3.1 Desk-based assessment

Statutory designated sites

Teesmouth and Cleveland Coast has several overlapping statutory designations as a Special Protection Area (SPA), Site of Special Scientific Interest (SSSI) and Ramsar site. Extensions to both the SPA and Ramsar sites were classified on 16th January 20207.

The SPA is adjacent to the northern boundary of the site, covering the River Tees. The SPA contains the following qualifying features:

- Knot *Calidris canutus* (non-breeding)
- Little Tern *Sternula albifrons* (breeding)
- Redshank *Tringa tetanus* (non-breeding)
- Sandwich Tern *Thalasseus sandvicensis* (non-breeding)
- Waterbird assemblage (non-breeding)

The Ramsar site is also located 200m north west of the site, including the mud flat areas of the River Tees. The site qualifies under **criterion 5** as it is regularly used by over 20,000 waterbirds in any season and **criterion 6** as it is regularly used by 1% or more of the biogeographic populations of the following bird species, in any season:

- Red Knot
- Common Redshank
- Sandwich Tern *Thalasseus sandvicensis*

The SSSI is also located adjacent to the northern boundary of the site, covering the River Tees. The following features are supported by the wider mosaic of coastal and freshwater habitats:

- Jurassic geology
- Quaternary geology
- Sand dunes
- Saltmarshes
- Breeding Harbour Seals *Phoca vitulina*
- Breeding Avocet *Recurvirostra avosetta*, Little Tern and Common Tern *Sterna hirundo*
- A diverse assemblage of breeding birds of sand dunes, saltmarsh and lowland open waters and their margins
- Non-breeding Shelduck Tadorna tadorna, Shoveler Spatula clypeata, Gadwall Mareca strepera, Ringed Plover Charadrius hiaticula, Knot, Ruff Calidris pugnax, Sanderling Calidris alba, Purple Sandpiper Calidris maritima, Redshank and Sandwich Tern
- An assemblage of more than 20,000 waterbirds during the non-breeding season

7 https://consult.defra.gov.uk/natural-england-marine/teesmouth-and-cleveland-coast-potential-sp/

- A diverse assemblage of invertebrates associated with sand dunes

Non-statutory designated sites

ERICNE returned one record of a non-statutory designated site, Easton Pumping Station. This site is located 1.8km north east of the site and is designated as a Redcar and Cleveland Local Wildlife Site. The site is a mosaic of habitats, including urban grassland with "borderline" neutral grassland covering 25% of the site (Redcar and Cleveland Borough Council, 2017). This site is sufficiently distanced and hydrologically isolated from the site to remain unaffected by the proposed works.

Protected species

There are records of fish returned from Ormsby Beck – North Ormsby, a tributary to the River Tees with a confluence 2km upstream from the western site boundary in 2013 and 2015. Species included 3-spined Stickleback *Gasterosteus aculeatus*, European Eels *Anguilla anguilla* and elvers and Stone Loach *Barbatula barbatula*.

Dabholm Cut, another tributary to the River Tees with a confluence 2km downstream of the eastern site boundary returned a range of invertebrate species, including crustaceans, *Diptera*, *Coleoptera*, *Trichoptera*, annelids and molluscs.

ERICNE also returned records of Water Vole and Otter within 2km of the site. The closest Water Vole record was located 1.8km south west and most recent record in 2017. The closest record for Otter was 1km north east and most recent record in 2019.

Invasive non-native species

The table below shows records from ERICNE of Schedule 9 species listed under the Wildlife and Countryside Act 1981 (as amended) dated post the year 2000, and includes the most recent record, and record within closest proximity to the site for each species.

Table A-1: Invasive non-native species within 2km of the site

Common Name	Scientific Name	Location and Date
New Zealand Pigmyweed	Crassula helmsii	1.6km NW (2010)
Japanese Knotweed	Reynoutria japonica	1km S (2019)
Japanese Rose	Rosa rugosa	Within site boundary (2019)
American Mink	Neovion vison	1.6km NW (2010)

A.3.2 Assessment for habitats on site

Habitats were classified under UKHab to level 3 and shown in Figure A-3:. Target notes are also mapped and described in Table A-2. Habitats on site include:

f2e - Reedbeds

A large defined reedbed of Common Reed *Phragmites australis* was present on the left bank of Cleveland Beck.

f2f – Other swamps

Large beds of marginal vegetation were noted on Lackenby Beck, with species including Reedmace *Typha latifolia,* Reed Sweet-grass *Glyceria maxima,* Flag Iris *Iris pseudacorus* and Bittersweet *Solanum dulcamara.*

g3c – Other neutral grassland

Both the banks of the becks showed variation; however, they were all generally classified to be within the g3c habitat. Grass species included Cocksfoot *Dactylis*

glomerata, Yorkshire Fog *Holcus lanatus*, Creeping Bent *Agrostis stolonifera* and Common Couch *Elymus repens.* Forb species included Wormwood *Artemisia absinthium*, Rosebay Willowherb *Chamaenerion angustifolium*, Ragwort *Jacobaea Vulgaris*, Nettle *Urtica dioica*, Wild Carrot *Daucus carota*, Common Mullein *Verbascum Thapsus*, Ribwort Plantain *Plantago lanceolata*, Ox-eye Daisy *Leucanthemum vulgare,* Common Bird's-foot-Trefoil *Lotus corniculatus*, Cleavers *Galium aparine* and Red Valerian *Centranthus ruber.* Shrubs of Japanese Rose *Rosa rugosa* (Schedule 9 invasive), Bramble *Rubus fruticosus agg*. and Elder *Sambucus nigra* were also observed.

r2 – Rivers and streams

Lackenby and Cleveland Becks consisted of highly turbid, likely polluted, water. The channels were artificially straightened and set within trapezoid channels; there was very little geomorphological diversity. The Lackenby Channel was slightly more diverse than the Cleveland Channel; within the narrower upstream Lackenby channel, bank colonisation by marginal vegetation was beginning to create small bends in the channel. The Cleveland Channel was wider, and the marginal vegetation was not having the same effect there.

Algal blooms were evident within the Lackenby Channel, and no macrophytes were observed in either channel.

The survey took place after a spell of dry weather, which may have resulted in lowered water levels and abnormal flow dynamics, however at the time of survey the flow of the water in both channels was generally very smooth and slow-flowing.

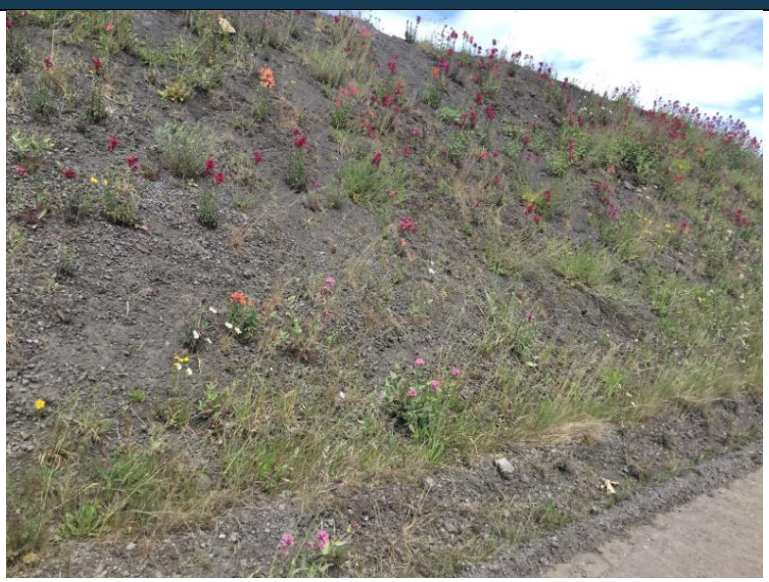
There were small weirs within the Lackenby Channel that may act as a barrier to fish passage, if present.

u1a – Open mosaic habitats on previously developed land

Behind the banks of the becks open mosaic habitats were present including earth banks. These were possible flood protection banks made from earth taken from around various parts of site (pers. comm. Rob Cooney, site contact). The banks appeared to contain seedbank with horticultural plants including Snapdragon *Antirrhinum majus* and Red Valerian *Centranthus ruber*. Other species observed in these areas were Wild Lettuce *Lactuca Virosa*, Mouse-ear Hawkweed *Pilosella officinarum* and Creeping Thistle *Cirsium arvense.*

Figure A-3: Watercourses and immediate surroundings mapped under UKHab methodology

Table A-2: Target notes and description

Target Note Number	Description	Photograph
1	Bank of Snapdragon on earthworks, evidence of soil importation.	
2	Fox *Vulpes vulpes* scat on right bank.	N/A
3	Abandoned structure on watercourse, potential for roosting bats and nesting birds.	

A.3.3 Assessment for protected and notable species

Fish

The channel was highly turbid and choked with algal growth. There is potential to support fish, but water quality is likely poor, and it is not anticipated large stocks of fish species would be present. Three fish species have been recorded on a tributary 2km upstream of the site and include elvers and European Eels. Similar species are anticipated to be encountered within the watercourses on site.

Invertebrates

No records for aquatic invertebrates were returned by ERICNE; however, records were available from the EA from Dabholm Cut. Aquatic invertebrates were seen within Lackenby Channel; however, identification was not possible due to the distance from the water's edge and their small size. It is likely that invertebrates included flies and other common invertebrate species.

Otter

Both channels were very open with culverts on the access routes into site; however, they are unlikely to support good stocks of fish. No evidence, such as holts, couches or spraints, was observed. Otter are therefore not anticipated to be encountered on the site.

Water Vole

The channel banks were suitable for Water Vole burrowing and offered commuting and foraging habitats with dense vegetation in many places. However, no evidence for Water Vole was observed, including footprints, feeding remains or latrines. ERICNE returned records of American Mink within 2km of the site which are known to predate on Water Voles and can wipe out entire populations. It is likely that any Water Vole populations on these channels are isolated due to the culverts, which could inhibit dispersal.

A.3.4 Invasive non-native species

Occasional stands of Japanese Rose were seen on right bank of Lackenby Beck. Specimens were observed through binoculars. There are multiple wild roses in the UK and they hybridise easily which can make definitive identification difficult from a distance, however the spiny branches, deep pink flowers and large hips that were present on these plants are indicative of Japanese Rose. Where there is doubt, it would be better to treat these plants as INNS to avoid committing an offence under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

A.4 Conclusions and recommendations

A.4.1 Conclusions

The habitats surrounding Lackenby Beck and Cleveland Beck comprised of reedbeds and other swamps as well as grassland banks, with open mosaic habitats on previously developed land present behind the river banks. The watercourses were highly turbid and choked with algal growth indicating poor water quality. There is potential for small numbers of fish and invertebrate species to be present on these watercourses. The habitats also have potential to support commuting and foraging Water Vole and Otter.

Due to the proximity of the statutory designated sites and the hydrological connectivity with the watercourses to the River Tees, there is potential for the SPA, Ramsar site and SSSI to be impacted.

A.4.2 Statutory designated sites

A Habitats Regulations Assessment (HRA) is likely to be required to assess the potential for adverse impacts on the SPA and Ramsar sites and consultation is advised with Natural England with regards to the HRA and any additional impacts upon the SSSI

A.4.3 Fish

A.4.4 Otter and Water Vole

General avoidance measures should be incorporated within the scheme include:

- Limit the hours of working to daylight hours, to limit disturbance to Otter
- Due to the potential presence of Otter the use of lighting at night should be avoided. If the use of lighting is essential, then a directional cowl should be fitted to all lights to prevent light spill and to be directed away from watercourses.
- Contractors must ensure that no harm comes to wildlife by maintaining the site efficiently and clearing away materials which are not in use, such as wire or bags in which animals can become entangled; and
- Any pipes should be capped when not in use (especially at night) to prevent animals becoming trapped. Any excavations should be covered overnight to prevent animals from falling and getting trapped. If that is not possible, a strategically placed plank should be placed to allow animals to escape.

A.4.5 Toolbox talks

Due to the potential presence of protected species, all staff working on the site should receive a toolbox talk from an ecologist on the following protected habitats and species:

- Teesmouth and Cleveland Coast SPA, SSSI and Ramsar site
- Fish
- Invertebrates
- Otter
- Water Vole

The toolbox talk should cover recognition of the species and evidence of its presence, what to do if evidence is seen and a summary of the relevant legislation.

A.4.6 Biosecurity

Measures will need to be put in place to ensure that there is no spread of invasive non-native species or diseases. The Check-Clean-Dry approach should be followed, ensuring that all PPE and equipment is cleaned before leaving site. For more information go to: www.nonnativespecies.org/checkcleandry.

A.4.7 Pollution Prevention Measures

Appropriate pollution prevention measures must be implemented throughout delivery of the project to mitigate any negative impacts on fish or invertebrates.

A.4.8 Biodiversity Net Gain

The forthcoming Environment Bill will mandate biodiversity net gain (BNG) in England for development. Due to future implications for this project, it is recommended that provisions for BNG are considered early in design. This would comprise a baseline assessment of the site covering both terrestrial and river habitats, noting habitat condition. This assessment would make use of the Defra Biodiversity Metric 2.0 (version 3.0 is anticipated to be available imminently), which requires input from the Rivers and Stream Metric by completing MoRPH surveys to determine the condition of the river habitats. River condition indicators, for the bank top, bank face, channel – water margin and channel bed, are generated and will highlight specific features of the watercourse which could be targeted to improve condition and ensure BNG is achieved.

A.5 Relevant policy and legislation

The legislation discussed below is intended as a guide only and does not replace formal legal advice.

A.5.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied with a presumption in favour of sustainable development a core element of the framework.

Of relevance to the proposed works in this report, the document states in relation to conserving and enhancing biodiversity, that: "If significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused" Ministry of Housing, Communities and Local Government (2019).

It also states that: "development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest" Ministry of Housing, Communities and Local Government (2019).

A.5.2 Statutory designated nature conservation sites

Sites with statutory designations receive varying degrees of legal protection under UK statute and European Directives. There are several statutory designations used for sites of high nature conservation value in the UK, which are applied depending upon the importance of the site in a local, regional, national or international context. This includes:

- Ramsar Sites (International designation)
- Special Areas of Conservation (SAC) and Special Protection Area (SPA) (European designations)
- National Nature Reserves (NNR) and Site of Special Scientific Importance (SSSI) (National designations)
- Local Nature Reserves (LNR) (Local designation)

A.5.3 Non-statutory designated sites

Non-statutory sites are afforded no statutory legal protection, but are normally recognised by local planning authorities and statutory agencies as being of local nature conservation value. The protection afforded to such sites is usually discretionary, through Local Plan policies. Non-statutory sites are designated by the local authority, usually in partnership with the County Wildlife Trust (or equivalent).

A.5.4 Protected species

Otter

The European Otter *Lutra lutra* is an EPS protected under the Conservation of Habitats and Species Regulations 2017 (as amended), making it an offence to:

- deliberately capture, injure or kill an Otter

- deliberately disturb an Otter such as to affect local populations or breeding success
- damage or destroy an Otter holt, possess or transport an Otter or any part of an Otter
- sell or exchange an Otter.

Otters also receive protection under the Wildlife and Countryside Act 1981 (as amended), this makes it an offence to:

- intentionally or recklessly disturb any Otter whilst within a holt
- intentionally or recklessly obstruct access to a holt.

Water Vole

The Water Vole *Arvicola amphibius* is protected under the Wildlife and Countryside Act 1981 (as amended). This makes it an offence to:

intentionally kill, injure or capture a Water Vole

possess or control a Water Vole, living or dead, or any part of a Water Vole

intentionally or recklessly damage, destroy or obstruct access to any place of shelter, or disturb a Water Vole within such a place

sell or offer for sale a Water Vole living or dead, or part of a Water Vole.

Fish

The Salmon and Freshwater Fisheries Act (1975) affords protection to fish and to the spawning grounds of fish. Section 2(5) makes it an offence to wilfully disturb spawning fish or the spawn of fish. Section 4(1) makes it an offence to knowingly permit the introduction of material to a watercourse such that it becomes injurious to fish, the spawn of fish or the spawning grounds of fish.

Invertebrates

Numerous invertebrate species receive international under the following legislation:

- The Conservation of Habitats and Species Regulations 2017 (as amended); Annex IIa, Annex Iva and Annex Va
- Council of Europe Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix II and III
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- EU CITES Regulations

Approximately 70 species of invertebrate species receive legal protection through Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). There are various levels of protection according to the rarity of the species. Offences include combinations of the following:

- Sale, or offering / exposing for sale
- Possession
- Intentional taking, killing or injuring
- Intentionally / recklessly damaging or destroying its place of shelter / protection

- Intentionally / recklessly disturbing it whilst occupying its place of shelter / protection
- Intentionally / recklessly obstructing access to its place of shelter / protection

Species with full protection under the Act include the Marsh Fritillary *Euphydryas aurinia*, Southern Damselfly *Coenagrion mercuriale* and Violet Click Beetle *Limoniscus violaceus*.

There are also over 400 invertebrate species listed under Section 41 of the Natural Environment and Rural Communities Act for England and under Section 7 of the Environment (Wales) Act 2016.

Invasive non-native species

Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) lists plant species, groups of plants and animal species for which it is illegal to plant, release, allow to escape or cause to spread into the wild. Examples of species listed on Schedule 9, which are most likely to be encountered, include Japanese Knotweed *Reynoutria japonica*, Himalayan Balsam *Impatiens glandulifera* and Giant Hogweed *Heracleum mantegazzanum*.

Some species are also classed as 'controlled waste' under the Environmental Protection Act 1990 and must be disposed of properly (i.e. Japanese Knotweed and Giant Hogweed). These provisions mean that, if these species occur on a site proposed for development or other work which may disturb the ground, control of these species is likely to be required.

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B Hydromorphology Survey

B.1 Survey scope

The site lies within the catchment of the River Tees that lies adjacent to the northern boundary of the site. Parts of the site are within sub-catchments of the River Tees:

- The Lackenby channel (that incorporates the Cleveland channel)
- The former Holme Beck that was historically part of the Holme Beck watercourse

These channels on site are ordinary watercourses and fall under the WFD, Northumbrian River Basin District (RBD), where (relevant) key pressures identified in the basin are:

- Physical modification,
- Urbanisation,
- Pollution from towns, cities and transport,
- Changes to the natural flow and level of water,
- Negative effects of invasive non-native species,
- Pollution from abandoned mines,
- Taking account of climate change.

However the channels do not fall under a WFD water body catchment and therefore do not have WFD objectives set against them.

The proposals to realign the Cleveland channel, alter flows in the Holme Beck and Lackenby channel and culvert sections of the Holme Beck are directly relevant to the Northumbrian RBD and a geomorphology survey of these channels at the site will inform the WFD assessment.

B.2 Catchment and character

The Lackenby, Cleveland and Holme Beck are all in close proximity within the 2.5 km^2 site boundary. The site is located within the tidal range of the River Tees, with the tidal limit defined by the Tees Barrage at Stockton, located approximately 8.5 km to the west, upstream of the site. The section of the Tees adjacent to the site has a width of approximately 350 m. The tidal water level in the Tees has been monitored at the Tees Dock gauging station 200m northeast of the site. The levels observed are between approximately -2.6 and 3.15 mAOD (with the 'normal level' in average weather conditions being -2.3 and 2.89 mAOD). As this reach of the Tees is tidal the water level fluctuates on a roughly 12-hour cycle. The gauge has been operational since January 1992 and has Environment Agency Station ID 8372.

The water bodies within the site are shown in Figure B- 1 and the catchment boundaries are shown in Figure B-2.

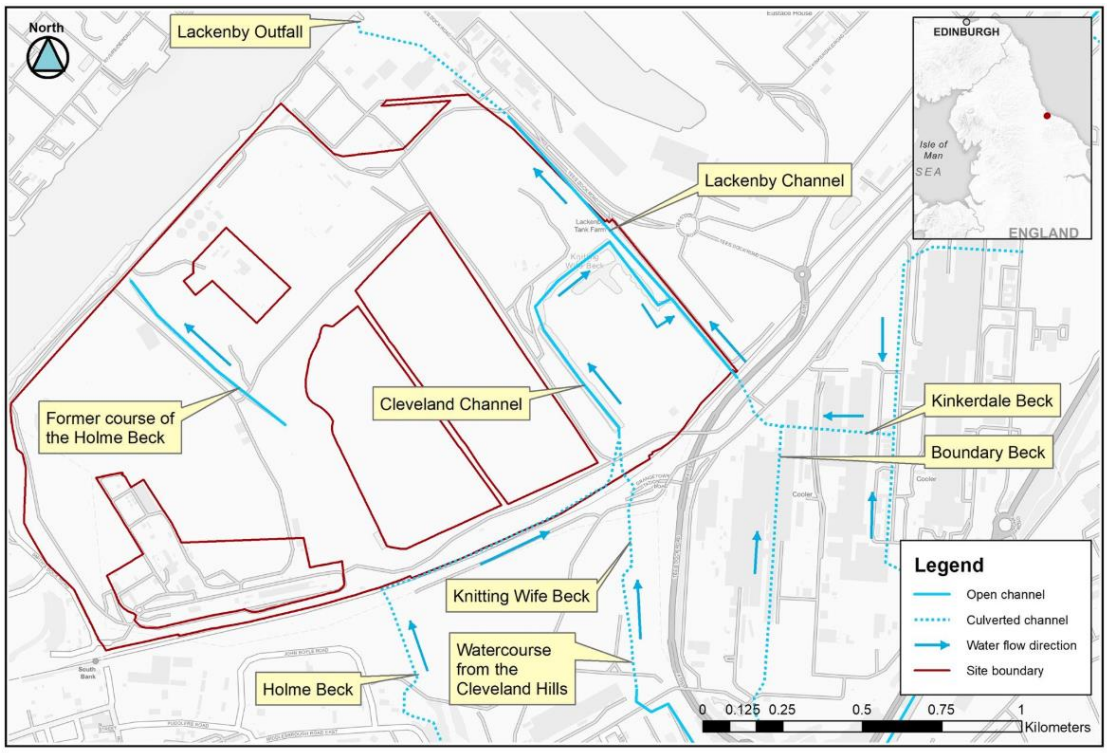

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Figure B- 1: Site boundary and watercourses through and surrounding the site

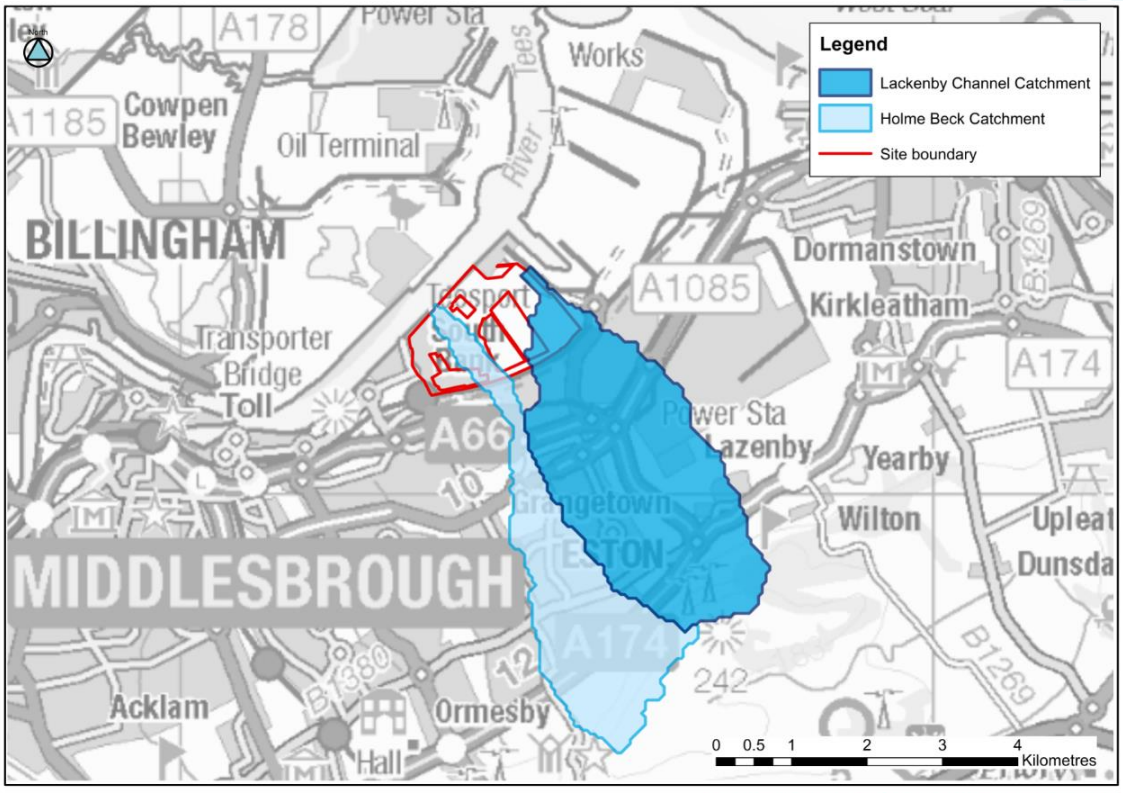

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Figure B-2: Catchment boundaries

B.2.1 Lackenby channel

This channel receives flow from Kinkerdale and Boundary Becks which are both culverted. The becks converge at NZ 55414 22073 and become the Lackenby channel. The Lackenby channel is culverted upstream for ~150 m and then becomes open channel at NZ 55322 22197 at the Tees Dock Road A1053. The confluence with the Cleveland channel is at NZ 55113 22419. The channel becomes culverted again at NZ 54606 22977 and enters the Tees through its outfall at NZ 54146 23326.

The hydrological catchment of the Lackenby Channel, down to NZ 54600 22950, has an area of approximately 8.3km2. The catchment drains from the south-east to the north-west. It rises on Eston Moor to the south east of the site at elevations of 240mAOD and drains north west, declining to an elevation of approximately 50 mAOD at the site.

In the Lackenby Channel downstream of the confluence with the Cleveland channel there is an in-channel structure assumed to act as a tidal weir located at NZ 54929 22656.

Figure B-3:. The Lackenby Channel (Left) looking upstream along the Lackenby Channel, (Right) further downstream both taken from the right bank.

B.2.2 Cleveland channel

The Cleveland channel receives its flows from Knitting Wife Beck, Cleveland Hills and the culverted upstream reach of the Holme Beck. These channels converge at NZ 54959 22013 and become the Cleveland channel. It is open channel and 1.9 km in length. These also rise on Eston Moor to the south east of the site and is highly urban.

Figure B-4: Cleveland Channel (Left) looking upstream from the left bank, (right) downstream looking from the footbridge crossing the Lackenby channel.

B.2.3 Holme Beck (Former)

At present, the Holme Beck is culverted and flows are directed to the Cleveland channel, therefore the Holme Beck has been fragmented and the reach described here is the former Holme Beck, located at NZ 53400 22500. The catchment at the downstream extent of the former course of the Holme Beck, at has an area of approximately 4.9km2. The former Holme Beck is adjacent to the Lackenby Channel catchment and like the Lackenby channel also originates on Eston Moor and is highly urban.

B.3 Historic trend analysis

As discussed above, the channel site has been subject to extensive physical modification between 1886 and the 1920s (1886 the earliest available online from National Library for Scotland shows the site at that time was undeveloped estuarine habitat). In the early 20th century the Lackenby channel was realigned and straightened to the west and Dabholme Gut which was created as a port. The Holme Beck was still intact as one continuous channel however the 250m upstream reach was culverted for rail transport. The site was drained, raised and developed for rail transport from the Teesport to the surrounding steelworks, iron works and Lackenby Farm which immediately surrounded the site to the south. It is unknown due to insufficient mapping available between 1970s – 2000s when the Holme Beck was fragmented and the Cleveland channel constructed as an open channel converging with the Lackenby Channel.

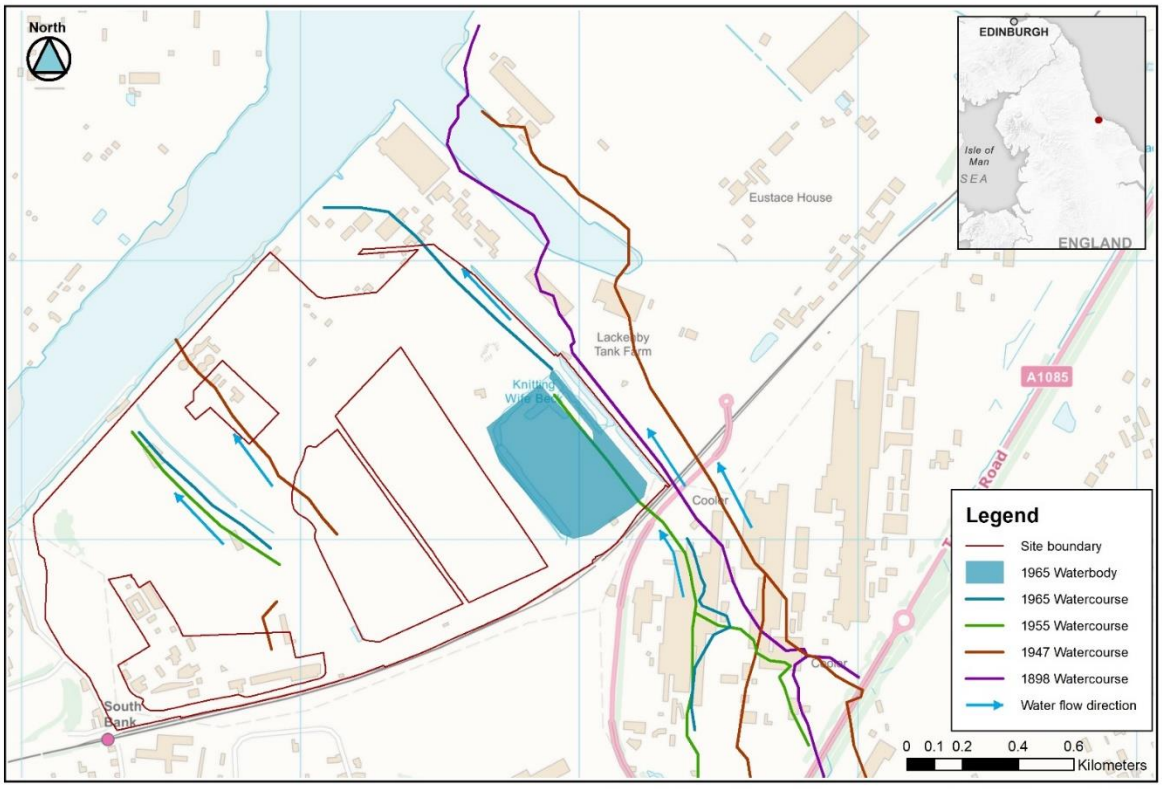


Figure B-5: Historic channels

B.4 Watercourse condition at the site

The site visit was undertaken on 10/06/21. The weather was hot, sunny and dry with some low to moderate wind. It had not rained for at least two weeks before the site visit. There was lack of diversity of flow and dominated by glide flow. No in-channel geomorphological processes viewable. The channel was very low energy and it was often difficult to determine the direction of flow as it was barely moving.

The channel morphology consists of the following features shown in the figure below with photographs and descriptions in the following table

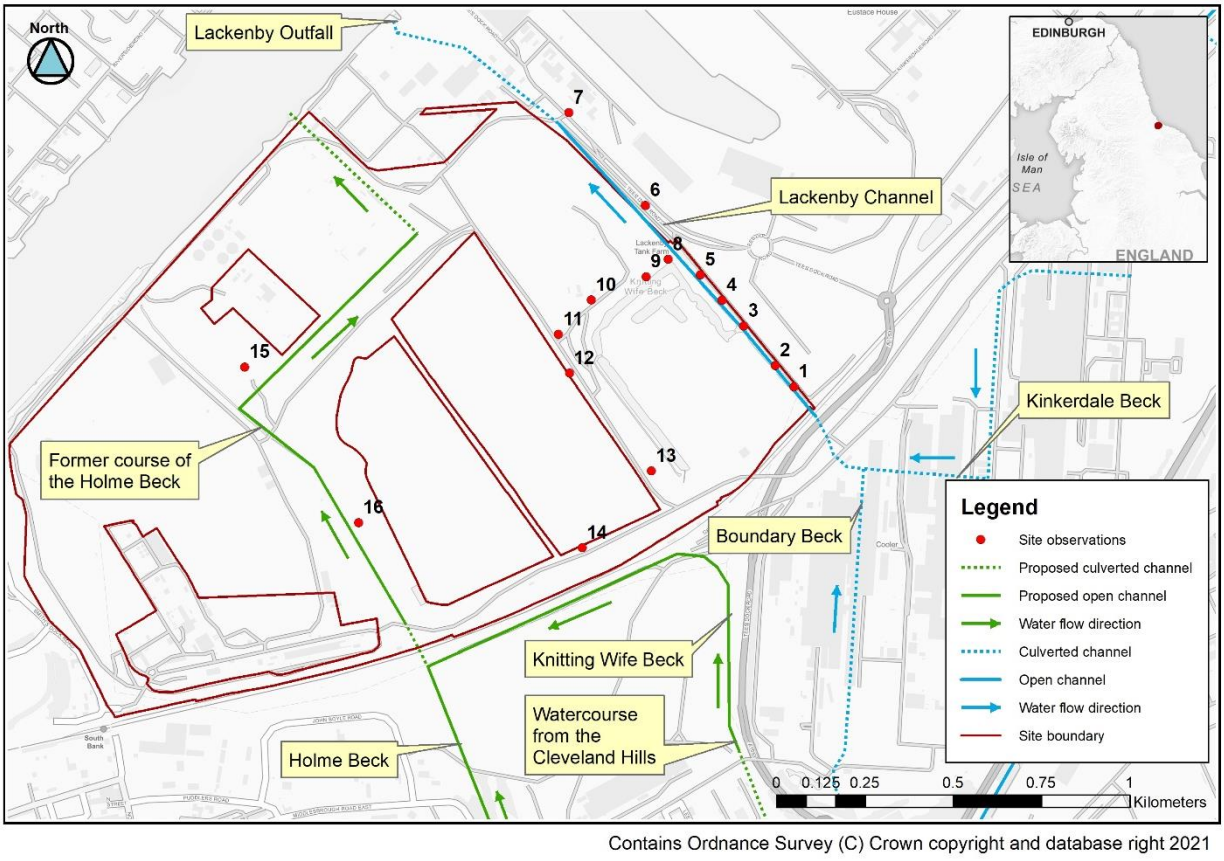


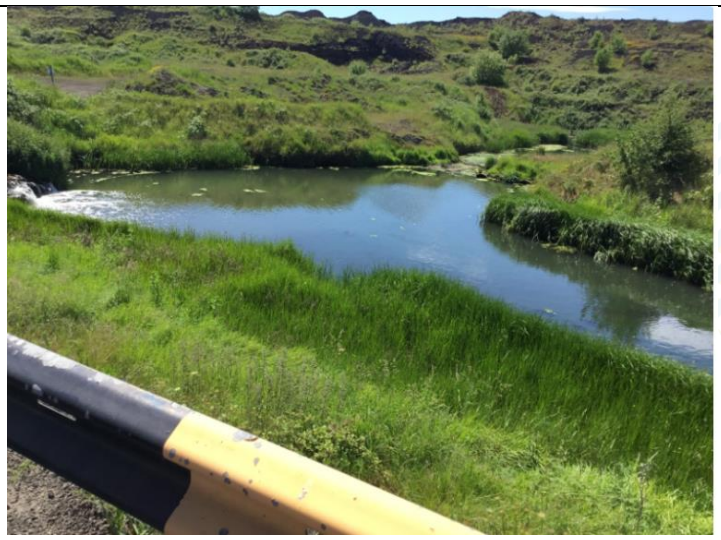
Figure B-6: Site location features

Table B-1: Geomorphology features

Geomorphology feature	Photograph
1 At this upstream location on the Lackenby channel, looking upstream. The banks are well vegetated with riparian habitat and the channel profile is largely trapezoidal with a straightened planform. Slumping of the banks can be seen along the right bank and reedbed developing on the left bank. There was no indication of high flows or floods, this could have been hidden by vegetation as it had not rained for at least two weeks. No indications of dredging but the site is continually being developed and earth works are moved around the site frequently.	
1 Same location as above but looking downstream. The banks are terraced with some slumping features and are well vegetated. Although terraced on the banks, the channel profile is largely trapezoidal with a straightened planform. The slumping banks showed signs of geomorphological recovery as the channel pulls in the banks to readjust the profile, if left to recover it is likely to narrow the channel, increase sinuosity, flow diversity and raise the bed.	

1 Photograph taken looking upstream. Evidence of banks slumping and depositional areas of mud in the downstream slack areas. Appears to be developing a reedbed.	
1 Structure is to be removed. Unsure about whether the foot bridge will be removed too.	

2 Looking upstream. At 100m downstream of (1) the valley is widened with extensive reedbed and riparian vegetation. The channel is confined within its immediate channel. Could be opportunity to increase sinuosity within this valley. Large woody debris (LWD) could achieve this without the need for interventions with diggers. Banks are slumping and should be encouraged to recover naturally with these geomorphological processes. LWD in strategic locations can maximise the natural recovery in this reach.	
2 Looking downstream. A vehicular bridge spans this section. If required to maintain access, would recommend over-spanning the bridge to allow natural recovery and avoid expensive hard engineering and maintenance to protect this feature. Booms are seen deployed in many sections of the Lackenby channel. There does not appear to be any pollution on the surface of the water and the booms appear to be clean. More information would be valuable to know why these are in the channel. Is this part of clean-up operation or is this a reaction to a recent pollution incident? The water is not clear and is a muddy brown colour. There is evidence of invertebrates and birds in the water.	

3 Looking upstream from right bank at confluence with Cleveland channel. There is an algal bloom present with a blue/green tinge to the water and algal scum on the surface. Reedbeds are developing on the right bank. There is a weir or raised structure on the Lackenby channel. Opportunity to remove or build fish passage.	
4 Looking across Lackenby from right bank. Vegetation is sparse in this reach, potentially evidence of recent earth works or contamination preventing growth? Reedbed developing on right bank.	
5 Looking across Lackenby from right bank. Vegetation is sparse in this reach, potentially evidence of recent earth works or contamination preventing growth?	

5 Looking downstream on Lackenby from right bank. This reach has lost the developing recovery seen upstream and is straighter, over wide and trapezoidal, much like a canal. Opportunities to improve this reach by narrowing the channel, encouraging reedbed growth, installing LWD for flow diversity and to encourage geomorphological processes.	
6 Looking downstream on Lackenby from right bank. This reach is outside red boundary towards Tees Port. This reach is heavily modified with built up protective grassed banks. Banks are becoming undermined and undercut. Asset to be aware of, pipe crossing the Lackenby channel.	
6 Looking across Lackenby from right bank. This reach is outside red boundary towards Tees Port. Gabion baskets have been installed for increased protection, probably reactionary as the area is becoming undermined.	

6 Looking downstream on Lackenby from right bank. This reach is outside red boundary towards Tees Port. Closer look at the pipe asset to be considered and undercutting of protective grassed banks on left bank.	
8 Looking downstream on Lackenby channel at potential flow/tidal control structure	
8 Looking downstream on Lackenby channel at potential flow/tidal control structure	

8 Looking upstream on Cleveland channel from footbridge on Lackenby channel. Reach is over wide and terraced. Reedbeds are developing on the right bank. The water appears clearer upstream.	
8 Looking at left bank of Cleveland channel from footbridge on Lackenby channel. Algal scum and maybe other pollutants caught in this slack area. Deposition of mud also visible.	
9 Looking downstream Cleveland channel from left bank. The valley is wide in this reach and has succeeded by reedbeds with a confined channel/thalweg on the right bank. The bank has developed scrub habitat. Opportunity to plant occasional riparian trees such as willow or hazel to increase shade and generate supply of woody debris for a natural and sustainable channel. Another opportunity is to diversity the flow and encourage erosion into reedbeds to create multi-thread channel and increase the ability of the reedbed to cleanse the watercourse.	

9 Looking upstream Cleveland channel from left bank. Walking upstream the watercourse and riparian habitat becomes more biodiverse. Evidence of banks slumping in and opportunity to enhance geomorphological processes and increase sinuosity. Watercourse confined to thalweg.	
10 Looking upstream Cleveland channel from left bank. This reach is highly biodiverse with extensive reedbeds and bank slumping. Watercourse confined to thalweg.	

11 Looking upstream Cleveland channel from left bank. High biodiversity upstream and extensive reedbed. Watercourse confined to thalweg and straightened planform. Some minor evidence of watercourse attempting to draw in banks and increase sinuosity	
12 Looking upstream Cleveland channel from left bank. High biodiversity upstream and extensive reedbed. Evidence of a berm developing on left bank and some deposited mud. This was the furthest upstream available to survey die to hazardous dust from site development in the area.	

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