

9 WATER RESOURCES

Summary

This chapter assesses the potential impact of the Proposed Project on the surface water and groundwater receptors within the area. The Proposed Project has the potential to interact with several water resources including the following:

- River Don and its floodplain
- River Don tributaries;
- Numerous unmapped field drains and overland flow pathways;
- South Pennine Moors Special Area of Conservation and the Dark Peak Site of Special Scientific Interest;
- Don & Rother Millstone Grit and Coal Measures Water Framework Directive groundwater body;
- Licensed and unlicensed groundwater and surface abstractions located downgradient or downstream the project;
- Ponds; and
- Areas at risk of flooding from surface water and groundwater.

The assessment has been supported by a detailed Flood Risk Assessment and Sustainable Drainage Systems Strategy.

Impacts will be minimised by the adoption of best construction practices and specified mitigation measures described below.

A Construction Environmental Management Plan will be implemented to manage environmental impacts during construction; this will include measures for controlling general pollution to surface and groundwaters. With the implementation of mitigation measures, no significant effects on water resources during the construction, operation and decommissioning phases are predicted.

Additional studies undertaken include a Flood Risk Assessment and a Sustainable Drainage System statement which form part of the planning application documentation

9.1 Introduction

9.1.1 This chapter of the Environmental Assessment Report presents the findings of the water resources assessment, during the construction, operation and decommissioning phases of the VIP Peak District (East) Project (hereafter referred to as the Proposed Project).

9.1.2 Water resources considered in this assessment include:

- Surface water resources;
- Groundwater resources;
- Hydromorphology;
- Water quality; and
- Flooding and drainage.

9.1.3 This chapter should be read in conjunction with Chapter 2 (Project Description) and Chapter 10 (Geology, Soils and Contaminated Land).

9.2 Scope and Methodology

Study Area

Impacts upon water resources are considered within a Study Area which has been based on the Area of Search for Permanent and Temporary Works¹ plus an applied 3km buffer area. This Study Area has been chosen as it is considered suitable to incorporate all potential surface and groundwater receptors that could be impacted by the Proposed Project.

Data Sources

9.2.1 To support the assessment, a wide range of data has been collated to describe the baseline environment within the Study Area. Where data was collected from public domain sources, and associated with an Open Government Licence (OGL)², these are summarised in Table 9.1 below.

Table 9.1: Public Domain Open Government Licence Sources³

Feature Title	Location (web address)	Date accessed
Aquifer designations	https://data.gov.uk/dataset/aquifer-designation-dataset-for-england-and-wales	23/06/2016
Borehole locations	http://mapapps2.bgs.ac.uk/geoindex/home.html	27/09/2016 verified 01/2018

¹ Chapter 3 of this Environmental Assessment Report contains further details of this defined boundary.

² <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/> (accessed 30-09-2016)

³ All hyperlinks for the datasets listed in Table 9.1 were valid at the time the data were accessed.

Feature Title	Location (web address)	Date accessed
Canal centreline	http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue	04/07/2016 verified 01/2018
Flood Map for Planning (Rivers and Sea) - Flood Zone 2. Flood Map for Planning (Rivers and Sea) - Flood Zone 3	http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue	26/08/2016 verified 01/2018
Flood Map for Planning (Rivers and Sea) - Flood Storage Areas	http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue	12/08/2016 verified 01/2018
Source Protection Zones (SPZ)	http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue	08/06/2016 verified 01/2018
OS Open Rivers	https://www.ordnancesurvey.co.uk/business-and-government/products/os-open-rivers.html	11/08/2016 verified 01/2018
Peat Bogs	http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue	16/09/2016
Reservoirs, lakes and ponds	http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue	04/07/2016 verified 01/2018
River Habitat Survey	https://data.gov.uk/dataset/river-habitat-survey-survey-details-and-summary-results1	22/09/2016 verified 01/2018
Hydrometric Monitoring Points	https://data.gov.uk/dataset/hydrometric-monitoring-points1	11/10/2016 verified 01/2018
Flood Map for Planning (Rivers and Sea) - Spatial Flood Defences	http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue	12/08/2016 verified 01/2018
Surface Water Safeguard Zones	<p>No SGZ within the study area which was confirmed using the formal EA's website What's In my Back Yard.</p> <p>http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683&y=355134&scale=1&layerGroups=default&ep=map&textonly=off&lang=en&topic=drinkingwater</p>	04/07/2016

Feature Title	Location (web address)	Date accessed
2015 Humber River Basin Management Plan (report)	https://www.gov.uk/government/publications/humber-river-basin-district-river-basin-management-plan	27/09/2016
WFD catchments classification (2015 Cycle 2), objectives, measures and reasons for not achieving good status	http://environment.data.gov.uk/catchment-planning/ManagementCatchment/3030	27/09/2016
WFD Groundwater bodies Cycle 2	http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue	06/06/2016 verified 01/2018
WFD groundwater bodies classification (2015 Cycle 2), objectives, measures and reasons for not achieving good status	http://environment.data.gov.uk/catchment-planning/ManagementCatchment/1016	27/09/2016
WFD River Waterbody Catchments Cycle 2	http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue	22/09/2016 verified 01/2018
WFD River Water bodies Cycle 1	http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue	29/09/2016 verified 01/2018
Water wells	http://mapapps2.bgs.ac.uk/geoindex/home.html	27/09/2016 verified 01/2018

9.2.2 In addition to obtaining datasets from public domain sources associated with an OGL, the Environment Agency was also consulted to obtain relevant data and information associated with conditional licences⁴. Similarly, Natural England was also contacted to provide relevant data and information. This information is summarised in Table 9.2.

Table 9.2: Data and Information Provided by the Environment Agency and Natural England

Feature Title	Date Accessed
Environment Agency Risk of Flooding from Surface Water	22/09/2016 verified 01/2018
Environment Agency Risk of Flooding from Reservoirs	22/09/2016 verified 01/2018

⁴<https://www.gov.uk/government/publications/environment-agency-conditional-licence/environment-agency-conditional-licence> (accessed 30-09-2016)

Feature Title	Date Accessed
Environment Agency River flow and levels (15 minutes time step records)	22/09/2016
Environment Agency surface and groundwater abstractions	22/09/2016
Environment Agency Product 5 and product 7 (all EA flood models and supporting modelling reports)	Enquiry made on 27 July 2016. No data held by the Environment Agency
Environment Agency Groundwater Safeguard Zones (GSZ)	No GSZs within the Study Area
Geological Conservation Review (GCR) sites	No GCR sites within the Study Area
Groundwater levels	No data held by the Environment Agency

9.2.3 Barnsley Metropolitan Borough Council and the Peak District National Park Authority have also been consulted to request data on un-licensed abstractions from either surface or groundwater sources and private water supplies. However, at the time of writing neither organisations is aware of any such abstractions.

9.2.4 Site-specific surveys and data collection undertaken to support the water resources assessment are summarised in Table 9.3.

Table 9.3: Summary of Site-Specific Survey and Data Collection

Survey Type	Extent	Date(s) Undertaken
LiDAR DTM (Digital Terrain Model)	Downstream of Winscar reservoir until Whams Road	March 2017
Topographical survey of the River Don, its hydraulic structures and key tributaries	River Don from up stream of Dunford Road bridge until immediately downstream of its confluence with Wogden Clough; Clough Beck (also called Windleden Clough) from just downstream of Lower Windleden reservoir until its confluence with the River Don; Short Grain from downstream of the confluence with Long Grain until confluence with River Don and selected tributaries	March 2017

9.2.5 Additionally, Jeremy Benn Associates' (JBA) latest groundwater flooding data for the Proposed Project were obtained in June 2017.

Environmental Assessment Methodology

9.2.6 The water resources baseline environment has been established using the data sources listed above and by undertaking detailed flood modelling of the River Don and its key tributaries.

9.2.7 The methodology adopted for the water resources assessment is based on the approach outlined in Chapter 3 (Environmental Assessment Process) and Consultation. Impact prediction and assessment is based on a source-pathway-receptor approach using a mix of qualitative and quantitative approaches. The assessment also assumes the incorporation of embedded mitigation practices (embedded mitigation is listed in Chapter 2 (Project Description)). Additional mitigation measures are then outlined (where relevant) to address any significant adverse effects remaining after the implementation of the embedded mitigation applied to the Proposed Project. A summary of the residual effects that remain are then described in section 9.10.

9.2.8 A flowchart summarising the process is given in Appendix 9A and is described below.

Determining the significance of effects

9.2.9 The significance of the effect is formulated as a function of the receptor sensitivity and the magnitude of impact (change).

Sensitivity of receptors

9.2.10 Receptor classes have been defined as surface water resources, groundwater resources, hydromorphology, water quality (both surface and groundwater) and flooding and drainage. Water-related receptors were then listed, and a sensitivity value was then defined as falling into the following classes: high, medium, low, very low or uncertain. The receptor value criteria used in this assessment is presented in Table 9.4.

9.2.11 Further details of this assessment of receptor sensitivity are presented in Appendix 9B. The water receptors are described in more detail in Section 9.6.

9.2.12 In terms of identifying licenced abstractions that could potentially be impacted by the project, the following criteria were developed with which to either 'screen in' or 'screen out' these potential water receptors:

- Any groundwater and surface water abstractions located within the River Don WFD catchment⁵; and/or
- Any groundwater and surface water abstractions located respectively down-gradient or downstream of the Proposed Project.

⁵ 'Don from Source to Scout Dyke' WFD River Water Body Catchment Cycle 2

Table 9.4: Receptor Value Criteria

Receptor Value	Receptor Class				
	Surface Water Resources	Groundwater Resources	Hydromorphology	Water Quality	Flooding & Drainage
High	<p>A surface water feature that:</p> <p>a) is part of a, protected water-dependent ecosystem with an international, European or National designation.</p> <p>b) is part of a surface water body that has a WFD status of 'High' for the hydrological regime.</p> <p>c) is a licensed or unlicensed surface water abstraction site used for water supply or agriculture.</p>	<p>An aquifer or groundwater feature that:</p> <p>a) is part of a protected groundwater-dependent ecosystem with an International, European or National designation.</p> <p>b) is part of a groundwater WFD body that has a WFD status of 'Good' for the quantitative status</p> <p>c) is entirely or partially within a SPZ1 or inner source protection buffer zone of a public water supply</p> <p>d) is a licensed or unlicensed groundwater abstraction site used for water supply or agriculture</p>	<p>A surface water feature that:</p> <p>a) is part of a protected ecosystem sensitive to hydromorphological changes with International, European or National designation.</p> <p>b) is part of a surface water body that has a WFD status of 'High' for the hydromorphological supporting elements or the morphology status</p>	<p>A surface water feature that:</p> <p>a) is part of a protected ecosystem sensitive to water quality changes with an International, European or National designation.</p> <p>b) has 'High' or 'Good' 'current WFD physico-chemical quality elements status</p> <p>c) is a licensed or unlicensed surface water abstraction site used for water supply or agriculture.</p> <p>An aquifer or groundwater feature that:</p> <p>a) is a principal aquifer or secondary A aquifer with 'Good' current WFD chemical status</p>	<p>Is a surface water feature or an area that is either part of:</p> <p>a) an Environment Agency Flood Zone 3 (rivers and seas)</p> <p>b) a zone at risk of groundwater flooding</p> <p>c) a zone at 'High' risk of surface water flooding</p> <p>Or is a water feature with high sensitivity to flooding and drainage changes, such as:</p> <p>a) Internal Drainage Board Areas or Critical Drainage Areas</p> <p>b) Main Rivers, Critical Drainage Infrastructure, Flood Defences or Flood Alleviation Schemes</p>

Receptor Value	Receptor Class				
	Surface Water Resources	Groundwater Resources	Hydromorphology	Water Quality	Flooding & Drainage
				<p>b) is entirely or partially within the modelled 'Inner' source protection zone (SPZ1) of a public water supply</p> <p>c) is a licensed or unlicensed groundwater abstraction site used for water supply or agriculture or located within a SPZ1.</p>	c) Highly and More Vulnerable Land Uses
Medium	<p>A surface water feature that:</p> <p>a) is part of a protected water-dependent ecosystems with regional or local importance.</p> <p>b) is part of a surface water body that has a WFD status of 'Supports Good' for the hydrological regime.</p>	<p>An aquifer or groundwater feature that:</p> <p>a) is part of a protected groundwater dependent ecosystem, with regional or county level designations or local ecological importance</p> <p>b) is entirely or partially within the modelled 'outer' source protection zone (SPZ2)</p>	<p>A surface water feature that:</p> <p>a) is part of a protected ecosystem sensitive to hydromorphological changes with regional and local designations.</p> <p>b) is part of a surface water body that has a WFD status of 'Supports Good' for the hydromorphological supporting elements or the morphology status.</p>	<p>A surface water feature that:</p> <p>a) is part of a protected ecosystem sensitive to water quality changes with regional and local designations.</p> <p>b) has 'Moderate' current WFD physico-chemical quality elements status.</p> <p>c) is a licensed or unlicensed surface</p>	<p>Is a surface water feature or an area that is either part of:</p> <p>a) an Environment Agency Flood Zone 2 (rivers and seas)</p> <p>b) a zone of 'Medium' risk of surface water flooding.</p> <p>Or is a water feature with moderate sensitivity and importance to flooding</p>

Receptor Value	Receptor Class				
	Surface Water Resources	Groundwater Resources	Hydromorphology	Water Quality	Flooding & Drainage
	c) is a licensed or unlicensed surface water abstraction site used for amenity activities, production of energy or environmental purposes.	<p>of a public water supply or the modelled 'Total Catchment' source protection zone (SPZ3) of a public water supply.</p> <p>c) is a licensed or unlicensed groundwater abstraction site used for amenity activities, production of energy or environmental purposes</p>		<p>water abstraction site used for amenity activities, production of energy or environmental purposes</p> <p>An aquifer or groundwater feature that:</p> <p>a) is a secondary B aquifer with 'Good' current WFD chemical status</p> <p>b) is a principal or secondary A aquifer with 'Poor' current WFD chemical status</p> <p>c) is entirely or partially within SPZ2 of a public water supply or the modelled 'Total Catchment' SPZ3 of a public water supply.</p> <p>d) is a licensed or unlicensed</p>	<p>and drainage changes, such as:</p> <p>a) Ordinary Watercourses (i.e. non-Main Rivers), Non-critical drainage infrastructure and Less Vulnerable Land Uses</p> <p>b) Regional surface water drainage networks</p>

Receptor Value	Receptor Class				
	Surface Water Resources	Groundwater Resources	Hydromorphology	Water Quality	Flooding & Drainage
				groundwater abstraction site used for amenity activities, production of energy or environmental purposes or located within a SPZ2 or SPZ3	
Low	<p>A surface water feature that:</p> <p>a) is part of a surface waterbody that has a WFD status of 'Does not Support Good' for the hydrological regime</p> <p>b) is a licensed or unlicensed surface water abstraction site used for other purposes (than those listed above).</p>	<p>An aquifer that:</p> <p>a) is part of a groundwater WFD body that has a WFD status of 'Poor' or 'Bad' for the quantitative status</p> <p>b) is a licensed or unlicensed groundwater abstraction site used for other purposes (than those listed above).</p>	<p>A surface water feature that:</p> <p>a) is part of a surface water body that has a WFD status of 'Does not Support Good' for the hydromorphological supporting elements or the morphology status</p> <p>b) has a hydromorphological designation of 'Heavily Modified' under WFD</p>	<p>A surface water feature that:</p> <p>a) is a licensed or unlicensed surface water abstraction site used for other purposes (than those listed above).</p> <p>An aquifer or groundwater feature that:</p> <p>a) is a secondary undifferentiated aquifer with 'Good' current WFD chemical status</p> <p>b) is a secondary B or secondary undifferentiated aquifer</p>	<p>Is an area that is either part of:</p> <p>a) An area outside Environment Agency Flood Zones 2 and 3 (rivers and seas)</p> <p>b) Is an area outside a zone at risk of groundwater flooding</p> <p>c) Has a 'Low' risk of surface water flooding</p> <p>Or is a water feature with limited sensitivity or importance to flooding and drainage changes, such as:</p> <p>a) Water-compatible land uses</p>

Receptor Value	Receptor Class				
	Surface Water Resources	Groundwater Resources	Hydromorphology	Water Quality	Flooding & Drainage
				<p>with 'Poor' current WFD chemical status</p> <p>c) is a licensed or unlicensed groundwater abstraction site used for other purposes (than those listed above).</p>	b) Local surface water drainage networks
Very Low	None of the above	None of the above	None of the above	<p>A surface water feature not meeting the above criteria.</p> <p>An aquifer or groundwater feature that is an aquifer classified as unproductive not meeting the above criteria.</p>	Not applicable
Uncertain	No available information on status	No available information on status	No available information on status	No available information on status	No available information on status

Magnitude of Impact

- 9.2.13 The criteria presented in Table 9.5 have been used to define the magnitude of each potential impact.

Table 9.5: Definition of Magnitude of Impact

Magnitude of Impact	Definition
High	Irreversible or long term (over 10 years) changes.
Medium	Moderate changes from which the receptor will recover over a medium period of time (5–10 years).
Low	A slight change where the proposals could occasionally cause minor changes from which the receptor will recover in the short term (1–5 years).
Very Low	No effect detectable.
Beneficial	Change is likely to have a beneficial impact.

Significance of Effect

- 9.2.14 The significance of the effect of the Proposed Project is quantified through comparison of the value of the receptor and the potential magnitude of impact upon it, in accordance with the matrix presented in Table 9.6.

Table 9.6: Classification of Effect

Receptor Value	Magnitude of Impact			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

- 9.2.15 This methodology has been applied for each element of the Proposed Project as follows:

During Construction

- Trans Pennine Trail Diversion – Subject to Planning Application;
- Sealing End Compound – Subject to Planning Application;
- Access Point 7 and Northern Access Road – Subject to Planning Application;
- 400kV Cable (Undergrounding);
- Removal of Existing Infrastructure (VIP subsection);
- Construction of replacement Pylon 4ZO157R; and,
- Temporary Elements.

During Operation

- Sealing End Compound – Subject to Planning Application;
- 400kV Cable (Undergrounding); and
- Removal of Existing Infrastructure (VIP subsection).

During Decommissioning

- Sealing End Compound – Subject to Planning Application; and
- 400kV Cable (Undergrounding).

The results are presented in Appendices 9C (Trans Pennine Trail diversion), 9D (SEC), 9E (400kV Cable), 9F (Removal of Existing VIP OHL subsection), 9G (Construction of Replacement Tension Pylon 4ZO157R) and 9H (Temporary elements). Impacts for the northern access road are the same as those assessed for temporary elements in Appendix 9H and therefore are represented within Appendix 9H.

Flood Risk Assessment

- 9.2.16 The Flood Risk Assessment (FRA) undertaken to determine flood risks to or from the Proposed Project and any mitigation which may be required, has been prepared to be compliant with the National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government (DCLG), 2019) and Planning Practice Guidance (DCLG, 2014). The FRA is submitted as a technical appendix to this Environmental Assessment Report (Appendix 9I), although flood risk impacts are also considered in this chapter.
- 9.2.17 In addition to the FRA, a Sustainable Drainage Systems (SuDS) Statement has been prepared. The SuDS Statement draws on information contained in the FRA and provides a description of the SuDS proposed and the reasons why they are the most suitable for the Proposed Project. The SuDS Statement is submitted as a technical appendix to this chapter (Appendix 9J).
- 9.2.18 A site walkover was conducted on 24 November 2016 and a related photographic log is presented in Appendix 9K.

Flood Modelling Methodology – River Don

- 9.2.19 A detailed flood modelling exercise of the River Don has been undertaken to support the FRA. The flood model used is a fully linked 1D-2D hydraulic model (ISIS-TUFLOW). The flood modelling involved the completion of a topographical survey of the River Don, its hydraulic structures and key tributaries. The flood model also makes use of LiDAR Digital Terrain Model (DTM) data available for the Proposed Project.
- 9.2.20 Figure 9.1 shows the flood modelling outputs for a 1 in 100 year + Climate Change flood event. The Proposed Project is represented in the flood model using a uniform 'grid'. Each grid 'cell' is 2m by 2m in size and has an associated ground level in mAOD (taken from the LiDAR DTM). The blue shading on Figure 9.1 indicates where flooding occurs. Each 2m by 2m grid cell that is shown to flood is colour coded a particular shade of blue. Those cells that do not experience flooding have no colour (i.e. only the underlying OS data is shown in these cells). So, for every 2m by 2m cell that is shaded a blue colour, the flood model can provide the following information:
- Flood level (mAOD);

- Flood depth (m);
- Flood velocity (m/s); and
- Flood Hazard (this is an index of the risk to people that follows DEFRA guidance and is based on a combination of depth, velocity and the potential for the water to carry debris; based on DEFRA reports FD2320/2321).

9.2.21 The flood model is 'hydrodynamic', which means that the results for each cell varies over time as the flood event starts, peaks and ends (the flood mapping referenced here, however, only shows the peak values in each cell to show maximum levels that can be generated).

9.2.22 The detailed flood mapping results have been used to support the Proposed Project in the following ways:

- To design the diverted Trans Pennine Trail so that it is located outside of the 1:100-year flood outline wherever possible. However, the Trans Pennine Trail Diversion crosses the 1 in 100-year + CC flood outline in a few instances, which are (1) at the first crossing with River Don, where the permanent bridge (bridge 1) will be installed, (2) about 100m East of the permanent bridge (bridge 1), a section of approximately 100m of the Trans Pennine Trail Diversion is located within the 1 in 100-year + CC flood outline – the presence of a steep embankment on the northern side of the Trans Pennine Trail diversion restricts available space to reroute the Trans Pennine Trail Diversion outside the flood zone and explains the crossing with the 1 in 100-year + CC flood outline; and (3) at the second crossing with River Don, where the temporary bridge (bridge 2) will be installed. This correlates with the Flood Map for Planning;
- To provide information on frequency of flooding, flood depth, velocity and hazard to people for any element of the Proposed Project that interacts with the flood risk areas;
- Help to safely design temporary bridge crossings and also other areas of the Proposed Project that cannot avoid flood risk areas;
- To assess the impact of the diverted Trans Pennine Trail on the floodplain of the River Don;
- Provide information on construction phase flood risk and health and safety considerations for construction staff;
- Help to reduce the environmental impact of construction, operational and decommissioning phase activities;
- Provide information to support the planning application and also any subsequent land drainage consents that may be required for the temporary/permanent bridge crossings over the River Don; and
- Help to answer questions raised by potential users of the diverted Trans Pennine Trail e.g. during public consultation events.

9.3 Uncertainty and Technical Difficulties Encountered

9.3.1 Groundwater levels were requested from the Environment Agency, however, the Environment Agency confirmed that no nearby records are available. This data would have formed part of the groundwater baseline dataset to predict any potential spatial, temporal and qualitative changes in groundwater levels during the construction, operation and decommissioning of the Proposed Project. As a result, the assessment of impacts to groundwater, or from potential groundwater flooding,

has relied on other groundwater information, such as ground investigation borehole data, Jeremy Benn Associates' (JBA) latest groundwater flooding data and results from flood model of River Don.

9.4 Consultation Undertaken

- 9.4.1 As part of the scoping phase of the Environmental Assessment, a Scoping Report (National Grid, July 2016) was prepared and submitted to Barnsley Metropolitan Borough Council and the Peak District National Park Authority. The information and advice received during the scoping process with regard to Water Resources is summarised in Table 9.7.

Table 9.7: Consultation Responses

Date	Consultee	Summary of Issues	Section where comment addressed
Scoping opinion consultation responses			
08 September 2016	Environment Agency (via Barnsley Metropolitan Borough Council)	<p>The River Don is an ordinary watercourse - the Lead Local Flood Authority (Barnsley MBC) should be consulted on the report.</p> <p>Schemes within ordinary water courses require a Land Drainage Consent under the Land Drainage Act 1991 (amended in 1994 and Flood and Water Management Act, 2010).</p> <p>From a groundwater perspective the EA accept the findings and recommendations within the submitted report.</p> <p>From a water resources perspective, the EA are satisfied with the content of the Scoping report and would like to make the following comments: Chapter 8 - EA support the report's consideration of the potential impacts and mitigation measures to the water course, existing abstractors, water quality and the surrounding area and their obligations under the WFD.</p> <p>Paragraph 8.11 – EA confirm the waterbody overall WFD classification is Moderate (Cycle 2, 2015 classification). The waterbody fails for fish, invertebrates and Mitigation Measure Assessment.</p> <p>Paragraph 8.15 – EA support the report's consideration of existing abstractors.</p>	Section 9.9.7

Date	Consultee	Summary of Issues	Section where comment addressed
		Paragraph 8.20 – Reference is made to the ‘Impact on the hydrology and flow conveyance of watercourses due to temporary bridge crossings (associated with access), which might increase the risk of blockage or constriction to flows...’ The applicant should note that if they intend to impound a watercourse, ditch or stream they are likely to need to apply to EA for an Impoundment License. 8.28 – EA support the report’s inclusion and consideration of the potential for WFD waterbody deterioration and the potential for the waterbody from being prevented from achieving good status. For information - the waterbody ‘Don from source to Scout Dyke’ at Location: SE1664402615 GB104027057500 fails for fish, invertebrates and Mitigation Measure Assessment.	
17 March 2017	Barnsley Metropolitan Borough Council	Drainage: Officers are satisfied that the scope of the proposed chapter on Water Resources would adequately address their considerations.	Not applicable
July 2016	Peak District National Park Authority	No specific comments for water resources were raised.	Not applicable

9.4.2 Consultation undertaken with respect to water resources has also included data and information requests submitted to the following organisations:

- Environment Agency;
- Natural England;
- Barnsley Metropolitan Borough Council; and
- Peak District National Park Authority.

9.5 Statutory and Planning Context

Legislation

9.5.1 Legislation relevant to the control and protection of water resources and the provision of flood risk management is presented in Table 9.8. A number of specific regulations exist to implement the statutory European and national legislation into law as set out in Table 9.8.

Table 9.8: Legislation and regulations relevant to the control and protection of water resources and the provision of flood risk management

Legislation	Related regulation
The EU Water Framework Directive (WFD) (2000/60/EC) - The WFD is intended to bring surface and groundwater bodies up to a condition where their potential to support healthy ecosystems is maximized.	The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
The EU Floods Directive (2007/60/EC) - The EU Floods Directive required the assessment of all watercourses to determine if they are at risk of flooding; the mapping of flood extents, including assets and humans at risk in these areas; and the implementation of adequate and coordinated measures to reduce the flood risk.	The Flood Risk Regulations 2009
The Water Resources Act 1991 (as amended) - The Water Resources Act 1991 regulates water resources, water quality and pollution, and flood defence. It provides the general structure for the management of water resources, explains the standards expected for controlled waters and defines water pollution, and provides information on mitigation through flood defence.	The Water Resources Act (Amendment) (England and Wales) Regulations 2009 Water Supply (Water Quality) Regulations 2018 The Groundwater Regulations (England and Wales) 2009
The Water Act 2003, and 2014.	
The Environment Act 1995.	The Environmental Permitting (England and Wales) Regulations 2016
The Environmental Protection Act 1990.	The Anti-Pollution Works Regulations 1999 The Control of Pollution (Oil Storage) (England) Regulations 2001 The Environmental Damage Regulations 2009
The Land Drainage Act 1991 and 1994.	
The Flood and Water Management Act 2010.	

- 9.5.2 The protection of water quality, quantity and flood risk management is regulated by the Environment Agency in England or the Lead Local Flood Authority in cases where the watercourse is classed as an 'ordinary watercourse'.

9.5.3 The Water Framework Directive (WFD) is a European Directive driving legal requirements to protect and improve the water environment. Physical works have the potential to impact WFD receptors like modify watercourses, flow or quality of water, sediment and vegetation. The WFD receptors directly relevant to water resources include:

- Water quality receptors especially the physico-chemical elements of water quality; and
- Physical habitat receptors related to hydromorphology including the physical processes creating new habitat.

9.5.4 Other WFD receptors (e.g. fish, invertebrates) are specifically related to ecology and as such are not covered in this chapter.

Policy

9.5.5 The main policy frameworks relating to planning and flood risk are outlined in the NPPF and its Technical Guide, in addition to the supporting Planning Practice Guidance⁶.

Local Planning Policy

9.5.6 The planning application for the Proposed Project is accompanied by a Planning Statement which considers the extent to which the proposed development complies with the following local planning policy:

- Barnsley Local Plan (BMBC, January 2019);
- Peak District National Park Authority Local Development Framework Core Strategy Development Plan Document (PDNPA, 2011); and
- Peak District National Park Authority Development Management Policies: Part 2 of the Local Plan (2019).

9.5.7 Barnsley Metropolitan Borough Council is the Lead Local Flood Authority, responsible for managing flood risk from local sources such as ordinary watercourses (not main rivers), surface water and groundwater. Its Local Flood Risk Management Strategy⁷ (September 2017) sets out its vision for managing local flood risk across the Barnsley area and includes, in the context of this Environmental Assessment, that all development over 1 hectare and any development within flood risk areas will be supported where it:

- Provides a FRA;
- Will be safe from all forms of flooding and does not increase flood risk elsewhere;
- Considers the use of SuDS where appropriate;
- Facilitates the maintenance of flooding and drainage infrastructure; and
- Ensures that mitigation measures, such as SuDS, can be maintained over the project lifetime.

⁶ <https://www.gov.uk/government/collections/planning-practice-guidance>

⁷ <https://www.barnsley.gov.uk/media/7196/flood-risk-management-strategy.pdf>

9.6 Existing Environment

Surface Water Features

Rivers and streams

- 9.6.1 The River Don passes through the Study Area, flowing west to east from Winscar reservoir. At this location, the River Don is classed as an ordinary watercourse, only becoming a main river after passing beneath the A628 at Millhouse Green approximately 1.7km to the east of the Proposed Project.
- 9.6.2 There are a number of small tributaries that flow into the River Don, mainly from the south. These include Smallden Clough, Clough Beck, Long Grain including its tributary Short Grain, and Wodgen Foot. These streams, with the exception of Smallden Clough, are culverted under the Trans Pennine Trail before flowing into the Upper Don. Smallden Clough is culverted under Dunford Bridge. Town Brook flows from the north into the River Don.
- 9.6.3 To the east of the Study Area and the A6106, the Sledbrook Dike joins the River Don. After this, the River Don flows generally in an easterly direction, passing to the south of the village of Millhouse Green.
- 9.6.4 Many drains (small streams), plus 'issues' and 'grains' (i.e. natural channels or fissures in a peat moor), flow in a northerly direction into the River Don, from Thurlstone Moors. These streams are culverted under the Trans Pennine Trail. Small streams, plus 'issues' and 'sinks' also flow in a southerly direction into the River Don, from Sand Ridge and Cocker Edge, through farmland adjacent to the river and around Town Head.
- 9.6.5 A waterfall feature is present along the Trans Pennine Trail, which has been highlighted as locally important from an aesthetic viewpoint. This waterfall is shown in the photographic log in Appendix 9K.
- 9.6.6 Surface water resources receptors closer to the site boundary are shown in Figure 9.2.

Lakes and ponds

- 9.6.7 There are 11 ponds located within the Study Area that have been surveyed by ecologists, which are presented in Table 9.9 and shown in Figure 9.2. No lakes have been identified within the Study Area. Additional ponds identified from desktop survey within the Study Area are also shown in Figure 9.2.

Table 9.9: Ponds within the Study Area

Pond location	Coordinates
Pond at Rolly Holme	X=417,554; Y=402574
Pond at Castle Hill	X=417,787; Y=402,886
Pond South of Winscar reservoir	X=415,689; Y=402,379
Pond 1 near Woodhead Tunnels (disused)	X=415,517; Y=402,281
Pond 1 near Woodhead Tunnels (disused)	X=415,494; Y=402,255

Pond location	Coordinates
Pond at Townhead	X=416,663; Y=402,767
Pond 1 at Dunford Bridge	X=415,736; Y=402,253
Pond 2 at Dunford Bridge	X=415,723; Y=402,241
Pond 3 at Dunford Bridge	X=415,770; Y=402,261
Pond along Smallden Clough	X=415,136; Y=401,845
Pond at confluence between Wodgen Foot and River Don	X=418,374; Y=402,747

Canals and artificial water bodies

- 9.6.8 There are a number of impounding reservoirs located in the west of the Study Area. These are the Snailsden and Harden reservoirs on the northern tributary of the River Don, the Winscar reservoir, which is on the River Don itself, and the Upper and Lower Windleden reservoirs located on a southern tributary of the River Don.
- 9.6.9 The above mentioned reservoirs are operated by Yorkshire Water Services Limited and have a significant impact on river flows entering the Study Area from the west.
- 9.6.10 There are no canals within the Study Area.

Hydraulic Connection with Designated Nature Conservation and Local Wildlife Sites

- 9.6.11 There are three statutory designated nature conservation sites within the Study Area namely the Peak District Moors (South Pennine Moors Phase 1) Special Protection Area (SPA), the South Pennine Moors Special Area of Conservation (SAC) and the Dark Peak Site of Special Scientific Interest (SSSI), all of which are shown in Figure 9.2. The South Pennine Moors SAC and the Dark Peak SSSI are designated due to the presence of blanket mires, peat bogs and dry and wet heaths and are as such anticipated to potentially interact hydrologically and hydrogeologically with the Proposed Project. The Peak District Moors (South Pennine Moors Phase 1) SPA is designated due to its bird assemblage at this site and as such is not anticipated to interact hydrologically with the Proposed Project.
- 9.6.12 Additionally, Wodgen Foot Local Wildlife Site (LWS) is also located within the Study Area.
- 9.6.13 Chapter 7 (Ecology), provides further details regarding these designated conservation sites.

River water body WFD status and objectives

- 9.6.14 The Study Area is located in the upper valley of the River Don. This valley is itself located within the 'Don from Source to Scout Dyke' WFD surface water body, which is also part of the Upper Don operational catchment. The current overall WFD status and objective for this surface water body is presented in Table 9.10 and Figure 9.3.
- 9.6.15 The 'Don from Source to Scout Dyke' surface water body currently has "Moderate" potential assessments for invertebrates and fish as separate biological quantitative elements, resulting in "Moderate" ecological and overall potential. For invertebrates, the cause of the Moderate designation is suspected to be intermittent sewage discharges, which cause organic pollution. The reason for the Moderate designation

for fish is likely to be due to the fact that the River Don is heavily modified with many impounding reservoirs.

Table 9.10: WFD Status and Objectives for the River Water Bodies

Watercourse Name: <i>'Don from Source to Scout Dyke'</i>	WFD Status and Objectives
Current Overall Status	Moderate
Overall Status Objective	Good by 2027
Current Ecological Status/Potential (for Heavily Modified water body)	Moderate
Ecological Status Objective	Good by 2027
Hydromorphological Supporting Elements	Not assessed (2015 WFD data) – Does not support High status (2014 WFD data)
Current Chemical Status	Good
Chemical Status Objective	Good
Hydrological Regime Status	Not assessed (2015 WFD data) – Supports Good (2014 WFD data)
Physico-Chemical Status	Good

Notes (1) The water body of interest is designated as a Heavily Modified Water Body

Surface water abstractions (licensed)

- 9.6.16 A summary of licensed surface water abstractions obtained from the Environment Agency for the Study Area is presented in Table 9.11. Four licences are located within the 'Don from Source to Scout Dyke' catchment, as presented in Figure 9.4. Due to the sensitivity of abstraction location information, Figure 9.4 displays the abstraction locations to at the nearest 1km grid corner, not the actual abstraction location. This shows several surface water abstraction locations linked with the impounding reservoirs referred to earlier in Paragraph 9.6.8. These are all associated with licence reference 2/27/05/026 for public water supply by Yorkshire Water Services Limited. Licence references NE/027/0005/007 and NE/027/0005/006 are located outside the Site Boundary (i.e. 1.4km and 1.7km to the east respectively) and are assumed to be related to the non-potable use of water abstracted from the River Don for the purposes of electricity production. Two abstractions under licence reference 2/27/10/090(S) are located next to Hepworth Ceramics, also outside the Site Boundary (i.e. 1.4km and 1.6km respectively to the north), although abstraction rates for which were not provided by the Environment Agency.
- 9.6.17 There are no records of unlicensed surface water abstractions located within the Study Area.

Table 9.11: Summary of Surface Water Abstractions (within the ‘Don from Source to Scout Dyke’ catchment)

Licence Reference	Licenced Amount (m ³)		Description
	Annual	Daily	
2/27/05/026	1,0140,000	38,640	Public Water Supply - Potable Water Supply - Storage
2/27/10/090(S)	No data	No data	Metal - General Use Relating To Secondary Category (Medium Loss)
NE/027/0005/006	12,960,000	51,840	Electricity - Transfer Between Sources (Post Water Act 2003)
NE/027/0005/007	12,960,000	51,840	Electricity - Transfer Between Sources (Post Water Act 2003)

Groundwater Features

Geology and aquifers

- 9.6.18 Details on the geology within and neighbouring the Study Area can be found in Chapter 10 (Geology, Soils and Contaminated Land). With respect to aquifers within and neighbouring the Study Area (see Figure 10.2 and Figure 10.3), there are “Secondary A” bedrock and superficial aquifers associated with the Millstone Grit Group.

Groundwater WFD status and objectives

- 9.6.19 The current overall WFD status and objectives for the groundwater body associated with the Study Area are presented in Table 9.12 and Figure 9.5. The ‘Don & Rother Millstone Grit & Coal Measures’ groundwater body currently has “Poor” chemical status and consequently “Poor” overall status. This is due to the presence of an abandoned coal mine, which causes “Poor” chemical status of surface water inputs to the WFD groundwater body⁸ (Environment Agency, 2019).

Table 9.12: WFD Status and Objectives of the Groundwater Body

Groundwater Body Name: ‘Don & Rother Millstone Grit & Coal Measures’	WFD Status and Objectives
Current Overall Status	Poor
Overall Status Objective	Good by 2027
Quantitative Status	Good

⁸ <https://environment.data.gov.uk/catchment-planning/OperationalCatchment/1065/Summary>

Groundwater Body Name: <i>'Don & Rother Millstone Grit & Coal Measures'</i>	WFD Status and Objectives
Quantitative Status Objective	Good by 2015
Quantitative Dependent Surface Water Body Status	Good
Current Chemical Status	Poor
Chemical Status Objective	Good by 2027

Groundwater abstractions (licenced)

- 9.6.20 The Study Area covers a Secondary A aquifer. Secondary A aquifers are described by the Environment Agency as “permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers”. Given this definition and the general geological dip to the east, it is likely that groundwater flow is generally along the valley and toward the River Don, with little flow likely between valleys. Therefore, licenced groundwater abstractions located within the River Don surface water catchment are considered in this assessment.
- 9.6.21 A summary of licenced groundwater abstractions obtained from the Environment Agency is presented in Table 9.13 and shown in Figure 9.4. Due to the sensitivity of abstraction location information, Figure 9.4 displays the abstraction locations to at the nearest 1km grid corner, not the actual abstraction location. There are five groundwater abstraction licences located within the Study Area. Licence references 2/27/10/090(G) and 2/27/10/091 with annual abstraction rates of 272760m³ and 20457m³ respectively are located 1.2km and 2.1km north of the Site Boundary, and are held by the Hepworth Pipe Company Limited. Licence NE/027/0005/016 is located 1.3km north of the Site Boundary and is held by R. Plevin & Sons Limited. Finally, licence references NE/027/0005/008 and NE/027/0005/010 are located 1.7km and 1.6km to the east of the Site Boundary respectively and used for heat pumping.

Table 9.13: Summary of Groundwater Water Abstractions (within the *'Don from Source to Scout Dyke'* catchment)

Licence Reference	Licenced Amount (m ³)		Description
	Annual	Daily	
2/27/10/090(G)	272760	909.2	Metal - General Use Relating To Secondary Category (Medium Loss)
2/27/10/091	20,457	90.92	Metal - Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Metal - General Use Relating To Secondary Category (Medium Loss)
NE/027/0005/008	15,500	50	Paper And Printing - Heat Pump

Licence Reference	Licenced Amount (m ³)		Description
	Annual	Daily	
NE/027/0005/010	12,000	100	Private Water Supply - Heat Pump
NE/027/0005/016	10,000	40	Refuse And Recycling - Dust Suppression

- 9.6.22 A small number of wells and springs are mapped within or neighbouring the Study Area, although there are no records of unlicensed groundwater sources located within the Study Area.

Safeguard Zones (SGZ) and Source Protection Zones (SPZs)

- 9.6.23 There are no Source Protection Zones (SPZ) or Safeguard Zones (SGZ) within the Study Area.

Hydromorphology Features

Hydromorphology setting

- 9.6.24 The Study Area is located within an enclosed gritstone upland of the Dark Peak Yorkshire Fringe of the Peak District National Park⁹. This landscape is associated with high, gently undulating gritstone uplands, in places rising steeply to higher open moorlands. The underlying bedrock is Millstone Grit and is often exposed as rock outcrops, particularly on the steeper slopes where it sometimes forms small gritstone edges. Towards the east there are outcrops of Coal Measures, including interbedded sandstones and shales and some seams of coal.
- 9.6.25 The hydromorphology of the Don valley (within which the Study Area is located) is typical of Millstone Grit uplands. The valley itself is relatively narrow and steeply incised in places with a floodplain that is confined in extent as a result. The valley sides rise sharply within the Study Area, before meeting plateaux to both the north and south.
- 9.6.26 The upstream presence to the west of the Study Area of impounding reservoirs has had a significant impact on the hydrological regime of the River Don, although field observations confirm that both the channel and floodplain are in places still morphologically active.
- 9.6.27 No Geological Conservation Review sites are present within the Study Area.

Hydromorphology WFD status and objectives

- 9.6.28 The 'Don from Source to Scout Dyke' surface water body is classified as a heavily modified water body, given the upstream presence of the impounding reservoirs noted in Paragraphs 9.6.8 and 9.6.9.
- 9.6.29 The WFD related hydromorphology status of this surface water body is presented in Table 9.14. This shows that the WFD hydromorphological supporting elements were not assessed for this water body in the 2015 Cycle 2 WFD assessment and that there are no associated objectives. However, in previous assessments in 2010, 2011, 2012 and 2014 this element did not supported High Status.

⁹http://www.peakdistrict.gov.uk/__data/assets/pdf_file/0006/90825/landscape-strategy-yorkshire-fringe.pdf

Table 9.14: Surface water bodies Hydromorphology related WFD Status and Objectives

Watercourse Name: 'Don from Source to Scout Dyke'	WFD Status and Objectives
Hydromorphological Supporting Elements Status	Not assessed
Hydromorphological Supporting Elements Objective	Not Assessed by 2015
Hydrological Regime Status	Not assessed
Hydrological Regime Objective	There is no information available on the objective
Morphology Status	Not assessed
Morphology Objective	There is no information available on the objective

Flooding and Drainage

Flood Risk for Planning – Environment Agency Flood Zone 2 (Medium Probability) and Flood Zone 3 (High Probability) flood extent¹⁰

- 9.6.30 The extent of the Environment Agency flood risk zones within the Study Area is presented in the 'Flood Map for Planning' shown on Figure 9.6. This shows that Flood Zones 2 and 3 are present along the River Don.

Flood Risk – from Surface Water¹¹

- 9.6.31 The Environment Agency's Flood Map for Surface Water is presented in Figure 9.7. This figure shows the potential risk of flooding from direct rainfall, where rainwater can pond and flow under a range of storm events.

Flood Risk – from Reservoirs¹²

- 9.6.32 The risk of flooding associated with failure of the local reservoirs is presented in Figure 9.8. This map shows the extent of flooding from such failures, and has been

¹⁰ The EA definitions of flood zones (<http://apps.environment-agency.gov.uk/wiyby/37837.aspx>) are as follows:

- Flood Zone 3 (High Probability) shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded: from the sea by a flood that has a 0.5 per cent (1 in 200) or greater chance of happening each year; or from a river by a flood that has a 1 per cent (1 in 100) or greater chance of happening each year.
- Flood Zone 2 (Medium Probability) shows the additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year.

Where there is no blue shading, this shows the area where flooding from rivers and the sea is very unlikely. There is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year. The majority of England falls within this area. (For planning and development purposes, this is Flood Zone 1).

¹¹ The Flood Map for Surface Water assesses flooding scenarios as a result of rainfall. The national scale model uses a detailed model of the ground to see where rain water flows and ponds, taking account of a range of storm durations, infiltration into the ground, hydraulics, and, in broad terms, subsurface drainage. (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297432/LIT_8988_0bf634.pdf).

¹² Dam breach and flood modelling techniques were used to produce a national set of reservoir flood maps for England and Wales. The maps were created showing how far flood water would spread from the reservoir in a worst case scenario so that

prepared to support emergency planning by the emergency services and local authorities.

Flood Risk – from Groundwater

- 9.6.33 The risk of groundwater flooding associated with rising groundwater is presented in Figure 9.9. This shows the potential for groundwater flooding along the Don valley. Within this zone, there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographical low spots.

Detailed Flood Modelling Outputs – River Don

- 9.6.34 Figure 9.1 shows the flood modelling outputs produced by Stantec as part of the detailed flood modelling of the River Don undertaken to inform the accompanying FRA. The shade of blue used denotes the relative magnitude of the depth of flooding (e.g. lighter blues tend to indicate lower flood depths, darker blues indicate greater flood depths).

Other drainage and/or flooding issues

- 9.6.35 No other drainage issues have been identified

9.7 Key Parameters for Assessment

Embedded Mitigation Relevant to Water Resources

- 9.7.1 Overall embedded mitigation measures for the Proposed Project are presented in Chapter 2 (Project Description), with those relevant to water resources during the construction phase presented Table 9.15 below. Table 9.16 lists the embedded mitigation measures relevant to water resources during the operational phase and gives an example of the potential impacts addressed by the embedded mitigation.

emergency services and councils have all the information they need to put plans in place to protect people. These maps do not provide an estimate of the likelihood of flooding. (<https://www.gov.uk/government/news/reservoir-flood-maps-published>).

Table 9.15: Embedded mitigation during construction

Embedded mitigation	Example of potential impact addressed by the mitigation
A Construction Environmental Management Plan (CEMP) will be prepared and used to manage environmental impacts during construction; this will include measures for controlling dust and general pollution from construction operations to the surface and groundwater environments and details of the approach to soil management to ensure protection, conservation and reinstatement of soil material, its physical and chemical properties and functional capacity for its intended end use	Applicable to all impacts on the water resources receptors
Appropriate industry best practice and published guidelines will be followed to reduce pollutant and sediment movement during construction	Contamination of surface water and groundwater
Suitable precautions will be taken to prevent spillages from equipment containing small quantities of hazardous substances	Contamination of surface water and groundwater
All fuel and chemical storage will comply with relevant storage regulations, including being fully bunded and located at least 10m from any watercourse and 50m from any borehole or well	Contamination of surface water and groundwater
Work will stop in the vicinity of any previously unidentified contamination if encountered until the nature and concentration of the contaminant(s) are determined and appropriate risk control measures implemented (See also Chapter 10 (Geology, Soils and Contaminated Land) for the range of measures and precautions)	Contamination of surface water and groundwater
All construction equipment will be maintained in good working order	Contamination of surface water and groundwater due to hydrocarbon leakage from construction equipment
Construction will not be undertaken during extreme wet weather where erosion of sediments and risk from flooding may increase and where there is a risk of structural damage to soils during handling	Increased volume and rate of surface runoff generated/ Increased soil erosion leading to sediment impacts on water quality

All soils will be stored as far away from watercourses as practical and any potentially contaminated soil will be stored on an impermeable surface and covered to reduce leachate generation and potential migration to surface waters.	Accessible sediment supply and mobilisation of existing soil based contaminants, if present, for high velocity flows affecting flood risk
Following completion of construction operations, all agricultural land will be restored to its previous condition unless otherwise specified.	Modified hydrological connectivity affecting flood risk (e.g. natural flow path blocking/diversion as a result of above ground assets, temporary drainage systems, underground assets or ground stockpiling, opening up of new flow pathways)
Deep excavations may require de-watering. Water pumped or removed from excavations will be passed through a silt-separator tank or equivalent, and discharged to ground. If there was a requirement to discharge to surface water a permit would be sought from the Environment Agency prior to undertaking such operations	Reduced infiltration and risk of sediment runoff entering watercourses
Clay bungs or other vertical barriers will be constructed within trench excavations where deemed necessary to prevent the creation of preferential drainage pathways or to prevent the creation of preferential migration pathways for contaminants (where suspected)	Modification to groundwater flow paths and effect on levels in nearby water features
Permanent surface water/ agricultural drains will be re-installed to reinstate any pre-existing field drainage systems to pre-construction condition	Modified hydrological connectivity affecting flood risk (e.g. natural flow path blocking/diversion as a result of above ground assets, temporary drainage systems, underground assets or ground stockpiling, opening up of new flow pathways)
Following the completion of all cable route construction works, the land within the working width will be fully reinstated as near as practically possible to its former condition, or as agreed with landowners and stakeholders in advance (this will include the reinstatement of drainage ditches and existing culverts)	Increased volume and rate of surface runoff generated/Modified hydrological connectivity affecting hydromorphology

Table 9.16: Embedded mitigation during operation

Embedded mitigation	Example of potential impact addressed by the mitigation
Use of appropriate measures to prevent spillage of potentially polluting substances	Contamination of surface water or groundwater
Fuel, lubricants solvents etc. will be stored in appropriately bunded areas and a range of other pollution prevention measures taken	Contamination of surface water or groundwater
The implementation of an Operational Phase SuDS Maintenance and Management Plan for the SEC including the permanent access road.	Increased volume and rate of surface runoff generated
National Grid will be responsible for the management and maintenance of the proposed SuDS solutions for the SEC and its permanent access road over the intended lifetime of the Proposed Project	Increased volume and rate of surface runoff generated

9.7.2 Embedded mitigation relevant to water resources during the decommissioning phase is listed below:

- If the cable is no longer required when it reaches the end of its design life expectancy it would remain buried in the ground to avoid the disruption associated with its removal.

9.7.3 It is also assumed that the relevant embedded mitigation measures associated with the Construction Phase will be implemented during the decommissioning (i.e. removal) of the Proposed Project.

9.8 Predicted Impacts

9.8.1 As described in Section 9.2, the assessment summarised below presents only those impacts considered to be of 'moderate' or higher significance after the implementation of embedded mitigation. Additional mitigation measures are included in Section 9.9 to reduce the residual impacts so that they are not considered to be significant (i.e. negligible and minor).

9.8.2 Impacts considered to be of 'minor' or lower significance after the implementation of embedded mitigation are not described within this section, but are presented in Appendices 9C, 9D, 9E, 9F, 9G and 9H relating to the main elements of the Proposed Project.

Assessment of Impacts during Construction

Trans Pennine Trail Diversion

9.8.3 Appendix 9C lists the receptor values, magnitude of potential impact and significance of effects associated with construction of the Trans Pennine Trail diversion.

Water Quality

9.8.4 Activities associated with the Trans Pennine Trail diversion have the potential to result in water quality effects to the River Don and its tributaries, particularly the Clough Beck and numerous unnamed drains, and to nearby surface water and groundwater abstractions. Such activities may result in increased soil exposure leading to sediment impacts and the mobilisation of existing soil-based contaminants (if present). These activities include chemical/fuel use, removal of vegetation and topsoil, the construction of above ground physical assets (e.g. the permanent and temporary bridges) and hardstanding associated with temporary Trans Pennine Trail, the later decommissioning of above ground physical assets (e.g. the temporary bridge) and land reinstatement following removal of Trans Pennine Trail diversion.

9.8.5 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Groundwater Resources

9.8.6 Activities associated with the Trans Pennine Trail diversion also have the potential to result in effects to groundwater resources, including reduced infiltration and groundwater storage within any peat layers that may be present. The activities

- include the construction of above ground physical assets and hardstanding and land reinstatement following removal of Trans Pennine Trail diversion.
- 9.8.7 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Flooding and Drainage

- 9.8.8 Direct and indirect impacts associated with the presence of bridge abutments in the floodplain have been identified which could potentially result in a reduction of floodplain conveyance and storage. During the construction phase the permanent and temporary bridges crossing the River Don will be constructed to ensure that their respective flow areas have a greater relative capacity than the existing bridge. Once the construction phase has been completed the temporary bridge will be removed with only Bridge 1 remaining. Bridge 1 has been designed with a greater relative capacity than the existing bridge. The deck and soffit levels of both structures have also been set above the modelled 1 in 100-year flood levels on the River Don. However, the bridge abutments for both structures will unavoidably need to be located within the floodplain of the River Don. The additional flood modelling undertaken to test the impact of these structures, however, has confirmed that the increase in effective flow area that both structures will deliver when compared to the baseline scenario outweighs the introduction of the new bridge abutments in the floodplain. This demonstrates that the overall impact of these new structures on the floodplain of the River Don is negligible.
- 9.8.9 Similarly, the ground levels of the Trans Pennine Trail diversion will be raised temporarily during the construction phase. The ground level of the Trans Pennine Trail diversion was raised for the following reasons:
- to be above 1 in 100 year flood level;
 - to meet the bridge level and Trans Pennine Trail gradient at this location, which are raised to comply with the Equality Act; and
 - due to the thickness of the track construction material

- 9.8.10 The effects will be temporary for the period of the construction works. Although parts of the Trans Pennine Trail diversion will involve raising of ground levels within the floodplain, this will be temporary and only for the duration of the construction works and any raised ground will be returned to existing levels following completion of the construction phase. The land Trans Pennine Trail diversion will be restored to baseline levels after construction and due to the temporary nature of the diverted Trans Pennine Trail, the residual effect will on be of **minor significance**.

Surface Water and Hydromorphology

- 9.8.11 No potential significant impacts on surface water resources and hydromorphology have been identified with regard to the construction of the Trans Pennine Trail diversion following the implementation of the embedded mitigation measures. In these cases, the significance of effects is considered to be either **Negligible or Minor** and as such the potential impacts do not require any further assessment.

Sealing End Compound

- 9.8.12 Appendix 9D lists the receptor value, magnitude of potential impact and significance of effects associated with the construction of the proposed SEC.

Water Quality

- 9.8.13 Activities associated with the construction of the SECs have the potential to result in effects on water quality within the catchments of the River Don and its tributaries and to nearby surface water and groundwater abstractions through increased soil erosion. These activities include vegetation removal, removal of soils and its stockpiling, the construction of a permanent access road and the above ground physical assets of the SEC (e.g. permanent compound fencing, landing gantries etc.), chemical/fuel use and the discharge of construction water/ temporary effluent discharges.
- 9.8.14 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Groundwater Resources

- 9.8.15 Construction activities also have the potential to result in impacts to groundwater resources of the Don & Rother Millstone Grit & Coal Measures WFD groundwater body through reduced infiltration, changes in groundwater levels and modified flow pathways within the respective catchments. Indirect impacts include reduced groundwater storage volumes, increased groundwater flood risk etc. These activities include vegetation removal and stockpiling of soils, construction of above ground physical assets and access road, construction of underground physical assets (e.g. tanked basement floor slab), and de-watering (if required).
- 9.8.16 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Flooding and Drainage

- 9.8.17 Construction activities also have the potential to affect flooding and drainage through increases to the volume and rate of runoff and sediment load transportation within the River Don catchment. These activities include vegetation removal, stockpiling of soils, construction of above ground physical assets and access road, and discharge of construction water/ temporary effluent discharges.
- 9.8.18 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Surface Water Resources and Hydromorphology

- 9.8.19 No potential significant impacts on surface water resources and hydromorphology have been identified with regard to the construction of the SEC following the implementation of the embedded mitigation measures. In these cases, the significance of effects is considered to be either **Negligible or Minor** and as such the potential impacts do not require any further assessment.

Access Point 7 and Northern Access Road

- 9.8.20 Appendix 9H lists the receptor values, magnitude of potential impact and significance of effects associated with Access Point 7 and the Northern Access Road.

Water Quality

- 9.8.21 Construction activities associated with Access Point 7 and the Northern Access Roads have the potential to affect water quality, through increased accessible sediment supply and mobilisation of existing soil-based contaminants (if present), within the River Don part and its tributaries and nearby surface water and groundwater abstractions. These activities include chemical/fuel use, vegetation and topsoil removal, the construction of a temporary access tracks and land reinstatement following removal of temporary structures.
- 9.8.22 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Flooding and Drainage

- 9.8.23 Activities also have the potential affect flooding and drainage though increases in the volume and rate of runoff and sediment load transportation within the catchments of the River Don and its tributaries. These activities include vegetation and topsoil removal, the construction of access tracks and land reinstatement following removal of temporary structures.
- 9.8.24 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Surface water and Groundwater Resources and Hydromorphology

- 9.8.25 No potential significant impacts on surface and groundwater and hydromorphology have been identified with temporary elements following the implementation of the embedded mitigation measures. In these cases, the significance of effects is considered to be either **Negligible or Minor** and as such the potential impacts do not require any further assessment.

400kV Cable

- 9.8.26 Appendix 9E lists the receptor values, magnitude of potential impact and significance of effects associated with the cable route.

Water Quality

- 9.8.27 Activities associated with the construction phase of the underground cable have the potential to affect water quality through increased soil exposure leading to sediment impacts on the waters associated with the River Don and its tributaries, such as Smallden Clough, Long Grain, Clough Beck, Wogden Foot and other unnamed drains along the length of the 400KV cable route, as well as to nearby surface water and groundwater abstraction. These activities also have the potential to mobilise existing soil-based contaminants (if present) which could affect the water quality of these receptors. These activities include chemical/fuel use, the removal of surface features including vegetation removal, drain and waterfall diversions, the construction of above ground physical assets (e.g. link pillars) and underground physical assets (e.g. cable trenches, sheet piling), the discharge of construction water/temporary effluent discharges, and land reinstatement.
- 9.8.28 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effects, additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Flooding and Drainage

- 9.8.29 Construction activities also have the potential to result in flooding and drainage effects, through an increase in the volume and rate of surface runoff generated, modified hydrological connectivity and potential blockage or diversion of critical flow conveyance routes etc., within the catchments of the River Don and its tributaries, particularly Smallden Clough, Long Grain, Clough Beck, and Wogden Foot. These activities include temporary exposure of bare earth during works including the removal of vegetation and topsoil, drain and waterfall diversions, construction of above ground and underground physical assets including the excavation of cable trenches (perpendicular to the valley), the stockpiling soil and alluvium, the discharge of construction water/ temporary effluent discharges, and land reinstatement.
- 9.8.30 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Surface Water and Groundwater Resources and Hydromorphology

- 9.8.31 No potential significant impacts on surface water resources, groundwater resources and hydromorphology have been identified with regard to the cable route section of the Proposed Project following the implementation of the embedded mitigation measures. In these cases, the significance of effects is considered to be either **Negligible or Minor**.

Removal of Existing Infrastructure (VIP subsection)

- 9.8.32 Appendix 9F lists the receptor value, magnitude of potential impact and significance of effects associated with the removal of the existing VIP infrastructure including overhead line (OHL) removal, dismantling of pylon structures and removal of pylon foundations.

Water Quality

- 9.8.33 Construction activities associated with the removal of the existing infrastructure have the potential to affect water quality, through increased accessible sediment supply and mobilisation of existing soil based contaminants (if present), within the River Don, including its tributaries: Smallden Clough, Clough Beck and other unnamed drains, as well as within the adjacent Winscar Reservoir. Lower Windleden Reservoir and nearby surface water and groundwater abstractions. These activities include chemical/fuel use, removal of hardstanding associated with pylon foundation and crane pad areas, land reinstatement following topsoil removal and excavation associated with pylon foundations, and discharge of construction water/ temporary effluent.
- 9.8.34 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Flooding and Drainage

- 9.8.35 Construction activities also have the potential to affect flooding and drainage though increases to the volume and rate of runoff and sediment load transportation within the River Don, Smallden Clough, Clough Beck and other unnamed tributaries of the River Don. These activities include the removal of hardstanding and land reinstatement following removal of pylon foundations and crane pad areas.
- 9.8.36 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Surface water and Groundwater Resources and Hydromorphology

- 9.8.37 No potential significant impacts on surface and groundwater and hydromorphology have been identified with regard to the removal of existing infrastructure following the implementation of the embedded mitigation measures. In these cases, the significance of effects is considered to be either **Negligible or Minor** and as such the potential impacts do not require any further assessment.

Construction of Replacement Pylon 4ZO157R

- 9.8.38 Appendix 9G lists the receptor value, magnitude of potential impact and significance of effects associated with the construction of Pylon 4ZO157R and the replacement conductors.

Water Quality

- 9.8.39 Activities associated with the construction of the replacement pylon have the potential to result in water quality effects. These effects may arise through increased soil erosion within the catchments of the River Don and its unnamed tributaries and may also affect nearby surface water and groundwater abstractions. Indirect impacts include increased sediment concentrations in downstream water bodies. These activities include vegetation and soil removal, stockpiling of soil, chemical/fuel use, construction of above ground physical assets (e.g. crane pad)

- and underground physical assets (e.g. pylon foundations), and the discharge of construction water/ temporary effluent.
- 9.8.40 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Flooding and Drainage

- 9.8.41 Activities associated with the replacement pylon also have the potential to affect flooding and drainage through increases in the volume and rate of runoff and sediment load transportation within the River Don catchment. These activities include vegetation and soil removal, stockpiling of soil, construction of above ground and underground physical assets, and discharge of construction water/ temporary effluent.
- 9.8.42 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Surface and Groundwater Resources and Hydromorphology

- 9.8.43 No potential significant impacts on surface and groundwater resources and hydromorphology have been identified with regard to the construction of the replacement pylon following the implementation of the embedded mitigation measures. In these cases, the significance of effects is considered to be either **Negligible or Minor** and as such the potential impacts do not require any further assessment.

Temporary Elements (Construction Compounds/ Lay down Areas and Temporary Access Tracks including Northern Access Road)

- 9.8.44 Appendix 9H lists the receptor value, magnitude of potential impact and significance of effects associated with the temporary elements of the project such as construction compounds, lay down areas and access tracks.

Water Quality

- 9.8.45 Construction activities associated with temporary elements have the potential to affect water quality, through increased accessible sediment supply and mobilisation of existing soil-based contaminants (if present), within the River Don part and its tributaries: Long Grain, Wogden Foot, Smallden Clough, Clough Beck, Town Brook and other unnamed drains, the Winscar and Lower Windleden Reservoirs and in nearby surface water and groundwater abstractions. These activities include chemical/fuel use, vegetation and topsoil removal, the construction of a temporary lay-down areas, temporary lay-down for pylon erection, temporary site compounds, access tracks and parking areas, temporary haul road (on existing Trans Pennine Trail) and land reinstatement following removal of temporary structures.
- 9.8.46 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following

implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Flooding and Drainage

- 9.8.47 Activities also have the potential affect flooding and drainage though increases in the volume and rate of runoff and sediment load transportation within the catchments of the River Don and its tributaries: Long Grain, Wogden Foot, Smallden Clough, Clough Beck, Town Brook and other unnamed drains. These activities include vegetation and topsoil removal, the construction of a temporary lay-down areas, temporary lay-down for pylon erection, temporary site compounds, access tracks and parking areas, temporary haul road (on existing Trans Pennine Trail) and land reinstatement following removal of temporary structures.
- 9.8.48 Although these effects will be temporary, they are considered to be of moderate significance even when embedded mitigation measures are implemented due to the high value of the receptors. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation, it is considered that the residual effects will be reduced to **negligible or minor significance**.

Surface water and Groundwater Resources and Hydromorphology

- 9.8.49 No potential significant impacts on surface and groundwater and hydromorphology have been identified with temporary elements following the implementation of the embedded mitigation measures. In these cases, the significance of effects is considered to be either **Negligible or Minor** and as such the potential impacts do not require any further assessment.

Assessment of Impacts during Operation

- 9.8.50 The operational phase impacts tables in Appendices 9D, 9E and 9G provide a detailed assessment of the potential environmental impacts on the water receptors during the operational phase of the cable, SEC and removal of existing infrastructure, respectively, of the Proposed Project

Sealing End Compound

- 9.8.51 Appendix 9D lists the receptor value, magnitude of potential impact and significance of effects associated with the operation of the SEC.

Flooding and Drainage

- 9.8.52 Activities associated with the operational phase of the SECs have the potential to result in flooding and drainage effects through an increase in the volume and rate of surface runoff generated. These activities include the presence of the access road and new assets (e.g. above link pillars, electrical equipment, compound fencing etc.) and chemical/fuel use during routine maintenance and operation.
- 9.8.53 It is considered that these permanent effects could be of moderate significance even after the implementation of embedded mitigation due to the high value of the receptors and the extent of the footprints of the SECs (including permanent access roads and parking areas etc.) which have the potential to increase the volume and rate of surface runoff generated. In order to reduce the magnitude of effect additional mitigation measures will be implemented, as presented in Section 9.9. Following implementation of this additional mitigation relating to the implementation and maintenance of SuDS measures, it is considered that the residual effects will be reduced to **negligible or minor significance**.

400kV Cable

Surface Water and Groundwater Resources, Hydromorphology, Water Quality and Flooding and Drainage

- 9.8.54 No potential significant impacts on surface and groundwater resources, hydromorphology, water quality or flooding and drainage are considered likely during the operational phase of the cable route and replacement of Pylon 4ZO157R following the implementation of the embedded mitigation measures. In these cases, the significance of effects is considered to be either **Negligible or Minor**.

Replacement Pylon 4ZO157R

Surface Water and Groundwater Resources, Hydromorphology, Water Quality and Flooding and Drainage

- 9.8.55 No potential significant impacts on surface and groundwater resources, hydromorphology, water quality or flooding and drainage are considered likely during the operational phase of the cable route and replacement of Pylon 4ZO157R following the implementation of the embedded mitigation measures. In these cases, the significance of effects is considered to be either **Negligible or Minor**.

Assessment of Impacts during Decommissioning

- 9.8.56 It is assumed that relevant best practice construction phase embedded mitigation measures will apply to the decommissioning phase however, detailed decommissioning methodology cannot be finalised until immediately prior to decommissioning but would be in line with relevant best practice and policy at that time.

Sealing End Compound

- 9.8.57 Appendix 9D lists the receptor value, magnitude of potential impact and significance of effects associated with the decommissioning phase of the proposed SEC.

Surface and Groundwater Resources, Hydromorphology, Water Quality and Flooding and Drainage

- 9.8.58 For assessment purposes, this Environmental Assessment Report assumes that the SEC would be removed if no longer required, with the foundations removed to a depth of approximately 1m. It is assumed that the relevant best practice embedded mitigation associated with the construction phase will be implemented during decommissioning. Specifically, it is assumed that following decommissioning of the SEC, its land surface will be reinstated as near as practically possible to its pre-development condition. No potential significant impacts on surface and groundwater resources, hydromorphology or water quality and flooding and drainage are, therefore, considered likely during the decommissioning phase of the proposed SEC. In these cases, the significance of effects is considered to be either **Negligible or Minor** and as such the potential impacts do not require any further assessment.

400kV Cable

Appendix 9E lists the receptor value, magnitude of potential impact and significance of effects associated with the decommissioning phase of the cable route (i.e. the removal of the Link Pillar).

Surface and Groundwater Resources, Hydromorphology, Water Quality and Flooding and Drainage

- 9.8.59 No potential significant impacts on surface and groundwater resources, hydromorphology, water quality and flooding and drainage have been identified with regard to the decommissioning of the cable route following the implementation of the embedded mitigation measures. In these cases, the significance of effects is considered to be either **Negligible or Minor** and as such the potential impacts do not require any further assessment.

Replacement Pylon 4ZO157R

Appendix 9G lists the receptor value, magnitude of potential impact and significance of effects associated with the decommissioning phase of the replacement Pylon 4ZO157R.

Surface and Groundwater Resources, Hydromorphology, Water Quality and Flooding and Drainage

- 9.8.60 No potential significant impacts on surface and groundwater resources, hydromorphology, water quality and flooding and drainage have been identified with regard to the decommissioning of the cable route or the decommissioning of Pylon 4ZO157R following the implementation of the embedded mitigation measures. In these cases, the significance of effects is considered to be either **Negligible or Minor** and as such the potential impacts do not require any further assessment.

9.9 Mitigation

- 9.9.1 In order to address the construction and operational phase impacts highlighted above additional mitigation measures are proposed. These are as described below and will be incorporated into the CEMP, Mitigation measures are applicable for all construction/ operational activities and therefore this section has not been separated into the Proposed Project element sub headings.

Additional mitigation measures for Construction Phase

- 9.9.2 Where it is necessary to strip and store topsoil in a floodplain all year around, methods will be employed to ensure that the soil is protected, and flood waters are not impeded. Topsoil stacks will be set back from watercourses and measures such as berms and vegetated strips will be used to control sediment run-off. Any surplus will be removed. This mitigation measure will help to address the potential increased soil erosion which may lead to sediment impacts on water quality.
- 9.9.3 For the installation of the cable within the existing Trans Pennine Trail, where appropriate, pre-construction drainage will be installed. The design of the drainage (and of any other drainage installed as part of the Proposed Project) will pay particular attention to the need to ensure that the drains do not act as pathways for contamination or cause flooding off-site, with consultation undertaken with the LLFA where necessary.
- 9.9.4 The material excavated from the trench (or elsewhere) during construction, comprising the subsoil, rock or made ground, will be stored away from the topsoil to prevent mixing of subsoil and topsoil and used in trench backfilling/ reinstatement. This mitigation measure would help to address the potential for accessible sediment supply and mobilisation of existing soil-based contaminants, if present, by high velocity flows which may affect water quality.
- 9.9.5 The small drainage ditch present to the southern side of the Trans Pennine Trail will be temporarily diverted underground as part of construction activities but will be

- reinstated following construction. The waterfall feature present along the Trans Pennine Trail will be fenced off and protected during construction activities, and the water from this feature will be temporarily diverted underground. The final drainage design will be subject to temporary works designs associated with the volume of water currently running off the ground and forming the waterfall feature.
- 9.9.6 All bridge crossings of the River Don, whether permanent or temporary, will be designed to the 1:100-year flood level.
- 9.9.7 Other watercourses and drainage ditches crossed by the Trans Pennine Trail diversion will be flumed (by the installation of temporary pipes) and ramped over to allow uninterrupted flow of water within the watercourse and a track for users of the Trans Pennine Trail and farm vehicles. Land Drainage Consents may be required from the Local Planning Authority for the installation of these temporary bridges and/or flume crossings depending on their design which will be discussed with the Local Planning Authority and constructed to minimise the risk of sediment run-off to watercourses and obstruction to migratory fish.
- 9.9.8 Geotextile will be used during construction on the ground in the immediate vicinity of watercourse/drain crossings to reduce damage to the surrounding ground and vegetation and reduce erosion, where required and practically possible. This mitigation measure will help to prevent increased runoff which may lead to increased sediment load transportation.
- 9.9.9 The CEMP will ensure that all reinstated channels will have the same hydraulic properties as existing and temporary and permanent structures (culverts, flumes) should be appropriately sized except when alternative options, such as the permanent diversion of the drainage ditch adjacent to the Trans Pennine Trail for example, have been discussed and agreed with the Lead Local Flood Authority. This measure will assist with the mitigation of flood risk.
- 9.9.10 Ensure that access roads / routes, parking bays, hardstanding areas (i.e. those that may be required for temporary access, maintenance or repairs) are laid at existing elevations and not raised compared to existing or surrounding ground levels.
- 9.9.11 Regular monitoring, to be determined by the Principal Contractor, will be put in place to ensure that the surface water features function as intended and check on the drainage system including for ensuring that no material from the diverted Trans Pennine Trail falls into the watercourse. If this does occur the material will be removed immediately. Generally, flumes/ bridges will be installed at the start of construction activities and removed during restoration. This mitigation measure would also help to address any increased volume and rate of surface runoff generated.
- 9.9.12 Appropriate signage along the Trans Pennine Trail diversion should be deployed to warn users of the potential flood risk in certain areas from the River Don, from overland flow (surface water sources) and from groundwater.
- 9.9.13 Contractors to consider temporary closure of the Trans Pennine Trail diversion in case of flooding.
- 9.9.14 Upon completion of the construction phase, the Trans Pennine Trail diversion will be reinstated to original levels where practicable. This will ensure that overland surface flow pathways are maintained as existing wherever possible. However, in some areas limited ground level raising will be unavoidable such as over the Clough Beck culvert, although this is expected to only have a minor impact on localised hydrological connectivity.
- 9.9.15 Other watercourses and drainage ditches crossed by the diverted Trans Pennine Trail will be flumed (by the installation of consented temporary pipes) and ramped

over to allow uninterrupted flow of water within the watercourse and provide a track for users of the Trans Pennine Trail and farm vehicles. This mitigation measure will also help to prevent the creation of modified hydrological connectivity which could affect flood risk.

9.10 Summary of Residual Effects

During Construction – Summary of Magnitude of Impact Post-Additional Mitigation and Residual Effect Significance

- 9.10.1 No residual significant effects were identified following the implementation of embedded and additional mitigation during the construction phase for all elements of the Proposed Project.

During Operation – Summary of Magnitude of Impact Post-Additional Mitigation and Residual Effect Significance

- 9.10.2 No residual significant effects were identified following the implementation of embedded and additional mitigation during the operational phase for all elements of the Proposed Project.

During Decommissioning – Summary of Magnitude of Impact Post-Additional Mitigation and Residual Effect Significance

- 9.10.3 No residual significant effects were identified following the implementation of embedded and additional mitigation during the decommissioning phase for all elements of the Proposed Project.

9.11 Cumulative Effects

- 9.11.1 Consideration has been given to the potential effects of the Proposed Project in conjunction with other proposed and potential third party developments within the area. Following a review of planning applications and consultation with Barnsley Metropolitan Borough Council and the Peak District National Park Authority, no cumulative third party developments were identified.
- 9.11.2 Intra-Project effects (impact interactions that arise where more than one impact source from the Proposed Project acts upon the same receptor) have been assessed and are summarised in Chapter 15 (Cumulative).

9.12 Summary of WFD Assessment

- 9.12.1 The WFD requires a risk assessment of the River Basin Management Plan (RBMP) objectives showing with a high level of confidence that the activities related to the Proposed Project support the RBMP objectives. The two environmental objectives to consider are:
- Objective 1: To prevent deterioration of the status or potential of surface waters and groundwater; and
 - Objective 2: To aim to achieve good status or potential for all water bodies and good surface water chemical status.
- 9.12.2 The WFD assessment was indirectly covered by the environmental assessment and the WFD status and objectives of the WFD receptors are presented in Table 9.10, Table 9.12 and Table 9.14. In particular, the environmental assessment presented in Section 9.8 and detailed in Appendices 9C to 9H effectively covers the following elements related to the WFD risk assessment, which comprises:
- Identifying the likely impacts of the activity on WFD receptors;

- Estimating the magnitude of those impacts;
- Estimating the probability of those impacts occurring; and
- Identifying the residual risk post mitigations.

However, the impact assessment does not cover the last element of the WFD risk assessment which requires the evaluation of the significance of the risk with reference to RBMP objectives. Table 9.17 presents and summarises the results of the last element against the WFD objectives.

Table 9.17: Summary of WFD Risk Assessment related to water resources receptors

WFD Receptors	WFD Status	Summary of Risk Assessment (Objective 1)	Summary of Risk Assessment (Objective 2)
Water quality of River Don part of 'Don from Source to Scout Dyke' WFD river water body catchment	<p>Current Overall Status is Moderate</p> <p>Overall Status Objective is Good by 2027</p> <p>Physico-chemical Quality Elements Status is Good and is predicted to be Good by 2027</p>	No significant impacts to water quality were identified as part of the assessment process. Providing embedded and additional proposed mitigation measures are in place to address any potential water quality deterioration due to potential chemical or fuel contamination or spillage of hazardous substances, the upper part of River Don part of 'Don from Source to Scout Dyke' WFD river water body catchment would retain its Current Overall Status and current Physico-Chemical Elements status.	No significant impacts to water quality during the operation and decommissioning phases are foreseen. Providing proposed mitigation measures are in place, the Proposed Project would not compromise the ability of the upper part of River Don to achieve WFD Overall Status Objective of Good by 2027 and it would retain a Good Physico-Chemical Elements Status by 2027.
Water quality of 'Don & Rother Millstone Grit & Coal Measures' WFD groundwater body	<p>Current Overall Status is Poor</p> <p>Overall Status Objective is Good by 2027</p> <p>Current Chemical Status is Poor</p> <p>Chemical Status Objective is Good by 2027</p>	No significant impacts to water quality were identified as part of the assessment process. Providing embedded and additional mitigation measures are in place to address any potential water quality deterioration due to potential chemical or fuel contamination or spillage of hazardous substances, Don & Rother Millstone Grit & Coal Measures' WFD groundwater body would retain its Current Overall Status and Current Chemical Status.	No significant impacts to water quality during the operation and decommissioning phases are foreseen. Providing proposed mitigation measures are in place, the Proposed Project would not compromise the ability of Don & Rother Millstone Grit & Coal Measures' WFD groundwater body to achieve a WFD Overall Status Objective of Good by 2027 and would not compromise the ability of Upper Frome and Piddle WFD ability to meet a Good Chemical Status Objective by 2027.
Physical habitat of River Don part of 'Don from Source to Scout Dyke' WFD	Current Overall Status is Moderate	No Significant impacts to hydromorphology were identified as part of the assessment process. Providing embedded and additional mitigation measures are in place to address any potential hydromorphological changes, the upper part of	No significant impacts to hydromorphology during the operation and decommissioning phases are foreseen. Providing proposed mitigation measures are in place, the Proposed Project would not compromise

WFD Receptors	WFD Status	Summary of Risk Assessment (Objective 1)	Summary of Risk Assessment (Objective 2)
river water body catchment	<p>Overall Status Objective is Good by 2027</p> <p>Hydromorphological Supporting Elements is Supports Good (2014 data) and was no assessed for 2027</p>	River Don part of ' <i>Don from Source to Scout Dyke</i> ' WFD river water body catchment would retain its Current Overall Status and current Hydromorphological Supporting Elements.	the ability of the upper part of River Don part of ' <i>Don from Source to Scout Dyke</i> ' WFD river water body catchment to retain a 'Supports Good' status for the Hydromorphological Supporting Elements.