A1 Birtley to Coal House

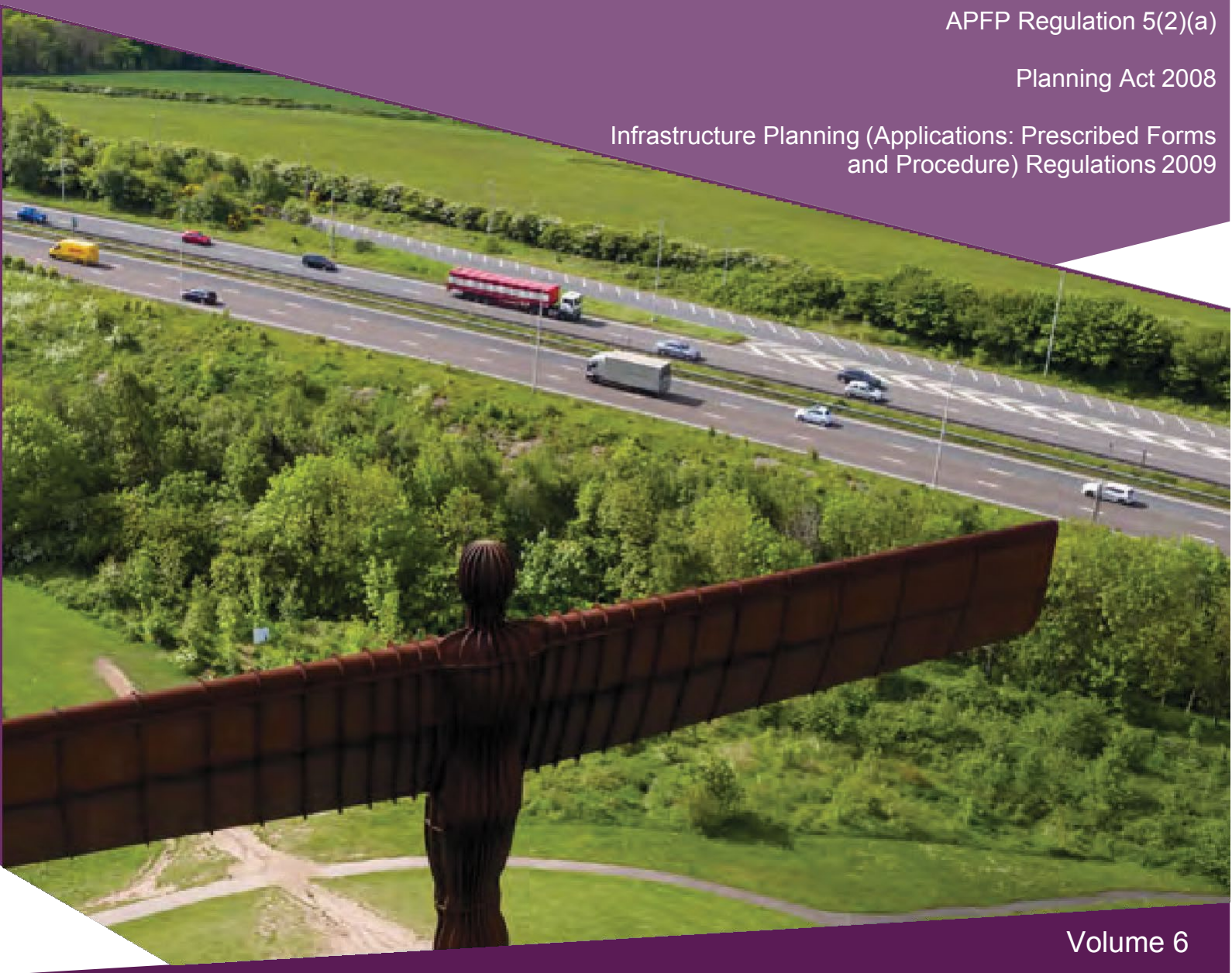
Scheme Number: TR010031

6.3 Environmental Statement – Appendix 13.2 Water Framework Directive Assessment

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009



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Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009

A1 Birtley to Coal House

Development Consent Order 20[xx]

Environmental Statement - Appendix

Regulation Reference:	APFP Regulation 5(2)(a)
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1. INTRODUCTION

1.1. BACKGROUND

1.1.1. This Water Framework Directive (WFD) assessment has been prepared by WSP UK Ltd (WSP) on behalf of Highways England to assess the impacts of the proposed works associated with the A1 Birtley to Coal House Scheme (hereafter referred to as 'the Scheme') against the WFD parameters for the River Team and associated local watercourses near Newcastle in Northumbria. This assessment includes a summary of the current local conditions and, where appropriate, identifies mitigation measures for any likely significant effects that may arise as part of the proposed works.

1.1.2. The assessment includes the following:

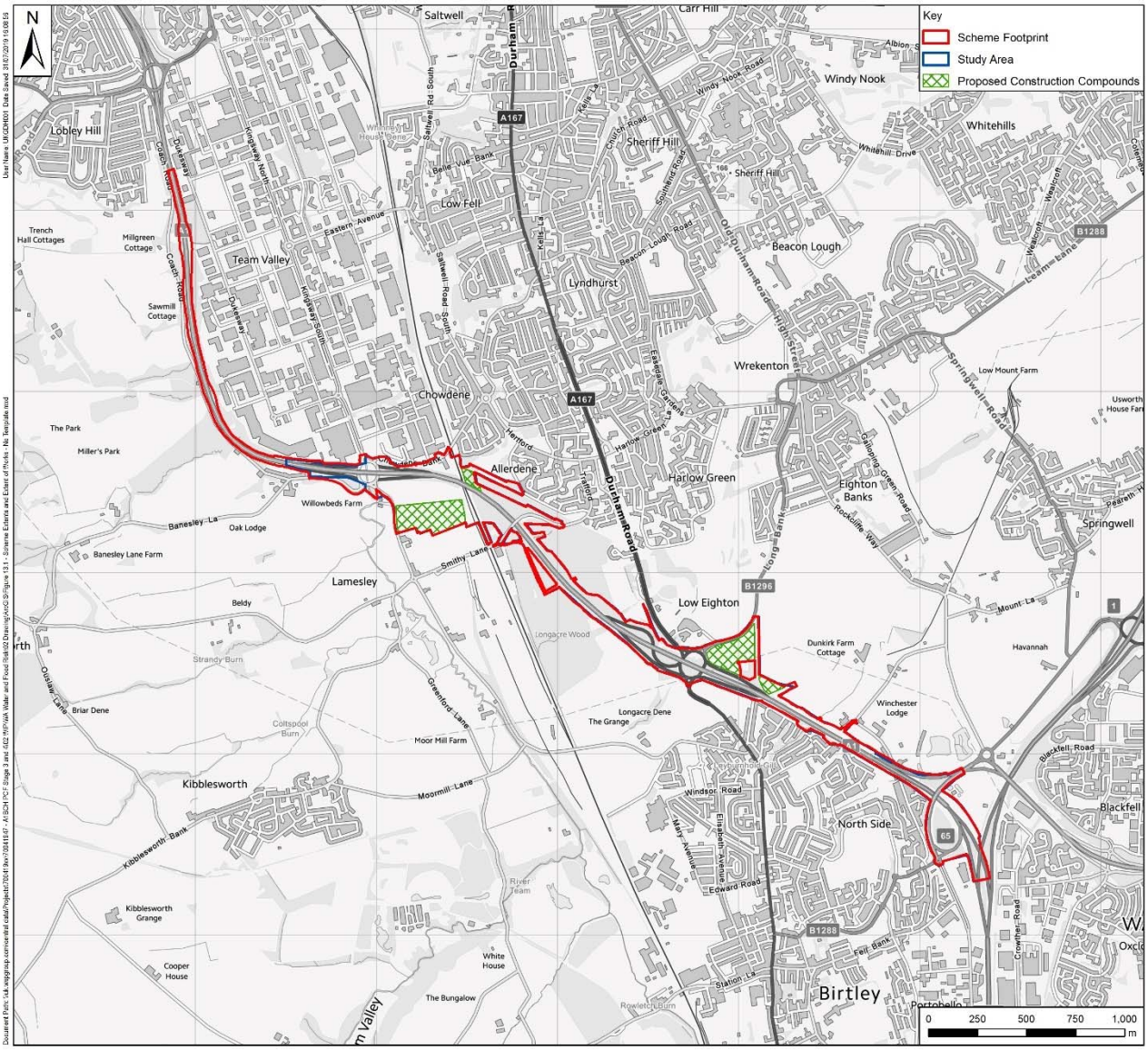
- A summary of the current baseline conditions.
- A qualitative assessment of the potential impacts associated with the Scheme.
- Identification of possible mitigation measures which could reduce any likely significant impacts that may arise as part of the proposed works.

1.1.3. A detailed assessment of the Scheme with regard to the existing and future flood risk has been undertaken separately to the WFD assessment. This is presented within the Flood Risk Assessment (FRA) of this ES (**Application Document Reference: TR010031/APP/6.3**), undertaken in accordance with the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG). A summary of the key findings is also summarised within this assessment to assess compliance against the WFD objectives.

1.1.4. A Water Quality Assessment has been undertaken to inform **Chapter 13 Road Drainage and the Water Environment** of the ES **(Application Document Reference: TR010031/App/6.1)**. This details the results of the assessment undertaken in line with the guidance in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 10 (HD 45/09) Method A and Method D. The findings are discussed within this WFD report to assess compliance against the WFD objectives. This assessment contains a series of figures, which are also contained in **Application Document Reference: TR010031/APP/6.2.**

1.1.5. The Study Area for this assessment comprises the Extent of works plus the 1km buffer shown in **Figure 1** below (a full-size version of this figure and all others is provided in **Appendix 6.2** of the ES (**Application Document Reference: TR010031/APP/6.2**), between junctions 65 (Birtley) and 67 (Coal House) of the A1.

Figure 1 - Site location



1.2. SCHEME DESCRIPTION

1.2.1. The Scheme is located between a point north of junction 67 (Coal House) and junction 65 (Birtley) of the A1 in Gateshead. It aims to increase capacity and reduce congestion along this section of the A1 trunk road. Most of the work would take place within the existing highway boundary. However, some permanent and temporary land-take would be required alongside the A1 at certain points to enable the additional carriageway to be constructed and for the construction of an offline replacement for Allerdene Bridge. The Scheme would also include changes to signage and road markings on the southbound carriageway between just south of junction 68 (Lobley Hill) and junction 67 (Coal House).

1.2.2. The Scheme would provide additional road capacity by widening of the southbound carriageway from three to four lanes and widening of the northbound carriageway from two to three lanes (with an additional lane between junctions) between junction 67 (Coal House) and junction 65 (Birtley). The additional lane between the junctions would help manage traffic joining and leaving the A1 on the northbound carriageway.

1.2.3. The Scheme includes a replacement bridge structure where the A1 crosses over the East Coast Main Line (ECML), 40m to the immediate south of the existing Allerdene Bridge structure, which would tie in to the existing carriageways at junction 67 (Coal House) and north of junction 66 (Eighton Lodge). The Scheme would also install advanced direction signage to provide driver information along the A1.

1.2.1. The Scheme is shown in the general arrangement drawings in **Appendix 2.1 (Application Document Reference: TR010031/APP/6.3).**

1.2.2. The Scheme include the following aspects of relevance to this assessment:

- The existing Kingsway Viaduct (junction 67) at the River Team crossing would be widened to accommodate the additional lanes. The widening would involve extension of the deck to the southern end of the structure only. The substructure would also be widened with the construction of new reinforced concrete piers/abutments within the floodplain of the River Team. A temporary culvert or bridge would be constructed to allow plant access to the construction site.
- The existing Allerdene Bridge crosses over the Allerdene Burn, an ordinary watercourse that discharges to the River Team. As part of the Scheme, the bridge would be replaced with a wider structure with additional lanes to improve capacity and the culverted ordinary watercourse would be modified to accommodate the bridge replacement. Two options (Allerdene embankment option and Allerdene viaduct option) have been proposed with respect to the bridge replacement, which would affect how the culverted ordinary watercourse is modified.
    - Allerdene embankment option: This includes lengthening the culverted section of the watercourse (Allerdene Burn) and the realignment of approximately 300m of the open section of the watercourse downstream to run parallel to the new bridge.
    - Allerdene viaduct option: This includes the replacement of the culverted section of the watercourse (Allerdene Burn) with an engineered open channel and the existing watercourse downstream will be realigned to accommodate the new viaduct. The proposed channel (new section and realignment) would be approximately 620m in length and will run under one of the bridge spans of the new structure.
- As a result of widening the existing road, there would be an overall in impermeable area associated with the larger extent of road surfacing.
- The proposed surface water drainage strategy for the Scheme would be an improvement to the existing drainage regime through the use of Sustainable Drainage Systems (SuDs), oil interceptors and filter drains and silt control vortex separators at the Long

Acre Dene outfalls (additional vortexes are to be considered during detailed design) to reduce the rate of runoff and to improve the water quality of road drainage.

1.3. LEGISLATIVE FRAMEWORK AND GUIDANCE

1.3.1. The coordination of policies for the water environment is managed by the UK Government. Many flood risk and water quality requirements are set at European level, which are then transposed into UK law.

WATER FRAMEWORK DIRECTIVE (2000/60/EC)

1.3.2. The overall objective of the WFD, (together with its daughter directive, the Groundwater Directive (2006/118/EC)) is to bring about the effective co-ordination of water environment policy and regulation across Europe. The main aims of the legislation are to ensure that all surface water and groundwater reaches 'good' status (in terms of ecological and chemical quality and water quantity, as appropriate), promote sustainable water use, reduce pollution and contribute to the mitigation of flood and droughts. Specifically, each country has to ensure the following:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters.
- Aim to achieve at least good status for all water bodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027.
- Meet the requirements of WFD Protected Areas;
- Promote sustainable use of water as a natural resource.
- Conserve habitats and species that depend directly on water.
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment. The WFD includes a 'List of Priority Substances'. Various substances are listed as either List I or List II substances, with List I substances considered the most harmful to human health and the aquatic environment. The purpose of the directive is to eliminate pollution from List I substances and reduce pollution from List II substances.
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants.
- Contribute to mitigating the effects of floods and droughts.

1.3.3. The WFD is transposed into law in England and Wales by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (the 2017 Regulations). The 2017 Regulations revoke and replace The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (subject to transitional provisions in article 38 of the 2017 Regulations).

Determination of 'Good Status'

1.3.4. Under the WFD, surface water bodies are classified in accordance with their ecological (quality) status and chemical (quality) status, which are combined to provide an overall

status. The chemical status is based on assessment against the defined list of priority substances and EU dangerous substances, and the ecological status is assessed considering the quality of the supporting elements including biological, general chemical, physio-chemical, and hydromorphological elements.

1.3.5. For surface waters, the 'good' status is determined from the combined ecological and chemical status of surface waters. Ecological status is determined from a number of individual quality elements, as follows:

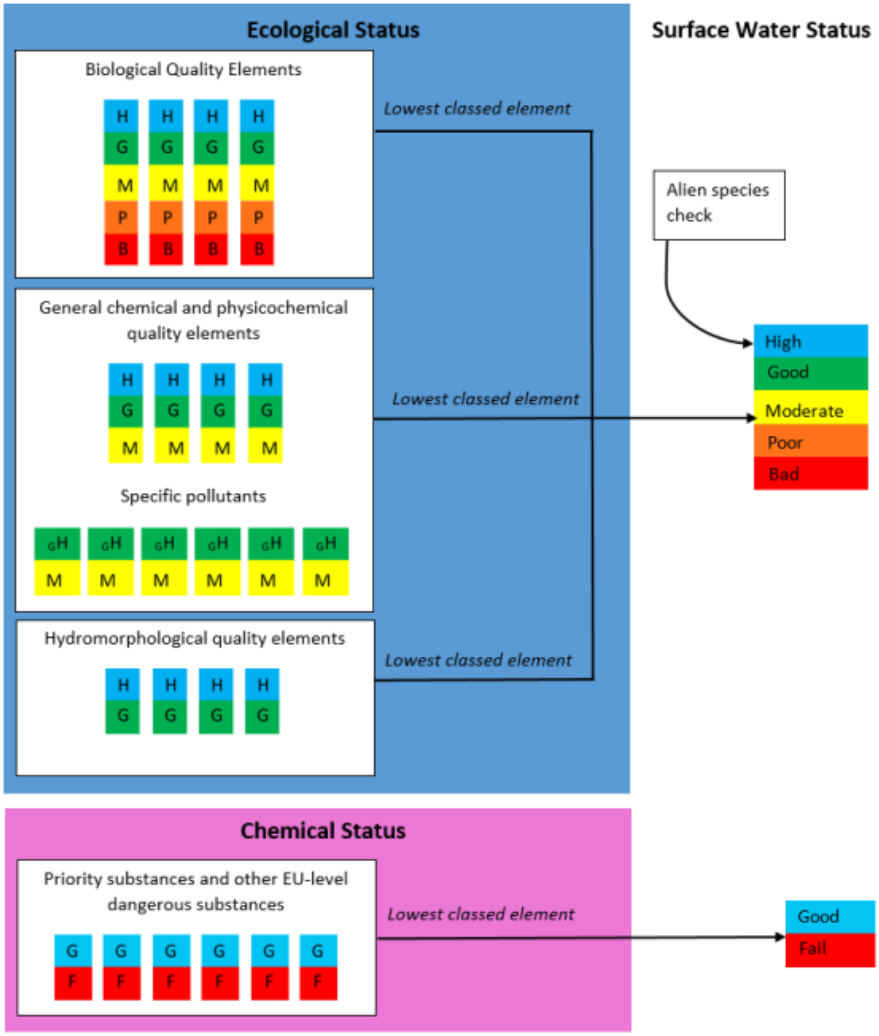
- Biological quality elements (e.g. fish, benthic invertebrates, aquatic flora).
- Supporting hydromorphological quality elements (e.g. flow regime, river continuity and substrate of the river bed).
- Supporting physical-chemical quality elements (e.g. temperature, oxygenation and nutrient conditions).

1.3.6. The chemical quality refers to environmental quality standards for river basin specific pollutants and the priority substances specified under the WFD. These standards specify maximum concentrations for specific water pollutants. The WFD works on a 'one out, all out' basis, so if one such concentration is exceeded, then the water body will not be classed as having a 'good' status. The chemical status of surface waters is therefore classified as 'good' or 'fail'.

1.3.7. The ecological status of surface waters is classified as being 'high', 'good', 'moderate', 'poor' or 'bad'. Water bodies that have been modified (e.g. canals or which contain significant flood defences) are classed as 'Heavily Modified Water bodies' (HMWB) and have to reach at least 'good ecological potential' by their objective year. **Figure 2** below is extracted from the Classification Method Statement (Environment Agency, 2011)[1], and illustrates the classification approach for surface water features.

[1] Method Statement for the Classification of Surface Water Bodies: Monitoring Strategy, Environment Agency. 2011.

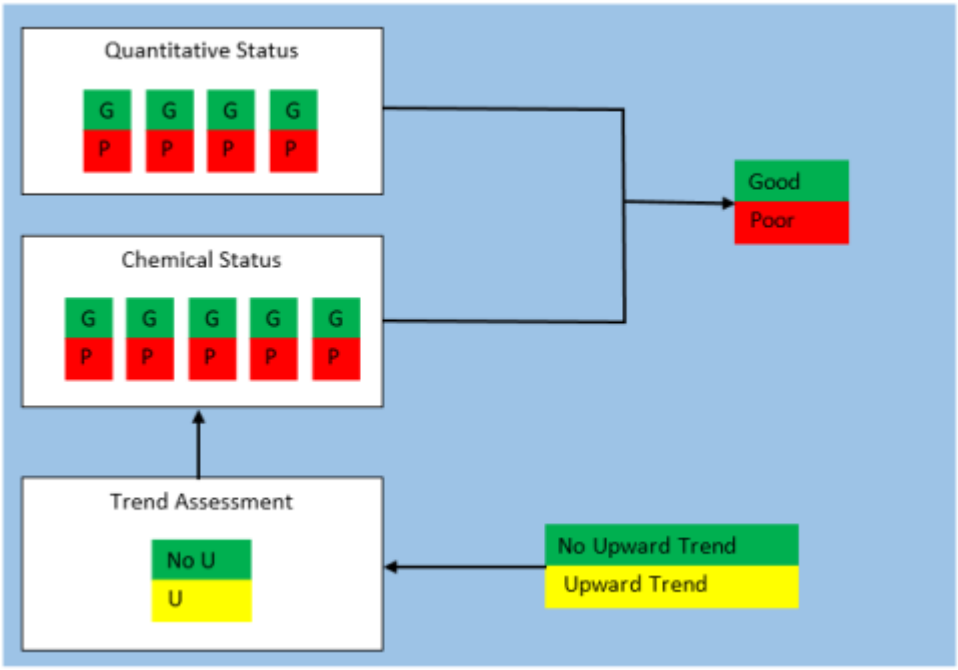
Figure 2 - WFD surface waterbody classifications[2]



1.3.8. Under the WFD, groundwater bodies are classified in accordance with their quantity (quality) status and chemical (quality) status, which are combined to provide an overall status. The quantity status considers elements such as impacts of saline intrusion, ability to serve ground and surface water abstractions, and ability to support dependent ecosystems. The chemical status is based on assessment against the defined list of priority substances and EU dangerous substances. **Figure 3** below is extracted from the Classification Method Statement (Environment Agency, 2011), and illustrates the classification approach for groundwater bodies.

[2] Classification method statement, Environment Agency, 2011

Figure 3 - WFD groundwater classification[3]



1.3.9. The WFD also contains provisions for controlling discharges of dangerous substances to surface waters and groundwater and includes a 'List of Priority Substances'. Various substances are listed as either List I or List II substances, with List I substances considered the most harmful to human health and the aquatic environment. The purpose of the directive is to eliminate pollution from List I substances and reduce pollution from List II substances.

Article 4.7

1.3.10. Article 4.7 of the WFD sets out reasons why physical modifications or activities may be allowed to cause deterioration in quality status or prevent 'good' status being achieved (for example, where activities are in the overriding public interest). If a scheme or activity is predicted to cause deterioration in water body status or prevent the water body from meeting any of its objectives, then assessment is required against the conditions listed in WFD Article 4.7, all of which must be met for the scheme to proceed without contravening the WFD. The impact of the scheme or activity on other water bodies within the River Basin District (RBD) must also be considered (Article 4.8) and protection given by existing Community Legislation to any Protected Areas must also be maintained (Article 4.9).

[3] Classification method statement, Environment Agency, 2011

Groundwater Directive (2006/118/EC)

1.3.11. This Groundwater Directive aims to set groundwater quality standards and introduce measures to prevent or limit pollution of groundwater, including those listed with the 'List of Priority Substances'. The directive has been developed in response to the requirements of Article 17 of the WFD, specifically the assessment of chemical status of groundwater and objectives to achieve 'good' status.

Northumbria River Basin Management Plan

1.3.12. The WFD introduced RBDs in order to better manage water bodies without administrative and political boundaries. Each river basin is managed to achieve the objectives of the WFD through the development River Basin Management Plans (RBMPs), which provide a clear indication of the way the objectives set for the river basin are to be reached within the required timescale, and set out a programme of measures. All watercourses along the Scheme are located within the Northumbria RBD[4].

National Planning Policy

1.3.13. The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

1.3.14. The NPPF is The NPPF is supported by a series of Planning Practice Guidance, one of which is key for this assessment, this is Water supply, wastewater and water quality.

A Green Future: Our 25 Year Plan to Improve the Environment

1.3.15. This plan[5] outlines the Governments plans that seek to ensure that new developments are should demonstrate environmental net gains.

[4] Northumbria river basin district: river basin management plan 2015, The Environment Agency. 2016. https://www.gov.uk/government/publications/northumbria-river-basin-district-river-basin-management-plan

[5] A Green Future: Our 25 Year Plan to Improve the Environment. Crown Copyright. 2018. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

2. ASSESSMENT METHODOLOGY

2.1. OVERVIEW

In brief, the methodology used for this WFD assessment comprises:

- Review of available relevant baseline information to understand the existing surface water and groundwater status, as well as future baseline and the ability of the water features to meet the WFD objectives.
- Review of the proposed works and the potential impacts to the identified surface and groundwater features, i.e. impacts that could reduce the WFD status of the feature and affect the ability of the waterbodies to meet the objectives of the WFD.
- Development of mitigation measures, as necessary.
- Provision of an assessment of residual risks.

2.2. DESK STUDY METHODOLOGY

DATA SOURCES

2.2.1. Baseline information to inform the desktop study has been obtained from the following sources:

- Environment Agency's online maps for flood risk[6] (accessed July 2018)
- Environment Agency's groundwater data
- Environment Agency's Catchment Data Explorer[7] (accessed July 2018)
- Northumbria River Basin Management Plan[8] (dated December 2015)
- Ground Investigation Factual Report (Application Document Reference: TR010031/APP/6.3)
- British Geological Society (BGS) Geology of Britain viewer[9] (accessed July 2018)
- BGS Geoindex online dataset[10] (accessed July 2018)
- Cranfield University's Soilscapes[11] (accessed July 2018)

[6] https://flood-map-for-planning.service.gov.uk/confirm-location?easting=425395&northing=562880&placeOrPostcode=Gateshead

[7] https://environment.data.gov.uk/catchment-planning/

[8] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718333/Northumbria_RBD_Part_1_river_basin_management_plan.pdf

[9] https://www.bgs.ac.uk/geoindex/

[10] https://www.bgs.ac.uk/geoindex/

[11] https://www.cranfield.ac.uk/themes/environment-and-agrifood/landis/soilscapes

- Historical maps[12] (accessed December 2018)
- Aerial imagery (Google Earth) (accessed December 2018)
- Hydrological and land use data[13] (Centre for Ecology and Hydrology (CEH)) (accessed December 2018)
- Ordnance Survey[14] (OS) mapping
- MAGIC online mapping[15] (accessed July 2018)

2.3. POTENTIAL IMPACTS

2.3.1. A review of the proposed works and the potential impacts to the identified surface and groundwater bodies has been undertaken by identifying the impacts that could reduce the WFD status or affect the ability of the water bodies to meet the objectives of the WFD.

2.3.2. The following factors have been considered when determining whether the potential adverse effects of the Scheme are likely to lead to a deterioration in status or prevent objectives being met:

- Whether the impact is temporary (such as short-term construction impacts) or permanent/long term.
- The characteristics and sensitivity of the specific water features affected by the Scheme (which may be different to the designated WFD water body).
- The scale and importance of the specific water features affected by the Scheme to the designated WFD water body.
- The nature, scale and extent of potential impact in the context of the existing pressures and proposed measures for the water body.

[12] old-maps.co.uk/

[13] https://nrfa.ceh.ac.uk/data/search

[14] https://www.ordnancesurvey.co.uk/opendatadownload/products.html

[15] Magic.defra.gov.uk/

3. WATERBODY DETAILS

3.1. BACKGROUND

3.1.1. The RBMP system provides a catchment-based approach to managing waterbodies, in accordance with the WFD. As such, the study area and the associated section of the River Team sit at the base of a hierarchy of catchments.

- The Northumbria River Basin District
  - Tyne Management Catchment; Northumbria Groundwater Management Catchment
  - The Tyne Lower and Estuary Operational Catchment; Tyne Carboniferous Limestone and Coal Measures Groundwater Operational Catchment.
  - The Team from Source to Tyne surface waterbody (ID: GB103023075670); Tyne Carboniferous Limestone and Coal Measures groundwater body (ID: GB40302G701500).

3.1.2. The Northumbria River Basin District covers an area of 9,000km^2, extending from the Scottish border in the north through Northumbria to Stockton-upon-Tees in the south. The major urban centres of the District include Newcastle, Gateshead, Sunderland and Middlesbrough. Around 67% of the District is farmed or used for forestry, with a mixture of arable and livestock production. The management catchments that make up the river basin district include many interconnected rivers, lakes, groundwater, estuaries and coastal waters. These range from industrial urban areas in the east to the moors, hills and valleys of the Pennines in the west. The Northumbria River Basin District has a particularly rich diversity of wildlife and habitats, supporting many species of global and national importance.

3.1.3. The Tyne Management Catchment covers an area of 2,943km^2 and drains in a generally eastward direction to the North Sea. The River Tyne rises in remote moorland landscape from two major tributaries, the North and South Tyne, which converge, just upstream of the village of Hexham, to become the River Tyne before flowing through the city of Newcastle and discharging into the North Sea at Tynemouth. Other major tributaries of the River Tyne include the Rede, Allen and Derwent.

3.1.4. According to the RBMP for the Northumbria River Basin District, at the time of writing (2015), 93% of the surface water bodies in this Management Catchment have an objective of maintaining or aiming to achieve good ecological status between 2015 and 2027, while all the waterbodies in the catchment are expected achieve good chemical status by 2027. The main issues for not achieving good status and reasons for deterioration are related to heavy metal pollution from abandoned mines and issues associated with urban waterbodies such as physical modification, diffuse pollution and the pressures of existing and new housing. Mitigation measures have been identified in the RBMP to tackle these issues.

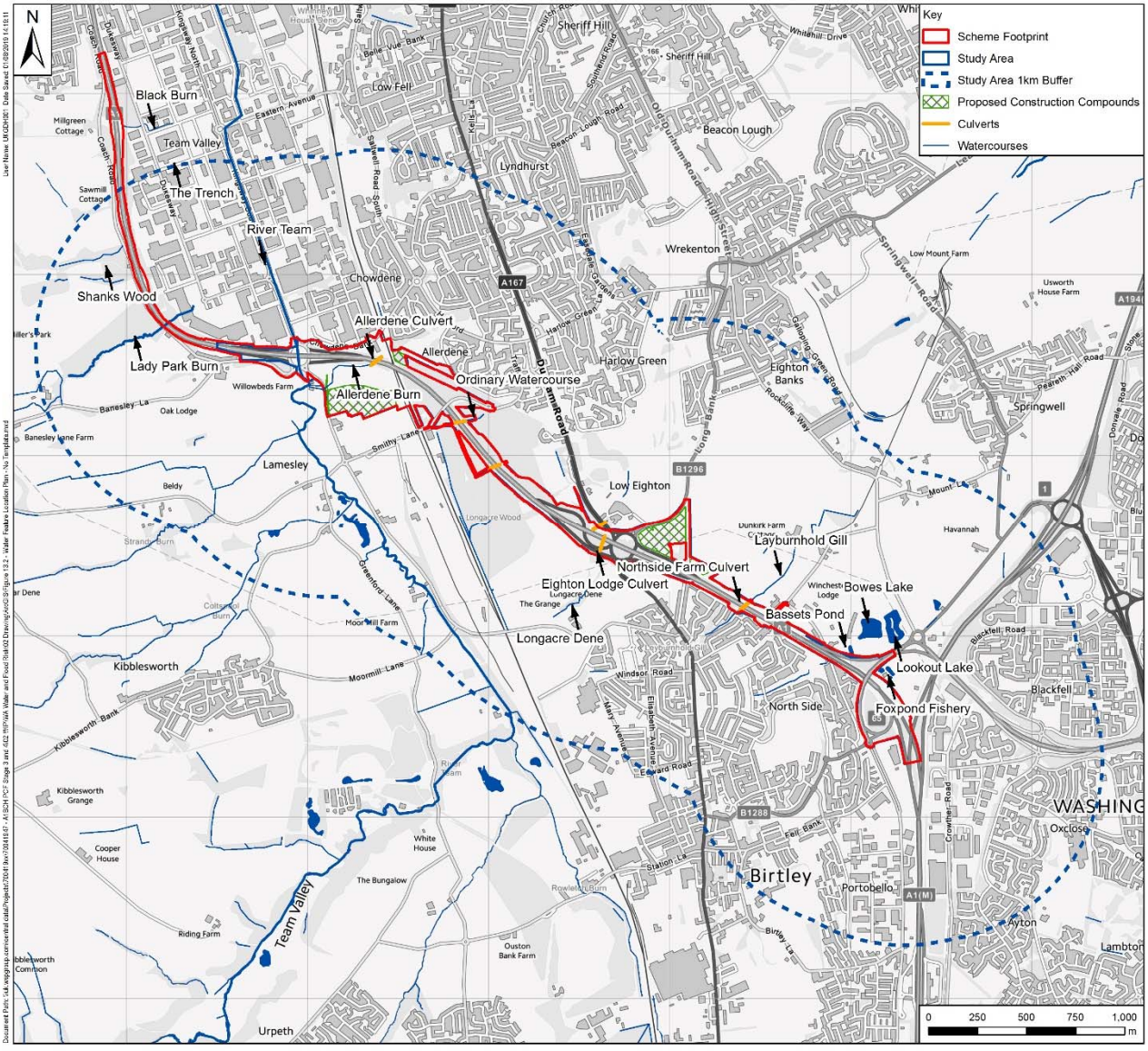
3.1.5. The Tyne Lower and Estuary Operational Catchment incorporates the River Team catchment and its tributaries. All the eight surface waterbodies within the catchment are expected to achieve good ecological and chemical status by 2027.

3.1.6. Within the Northumbria Groundwater Management Catchment, there are ten groundwater bodies, and based on the RBMP, all the waterbodies are expected to achieve good quantitative status by 2027, while 50% are predicted to achieve good chemical status by 2027.

3.2. SURFACE WATER BODIES

3.2.1. The following receiving waterbodies for the Scheme have been identified, as illustrated in **Figure 4** below.

Figure 4 - Receiving waterbodies



3.2.2. The River Team (classified as a Main River and under the jurisdiction of the Environment Agency) is under the junction 67 (Coal House) viaduct. The River Team flows from south to north and joins the Tyne Estuary at Dunston approximately 4.5km downstream of junction

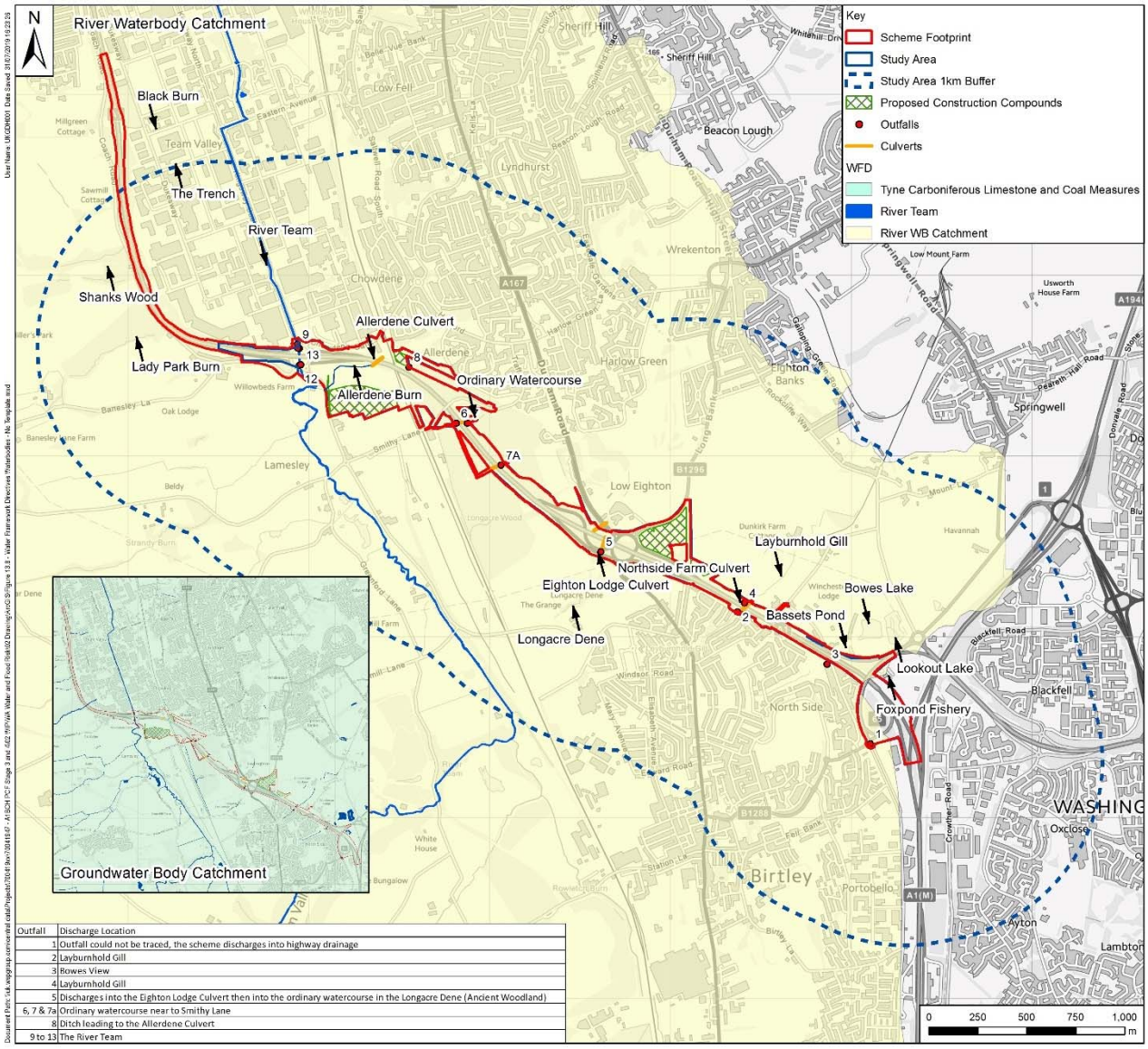
67 (Coal House). A proportion of the Scheme crosses over the fluvial floodplain of the River Team, land designated as Flood Zone 2.

3.2.3. The Lamesley Pastures Nature Reserve is located in the floodplain of the River Team approximately 1.3km west of the Scheme. The land is currently managed by Durham Wildlife Trust as a temporary wetland for wintering birds and other wildlife. It also forms part of the Team Valley flood alleviation scheme facilitated by the Environment Agency and the Gateshead Council.

3.2.4. The Northumbria RBMP shows that the River Team is a 'heavily modified waterbody'. The RBMP classified the current Ecological and Chemical Quality of the River Team as Moderate and Fail, respectively. The overall waterbody status is classified as Moderate with an objective for Good by 2027. **Table 3-1** details the current status of the River Team[16], and **Figure 5** shows the WFD designated waterbodies.

[16] Data for the waterbody are available on the Environment Agency's Catchment Data Explorer (http://environment.data.gov.uk/catchment-planning/WaterBody/GB103023075670) from 2009 to 2016.

Figure 5 - Water framework directive waterbodies



Outfall	Discharge Location
1	Outfall could not be traced, the scheme discharges into highway drainage
2	Layburnhold Gill
3	Bowes View
4	Layburnhold Gill
5	Discharges into the Eighton Lodge Culvert then into the ordinary watercourse in the Longacre Dene (Ancient Woodland)
6, 7 & 7a	Ordinary watercourse near to Smithy Lane
8	Ditch leading to the Allerdene Culvert
9 to 13	The River Team

3.2.5. Other watercourses within the study area, including the ordinary watercourse that drains through the Longacre Dene Ancient Woodland and the Allerdene Burn, which is the watercourse that passes under the Allerdene Bridge, have not been assessed as part of the Northumbria RBMP. However, given that they both discharge into the River Team, the water quality of these two ordinary watercourses is assumed to be similar to the River Team.

3.2.6. Longacre Dene, to the south of junction 66 (Eighton Lodge), falls under the Ancient Woodland Inventory and the Priority Habitats Inventory, and is therefore considered as a sensitive receptor. Highways Agency Drainage Data Management System (HADDMS) shows the presence of the Eighton Lodge Culvert through which the Scheme outfalls (Outfall 5) into the ordinary watercourse that drains through Longacre Dene.

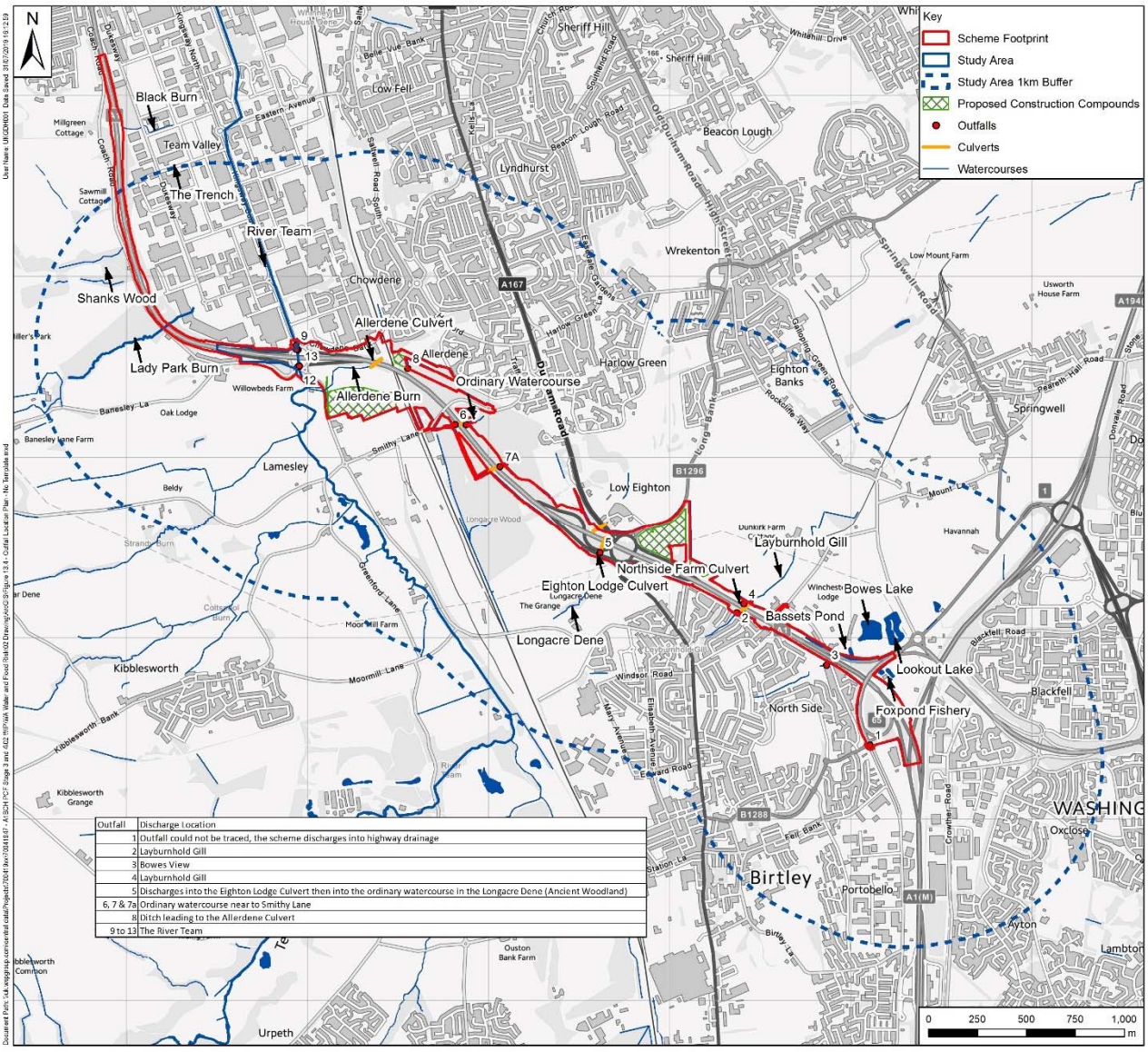
Table 3-1 - Environment Agency waterbody classification for River Team

Water Body Classification	Team from Source to Tyne	
	2016 Cycle 2	Objectives
Overall Water Body	Moderate	Good by 2027
Ecological	Moderate	Good by 2027
1. Supporting elements (Surface Water)	Moderate	Good by 2027
2. Biological quality elements	Moderate	Good by 2027
Fish	-	-
Invertebrates	-	Good by 2027
Macrophytes and Phytobenthos Combined	Good	Good by 2027
2. Hydromorphological Supporting elements	Supports good	Supports good by 2015
Hydrological Regime	Supports good	Supports good by 2015
3. Physico-chemical quality elements	Moderate	Good by 2027
Ammonia (Phys-Chem)	Good	Good by 2015
Biochemical Oxygen Demand (BOD)	High	-
Dissolved oxygen	High	Good by 2015
pH	High	Good by 2015
Phosphate	Poor	Good by 2027
Temperature	High	Good by 2015
4. Specific pollutants	High	High by 2015
Triclosan	High	High by 2015
Copper	High	High by 2015
Zinc	High	High by 2015
Chemical	Good	Good by 2015
1. Priority substances	Good	Good by 2015

Water Body Classification	Team from Source to Tyne	
1,2-dichloroethane	Good	Good by 2015
Atrazine	Good	Good by 2015
Lead and Its Compounds	Good	Good by 2015
Nickel and Its Compounds	Good	Good by 2015
Pentachlorophenol	Good	Good by 2015
Simazine	Good	Good by 2015
Trichlorobenzenes	Good	Good by 2015
Trichloromethane	Good	Good by 2015
2. Other Pollutants	Good	Good by 2015
Aldrin, Dieldrin, Endrin & Isodrin	Good	Good by 2015
Carbon Tetrachloride	Good	Good by 2015
DDT Total	Good	Good by 2015
Para DDT	Good	Good by 2015
Tetrachloroethylene	Good	Good by 2015
Trichloroethylene	Good	Good by 2015
3. Priority hazardous substances	Fail	Good by 2027
Cadmium and Its Compounds	Good	Good by 2015
Hexachlorocyclohexa	Good	Good by 2015
Tributyltin Compounds	Fail	Good by 2027
Trifluralin (Priority hazardous)	Good	Good by 2015

3.2.7. A total of 13 surface water outfalls have been identified within the Scheme Footprint[17], which discharge into various ditches, culverts and watercourses that eventually contribute to the River Team in the west. Locations of the existing outfall are mapped in **Figure 6**.

Figure 6 - Scheme surface water outfall and culvert locations



Outfall	Discharge Location
1	Outfall could not be traced, the scheme discharges into highway drainage
2	Laybumhold Gill
3	Bowes View
4	Laybumhold Gill
5	Discharges into the Eighton Lodge Culvert then into the ordinary watercourse in the Longacre Dene (Ancient Woodland)
6, 7 & 7a	Ordinary watercourse near to Smithy Lane
8	Ditch leading to the Allerdene Culvert
9 to 13	The River Team

[17] The Scheme Extent is based on Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 10 (HD 45/09). HD45/09 requires the study area to extend over 1km from the Scheme Footprint to ensure that any features which could be impacted are identified and assessed.

3.2.8. Details of the existing outfall locations are summarised as follow:

- Outfalls 1 and 3 are located in proximity to junction 65 (Birtley) - the exact discharge location of Outfall 1 is likely connected to the Gateshead Council highway drains; Outfall 3 discharges to the ditch at Bowes View.
- Outfalls 2 and 4 discharge into Leyburnhold Gill, which drains from northeast to southwest towards the River Team.
- Outfall 5 discharges into the Longacre Dene ordinary watercourse via Eighton Lodge Culvert; the ultimate discharge of this watercourse is the River Team.
- Outfalls 6 and 7 drain the Scheme to the ordinary watercourse near Smithy Lane, while Outfall 7a drains into a ditch that leads to the ordinary watercourse near Smithy Lane.
- Outfall 8 discharges into a culvert that leads to the Allerdene Burn
- Outfalls 9 to 13 discharge directly into the River Team at junction 67 (Coal House).

3.3. GROUNDWATER BODIES

3.3.1. According to the British Geological Survey, the bedrock underlying the entirety of the Scheme is of the Pennine Middle Coal Measures Formation, containing Mudstone, Siltstone, Sandstone, Coal, Ironstone and Ferricrete.

3.3.2. Superficial deposits underlying the Scheme are mostly Till, Devensian – Diamicton, with localised areas of Alluvium (Clay, Silt, Sand & Gravel) and Glaciolacustrine deposits (Devensian Clay & Silt) underlying the Scheme between junction 66 (Eighton Lodge) and junction 67 (Coal House).

3.3.3. The Bedrock underlying the Scheme is classified as Secondary A aquifer. These are permeable strata 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.

3.3.4. The majority of superficial deposits underlying the Scheme have been classified as secondary (undifferentiated) aquifer, with the rest classified as unproductive strata.

3.3.5. The Scheme is located within the Tyne Carboniferous Limestone and Coal Measures Groundwater Catchment (ID: GB40302G701500). This waterbody is designated as a drinking water protected area and is utilised throughout the catchment for small local, private water supplies (although none are identified in close proximity to the Scheme). It is at Poor status due to a combination of point and diffuse coal and metal mine impacts to both ground and surface waters. A number of remediation measures are being developed to mitigate these issues; however, the groundwater body will remain at Poor status. It is technically unfeasible and disproportionately costly to fully remediate polluted groundwater at such a large scale. Therefore, no change in status is expected and no impact on the status of the waterbody as a result of the Scheme is expected. The key statistics for this waterbody are given in **Table 3-2** below. Where 2015 targets are outlined as Good, the waterbody has met these targets, therefore, no further targets are required. However, in the case of Chemical (GW), Chemical Status element and General Chemical Test the status is

Poor, no improvement targets are given as no known technical solution is available or the mitigation measures would require a disproportionate burden. The overall score for this waterbody is Poor and is considered to remain at this status.

3.3.6. A meeting was held between WSP and the Coal Authority on 22 March 2018. This identified that the local groundwater regime is heavily influenced by major dewatering at Kibblesworth (~300l/s) undertaken by the Coal Authority. There is currently no programme of measures to turn off the pumps or change the regime.

Table 3-2 - Environment Agency waterbody classification for Tyne carboniferous limestone and coal measures groundwater body

Water Body Classification	Tyne Carboniferous Limestone and Coal Measures	
	2016 Cycle 2	Objectives
Overall Water Body	Poor	No known objectives to improve current status
Quantitative	Good	Good by 2015
1. Quantitative Status element	Good	Good by 2015
Quantitative Saline Intrusion	Good	Good by 2015
Quantitative Water Balance	Good	Good by 2015
Quantitative GWDTEs test	Good	Good by 2015
Quantitative Dependent Surface Water Body Status	Good	Good by 2015
Chemical	Poor	Good by 2015
1. Chemical Status element	Poor	No known objectives to improve current status
Chemical Drinking Water Protected Area	Good	Good by 2015
General Chemical Test	Poor	No known objectives to improve current status
Chemical GWDTEs test	Good	Good by 2015

Water Body Classification	Tyne Carboniferous Limestone and Coal Measures	
Chemical Dependent Surface Water Body Status	Poor	Good by 2027
Chemical Saline Intrusion	Good	Good by 2015

Note – The waterbody has achieved the Good Targets by 2015. Where it is of Poor Status then no known technical solution is available or the mitigation measures would require a disproportionate burden and no further targets are therefore required.

4. WATER BASELINE CONDITIONS

4.1. SITE DESCRIPTION

4.1.1. The Scheme is located on the A1 Newcastle Gateshead Western Bypass (NGWB) between just south of junction 68 (Lobley Hill) and junction 65 (Birtley), in the metropolitan borough of Gateshead and is approximately 6.5km in length. Further details can be found on **Figure 2.1 Scheme Location Plan** of this ES **(Application Document Reference: TR010031/APP/2.1)**

4.1.2. The Scheme is located in an area of mixed residential land, rural and agricultural land, industrial land, recreational land, public open space and urban fringe. The majority of the land in which the Scheme is situated is Green Belt. The Angel of the North, a culturally significant monument, is located adjacent to the Scheme. Nearby Scheduled Monuments (SMs) include Bowes Railway, Ravensworth Coalmill and Ravensworth Castle. The Scheme intersects Ravensworth Conservation Area. There are adjacent woodlands (Longacre Dene, Hill Head) listed in the Ancient Woodlands Inventory 2011. Other land uses include Lamesley Conservation Area (and listed buildings) and large areas of agricultural land.

4.1.3. The River Team runs underneath junction 67 (Coal House) and continues to flow in a northerly direction through Team Valley Trading Estate where it is heavily modified, and onward to the River Tyne at Dunston. The River Team floodplain occupies areas from the outskirts of Birtley in the south, through Lamesley and around Coal House roundabout, and continues through Team Valley. The River Team wildlife corridor is situated largely to the south of, but also crossing, the A1 and is made up of Lamesley Pastures Local Wildlife Site (LWS), Tyne Marshalling Yard, Lamesley reed beds mine water treatment area, Bowes Railway SM and bridleway and Longacre Wood LWS

4.2. EXISTING SURFACE WATER FEATURES

4.2.1. Whilst the Scheme only crosses one WFD watercourse, the River Team, a number of associated tributaries that drain into the River Team would be impacted by the works and are therefore considered in this assessment. These are listed below from west to east:

- River Team
- Allerdene Burn
- Ordinary Watercourse near to Smithy Lane
- Ordinary Watercourse in Longacre Dene
- Layburnhold Gill
- Bowes View

4.3. RIVER TEAM

BASELINE CONDITIONS

Catchment Overview

4.3.1. The River Team rises west of Annfield Plain, where it is known as Kyo Burn, at an altitude of ~310 m AOD. Catchment landcover is dominated variously by urban extent, grassland, and agricultural land, with small parcels of woodland and heathland disbursed throughout the catchment (CEH, 2019)[18].

4.3.2. Within the Study Area, the River Team flows under the existing A1 carriageway and flows in a predominantly south-west direction. It drains into the River Tyne at Dunston approximately 5 km downstream of the Scheme after flowing via a heavily urbanised area. The River Team is classified as a Main River and under the jurisdiction of the Environment Agency. The study reach lies within a heavily built-up area with a network of main roads, one of which is part of the Scheme (the Kingsway Roundabout and the Kingsway Viaduct). Areas of open floodplain local to the Kingsway Viaduct are planted with a mix of grasses, shrubs and small deciduous trees; however, areas where the road carriageways cross the floodplain are largely devoid of riparian vegetation. In addition, concrete piers that support the existing Kingsway Viaduct are situated within Flood Zone 2.

4.3.3. Solid geology within the catchment is dominated by sedimentary mudstone, siltstone and sandstones that comprise the Pennine Middle Coal Measures. Superficial geology is mixed; however, the upper reaches of the catchment are dominated by drift material of glacio-fluvial origin, whereas the lower reaches are dominated by glaciolacustrine and, within the river corridor, alluvium deposits.

Historical channel changes

4.3.4. Analysis of historical maps dating back to the 1860s indicate that the alignment of the River Team has changed significantly, initially as consequence of natural geomorphic processes, and later, from approximately the 1930s, anthropogenic influences. Mapping record reveals that natural geomorphic processes operating within the River Team appear to have been curtailed through straightening and realignment of the channel at multiple locations. This is particularly true towards the study area where the River Team previously exhibited a highly sinuous, actively meandering system. The contemporary planform of the channel towards the study reach exhibits significantly reduced sinuosity, where it has been diverted to allow for infrastructure.

[18]Centre for Ecology and Hydrology (2019) Catchment Data. Available at: https://nrfa.ceh.ac.uk/data/search

4.3.5. River bed composition local to the site of works was not ascertained through geomorphological survey; however, photographic evidence suggests bed material is comprised of medium to coarse gravels with an overabundance of fine silt material that potentially chokes the natural, coarse substrate. This appears to be exacerbated by the presence of a weir structure in the central part of the reach which exerts an upstream ponding effect where fines have accumulated. Furthermore, the presence of fine material is indicative of catchment-wide issues such a dominance of agricultural and urban/industrial land – livestock poaching, for example, appears to be prevalent immediately upstream of the study reach. Additionally, fine sediment accumulation throughout the study reach is likely derived from local sources: primarily the road and rail networks, from where road silts are derived.

4.3.6. No records for fish, including brown trout *Salmo trutta*, European eel *Anguilla anguilla* or Atlantic salmon *Salmo salar* were returned within the desk study data. The Environment Agency Preliminary Environmental Information Report (PEIR) response stated that recent records of salmon had been recorded within the River Team. However, no further data was provided.

4.3.7. The River Team was subject to electric fishing surveys during 2005, within the underground culverted section, beneath the Team Valley Trading Estate. This survey resulted in a zero catch, therefore, there were no records (at the time of the survey) of brown trout, European eel or Atlantic salmon passing through the extensive underground culvert section of the River Team.

However, the Environment Agency National Fisheries Populations Database has records (recorded via electric fishing during 2007, 2015 and 2017) for each of the species detailed above, in the following locations:

- River Team at Beamish Hall – brown trout
- River Team nr. Kibblesworth – European eel
- River Team Urpeth Caravan Park – brown trout
- Team Valley Weir – brown trout, European eel and Atlantic salmon

4.3.8. Each of these locations above are up and down stream of the Scheme Footprint along tributaries of the River Team. It is reasonable to assume that these species commute through the Study Area, and that the River Team therefore supports such populations which are of **National** value.

Figure 7 - View of the River Team looking downstream to the Kingsway Viaduct

Figure 8 - View of the bridge piers beneath the Kingsway Viaduct

4.4. ALLERDENE BURN

Catchment Overview

4.4.1. Allerdene Burn is a tributary of the River Team and is classed as an Ordinary Watercourse whose source is located at Ravensworth Golf Course, north of the village of Low Eighton. As a consequence of its largely urban setting, Allerdene Burn is heavily impacted by a series of culverts where it passes through built-up areas, and under the existing A1 and ECML. However, the watercourse also passes through small parcels of deciduous woodland in the urban area of Allerdene which provide some ecological benefit.

Historical channel changes

4.4.2. Historical mapping evidence reveals that Allerdene Burn has been significantly modified from its original form, particularly in its lower reaches, downstream of the existing A1 and ECML. The channel originally flowed in an east to west direction through a deeply incised, wooded valley section, a portion of which is still present, however housing and local infrastructure has resulted in a number of culverted sections. Downstream of the A1, Allerdene Burn has been straightened and realigned to the north of its original position. The channel now runs parallel to the existing A1 for approximately 275m, before two successive right-angle bends turning sharply south, and again west, where it joins the River Team.

Contemporary channel characteristics

4.4.3. Allerdene Burn is likely to be considerably different today in comparison to its original form and character. Within the Study Area, the channel is essentially an artificial, over-deep ditch with little desirable hydraulic variation. Based on photographic evidence, fine sediment represents the dominant substrate material, probably as a consequence of catchment-wide and localised pressures – namely, urban runoff and locally-derived road silts respectively, but also as a result of impeded coarse sediment delivery to the reach due to the upstream culvert which conveys water under the existing A1 carriageway. The riparian zone is mixed, with small deciduous trees occupying the right-hand bank (as viewed looking downstream). There is currently no riparian vegetation occupying right bank.

Figure 9 - View of the Allerdene Burn looking downstream from Lamesley Road

Figure 10 - Route of the current Allerdene Burn (along the fence line)

4.5. ORDINARY WATERCOURSE NEAR SMITHY LANE

Catchment Overview

4.5.1. The Ordinary Watercourse near Smithy Lane drains a small catchment to the east of the existing A1 near Harlow Green. The catchment is dominated by woodland; however, its source may be situated within the urban fringes of Harlow Green. Solid geology within the catchment is dominated by sedimentary mudstone, siltstone and sandstones that comprise the Pennine Middle Coal Measures. Superficial geology is comprised of Devensian till material.

Historical channel changes

4.5.2. It is difficult to ascertain if the alignment of the Ordinary Watercourse near Smithy Lane has changed over the last circa. 120 years. Historical maps dating back to the late 19th Century do not depict the watercourse at its lowermost extent; however, contemporary maps show a drain that runs parallel to the existing ECML, which appears to capture flow from the Smithy Lane water course, in addition to an additional small watercourse that drains from Longacre Wood.

Contemporary channel characteristics

4.5.3. It was not possible to ascertain the present-day character of this watercourse without a site visit due to lack of a photographic record.

4.6. ORDINARY WATERCOURSE IN LONGACRE DENE

Catchment Overview

4.6.1. The Ordinary Watercourse in Longacre Dene drains a small catchment to the east of the existing A1 near Low Eighton. Its source is located north-east of Low Eighton and drains in a north to south direction. Catchment landcover is dominated by agricultural land; however, the presence of the A1 and a number of A and B roads constitute a significant portion of catchment landcover. Solid geology within the catchment is dominated by sedimentary mudstone, siltstone and sandstones that comprise the Pennine Middle Coal Measures. Superficial geology is comprised of Devensian till material.

Historical channel changes

4.6.2. Analysis of historical maps dating back to the 1860s indicates that the alignment of the Ordinary Watercourse in Longacre Dene has been modified significantly where the Eighton Lodge roundabout and A1 have been constructed. The watercourse upstream and downstream of this location, however, has remained largely unchanged since the late 19th Century.

Contemporary channel characteristics

4.6.3. The channel is almost immediately captured by a culvert immediately north of the village of Low Eighton, which conveys the watercourse under the existing A1. Upon its emergence to the south of the A1, the channel is characterised by a steeply incised, wooded valley which offers multiple ecological benefits. Bed composition here is largely dominated by medium to coarse gravels with a number of small cobbles. The riparian environment consists of a variety of deciduous trees and small shrubs. There appears to be minimal fine sediment issues in the reach.

Figure 11 - View of the watercourse upstream of the culvert inlet

4.7. BOWES RAILWAY PATH AND LEYBURNHOLD GILL

Catchment Overview

4.7.1. Leyburnhold Gill drains a small catchment to the north east of the A1. Landcover in the upper reaches of the catchment is dominated by agricultural land; whereas landcover in the lower reaches is dominated by the urban area of Birtley. Solid geology within the catchment is dominated by sedimentary mudstone, siltstone and sandstones that comprise the Pennine Middle Coal Measures. Superficial geology is comprised of Devensian till material.

Historical Channel Changes

4.7.2. Analysis of historical maps dating back to the 1860s indicates that the alignment of Leyburnhold Gill has not changed significantly to the north of the A1. Downstream of the A1, however, the channel is likely to have changed significantly since the late 19th Century

Contemporary channel characteristics

4.7.3. Contemporary mapping shows that the channel has been extensively culverted due to the urban expansion of Birtley and construction of the A1. It is likely that Leyburnhold Gill follows its original course; however, contemporary culverts are likely to have resulted in the channel become straightened.

Figure 12 - View upstream of the A1 crossing, noting no formal surface water channel with surface water flowing from the field on the left-hand side

Figure 13 - View through the A1 underpass on the Bowes Railway Bridleway, noting the surface water channel on the left-hand side

5. BIODIVERSITY

5.1. BIODIVERSITY BASELINE CONDITIONS

5.1.1. The Biodiversity Chapter of the ES (**Application Document Reference: TR010031/APP/6.1**) outlines the following water related findings:

- The underground culverted section presents an existing barrier to fish migration to and from the lower reaches of the River Team and River Tyne downstream due to the change in conditions brought about by water flowing through the culvert e.g. lack of vegetation, increased flow rate, shading from the culvert roof. Equally, the smaller watercourses to the west of the A1 and River Team are also culverted beneath the existing A1, and the Team Valley Trading Estate, before joining the culverted section of the River Team.
- The River team supports fish populations of brown trout, European eel and Atlantic salmon, (refer to **paragraphs 8.7.22 to 8.7.24** of the **Chapter 8 Biodiversity**) of this ES (**Application Document Reference TR010031/APP/6.1**) for further details.
- The River Team has negligible potential to support water vole on this particular stretch.
- No potential otter holts or resting sites were identified during surveys and otter commuting and foraging activity is considered unlikely given the presence of a significant stretch of culvert (approximately 1.3km) leading to this section of the river.

5.2. BIODIVERSITY DESIGN AND MITIGATION MEASURES

5.2.1. The design measures that are detailed within the Biodiversity chapter are:

- Construction of the Scheme would result in the loss of habitat, for which compensatory habitat creation would be required. Habitat creation (mitigation planting) has been developed and incorporated into the landscape plan. Specific mitigation measures (for example, areas of habitat creation) are presented in the **Figure 7.6** Landscape Mitigation Design of this ES (**Application Document Reference TR010031/APP/6.2**).
- Avoidance of permanent loss of priority habitat areas where possible and the reduction in construction footprint to reduce temporary loss of priority habitat areas and suitable GCN terrestrial habitat.
- Avoidance and revision of land-take within the vicinity of and adjacent to waterbodies B, 14, 15, 16 and 17 (**Appendix 8.7** of this ES (**Application Document Reference TR010031/APP/6.3**)).
- Retention of existing vegetation, where possible, to reduce impacts relating to habitat loss and ecosystem services.

5.2.2. The mitigation measures that are detailed within the Biodiversity chapter are as follows:

- The approach to the biodiversity and landscape mitigation design (**Figure 7.6** (**Application Document Reference TR010031/APP/6.2**)) has sought to where possible result in ecological enhancement in the longer term. As set out in **Figure 7.6** (**Application Document Reference TR010031/APP/6.2**). The design includes:

- Reinstatement of habitat features within the same geographical area, where possible, maintaining connectivity to existing retained habitat features.
- Creating a diversity of habitat creation across the Scheme, including grasslands, scrub and woodland.
- Creation of woodland corridors and treelines to link existing woodland at Robin's Wood to the River Team and enhance the wildlife corridors between Longacre Wood LWS and the existing wildlife corridor to the west.
- Creation of linear features (hedgerows and tree lines) using native species along much of the length of the Scheme, on both east and west sides of the carriageway (design permitting).
- The use of native species within the planting plan.
- Planting of native trees and hedgerows to enhance the Bowes Railway LWS wildlife corridors and strengthen the wildlife corridor to encourage use.
- Use of native species and plant stock of local provenance within the mitigation planting design.

ALLERDENE BRIDGE OPTIONS MITIGATION

5.2.3. The overall mitigation for each of the options are similar in design, both the Allerdene embankment option and Allerdene viaduct option include:

- Creation of woodland and woodland edge habitats to the north and south of the carriageway. This planting creates a nearly continuous corridor of woodland and/or treelines between Ravensworth Pond and Woods to the southeast corner of Longacre Wood LWS, measuring approximately 2km in length.
- A realignment of a section of Allerdene Culvert to create a naturalised line and to include an associated wet grassland. Each option provides a slight deviation on design.

5.2.4. Additionally, the Allerdene embankment option includes the creation of a waterbody and species rich grassland north of the embankment (refer to Sheet 2a of 5 of **Figure 7.6 (Application Document Reference TR010031/APP/6.2)**.

5.2.5. The Allerdene viaduct option provides additional areas available for species rich grassland creation below the viaduct, to mitigate for the loss of grassland that supports the wintering bird populations.

6. IMPACT ASSESSMENT

6.1.1. The Scheme will impact water bodies in one of three different ways:

- Modification to the channel, changes to surface water discharges and potential for construction related impacts – this is related to the River Team and the Allerdene Burn.
- Changes to surface water discharges and potential for construction related impacts – this is related to the Ladyburnhold Gill, ordinary watercourse at Bowes View, ordinary watercourse in Longacre Dene. Ordinary watercourse at Smithy Lane.
- Potential for construction related impacts – this is related to the ordinary watercourse at Bowes Railway Bridleway.

6.1.2. These are considered within **Table 6-1** above along with the findings and in built mitigation as detailed within the Flood Risk Assessment (**Appendix 13.1** of this ES) (**Application Document Reference: TR010031/APP/6.3)**) which includes the Surface Water Drainage Strategy, the HAWRAT assessment and **Chapter 8 Biodiversity** of this ES (**Application Document Reference TR010031/APP/6.1**). Further information on each of these potential impacts are explored below.

6.2. CONSTRUCTION DESIGN AND MITIGATION

RIVER TEAM

6.2.1. In summary for the River Team, the Scheme will involve widening of five piers in the 1 in 100 year plus climate change flood plain, for which floodplain compensation is provided. More details on this aspect of the Scheme are:

- Widening of 5 piers that support the Kingsway Viaduct, these are outside of the River Team channel and 1 in 100 year floodplain, but will be within the 1 in 100 year plus climate change floodplain.
- Measures to prevent scour of the Kingways Viaduct piers, this is expected to be primarily managed by the piers being founded on piled foundations. Scour protection would be considered at detailed design and implemented in such a way so as not to impact the morphology of the river.
- Flood plain compensation would be provided via a top soil scrape for the loss of the River Team plain due to the extended piers, this will be provided within the junction 67 (Coal House) roundabout and outside of the River Team channel.

ALLERDENE BURN

6.2.2. In summary for the Allerdene Burn the Scheme would provide opportunities to daylight the existing culvert (more substantially in the Allerdene viaduct option) and create a two stage channel which would provide ecological benefits during the summer (again more extensive for the Allerdene viaduct option). More details on this aspect of the Scheme are:

- Modifications to the Allerdene Burn to accommodate the bridge replacement. Two options (Allerdene embankment option and Allerdene viaduct option) have been

proposed with respect to the bridge replacement, which will affect how the culverted ordinary watercourse is modified:

  - Allerdene embankment option: This includes daylighting (and naturalisation of this section) part of the current culvert to offset the lengthening of the downstream part of the culverted section of the watercourse (Allerdene Burn) and the realignment of approximately 300m of the open section of the watercourse downstream to run parallel to the new bridge.
  - Allerdene viaduct option: This includes the replacement of the culverted section of the watercourse (Allerdene Burn) with an engineered open channel and the existing watercourse downstream will be realigned to accommodate the new viaduct. The proposed channel (new section and realignment) will be approximately 620m in length and will run under one of the bridge spans of the new structure.

- Both options for Allerdene Culvert would be designed to mimic the flow conditions of the existing watercourse in order to minimise impacts to the channel morphology and to ensure flood risk is not increased within and outside of the Scheme Footprint. Mitigation measures to be implemented include:

  - For Allerdene embankment option, reinforced concrete headwalls, wingwalls and aprons would be provided at the inlet and outlet of the new culvert with appropriate scour prevention measures to minimise the risk of erosion.
  - For Allerdene viaduct option, in addition to the alterations provided for Allerdene embankment option, the existing culvert would be removed and replaced with an open channel.

- For both Allerdene embankment option and Allerdene viaduct option potential opportunities have been identified to improve the channel design and to provide enhancement to the river environment and morphology by, for example, inclusion of pools and riffles (or similar features to increase biodiversity) constructing a two-stage channel, adopting bioengineering techniques, such as rock rolls and mattresses, to maintain the channel profile and by re-vegetating the banks of the proposed channel realignment. These potential enhancements would be considered in the detailed design stage of the Scheme.
- The proposed channels, for both Allerdene embankment option and Allerdene viaduct option, have a slightly larger capacity than the existing (1,001m^3, 1,293m^3 and 865m^3 respectively) as detailed in **Table 8** of the FRA (**Appendix 13.1** of this ES (**Application Document Reference: TR010031/APP/6.3**)), therefore the use of flow control culverts has been considered to maximise the channel storage and subsequently utilise the storage in the floodplain to minimise the change in flow contribution to the River Team. The effects of the flow control culverts have been modelled and they are shown to be effective such that the post-development flood peaks/levels for both options will remain unchanged from the existing for all modelled events up to and including the 1 in 1000

year event. The requirements for flow control culverts would be incorporated into the detailed design stage of the proposed channel.

- The realigned channel includes features to restrict the flows to ensure that the flood peak is attenuated and to maximise the storage within the channel realignment. For Allerdene embankment option, the modelling indicates that two 1200mm culverts are required to be incorporated along the channel realignment to minimise the change in flood peak from the existing for both the 1% Annual Exceedance Probability (AEP) plus 50% climate change and the 0.1% AEP events. Similarly, for the Allerdene viaduct option, the modelling indicates that 1500mm and 1350mm culverts are required in the realigned channel to attenuate flows and minimise the change compared to the existing for the 1% AEP plus 50% climate change and the 0.1% AEP events.

6.3. SURFACE WATER DRAINAGE

6.3.1. In summary the proposed surface water drainage strategy for the Scheme will be an improvement to the existing drainage regime through the use of SuDs, oil interceptors and filter drains with an additional measure of a silt control vortex separator at Long Acre Dene (with detailed design to consider the installation of these at all outfalls) to reduce the rate of runoff and to improve the water quality of road drainage.

6.3.2. The Scheme will involve (further information is provided in **Section 5** of the **FRA, Appendix 13.1** of this ES (**Application Document Reference: TR010031/APP/6.3**):

- Existing outfalls along the A1 would be utilised but the Surface Water Drainage Strategy includes storage measures and associated flow control structures, such as oversized pipes, geo-cellular storage and balancing/attenuation ponds, that would be installed at each outfall to reduce the rate of surface water runoff. As detailed within Section 5 of the FRA it has been agreed with the Highways England Safety, Engineering & Standards team and the Environment Agency that attenuation storage will be designed to accommodate the 1 in 100 year plus 20% climate change event for all areas with the discharge restricted to off-set the increases in impermeable area to the greenfield runoff rates.
- Where the outfalls are within the Scheme Footprint detailed design will ensure that the outfalls are, where practicable, set back from the watercourse with an appropriate apron to reduce velocities prior to entering the watercourse, to assist with morphological aspects.
- A secondary effect of the attenuation ponds would be to treat the water. Sediment and pollutants would settle to the bottom of the attenuation ponds and not enter the Allerdene Burn or the River Team. Additionally, vegetation associated with the ponds would uptake nutrients, which would reduce the nutrient concentration in the water.
- The proposed Surface Water Drainage Strategy for the Scheme has included the provision of treatment of highway runoff to improve the water quality of surrounding watercourses. The following pollution control measures have been considered in the

drainage strategy (**Appendix 13.1** of this ES (**Application Document Reference: TR010031/APP/6.3**)):

- All attenuation storage would be designed with overflow and isolation systems to retain contaminated road drainage, allowing the contaminated water to be treated before discharge. The storage facilities would also allow sediment and pollutants to settle thus reduce the contaminant concentration in the water.
- Oil interceptors would be installed at all the outfalls to improve the water quality of the road discharge. Noting that they are currently only installed at two locations.
- Catch-pits have been specified in-lieu of manholes throughout the network, to assist with sediment reduction due to the sump at the base.
- In addition, silt control vortex separators would be incorporated into the outfall to Longacre Dene. The potential to include further silt control measure on all other outfalls would be assessed at detailed design to minimise sediment issues. However, catchpits have been specified instead of manholes to aid sediment retention within the drainage system.
- Cut-off drains would be constructed at the base of the new embankments along the road to prevent any contaminated runoff that exceeds the drainage capacity from entering third party land.
- Pollution Control Devices (Penstocks) would be installed where the larger volumes of liquid can be retained in the case of a pollution incident. These would be at the following locations:
  - Allerdene pond - Outfall 8
  - Coal House underground storage tank (north-east quadrant) – Outfall 11
  - Coal House underground storage tank (south-east quadrant) - Outfall 13
  - Birtley Bowes Incline underground storage tank – Outfall 1

Table 6-1 - Assessment of the potential for the Scheme to result in deterioration in the current ecological and chemical potential of the River Team

Element	Receptor	Potential impact of Scheme on Receptor	Scheme (including mitigation)	Detrimental Impact or Change to WFD Status	Compliant with WFD Objectives
River Team – Ecological					
Biological (current status: Bad; status objective: Good by 2027)	Fish; Invertebrates; Macrophytes& Phytobenthos Riparian mammals (e.g. water vole) Longacre Dene Ancient Woodland	Impacts and changes to retained habitats, including the Lamesley Pastures, along surrounding watercourses (River Team and other local watercourses culverted underneath the A1) during construction and operation of the Scheme, as a result of, for example, increased diffuse pollution and discharge of suspended solids into receiving watercourses. Impacts to Longacre Dene Ancient Woodland/Lamesley Pastures as a result of polluted road drainage discharge	▪ Prior to construction, a Construction Environment Management Plan (CEMP) would be produced to manage environmental impacts during construction. The CEMP would contain an ecological mitigation strategy to identify measures to mitigate the impact on ecological assets and a strategy of pollution prevention, which would include details of fuel storage, spillage management, disposal of contaminated drainage and measures for highlighting pollution prevention awareness within the workforce. ▪ With respect to riparian mammal habitats, findings from the latest ecology surveys identified that the River Team has negligible potential to support otter or water vole along the stretch adjacent to the A1 and downstream of junction 67 (Coal House) which is culverted for over 2km. The Allerdene Burn was also determined to have negligible potential to support otter or water voles. Potential works around junction 67 (Coal House) and the Allerdene Bridge area are unlikely to alter the existing ecological assets, with respect to riparian mammal habitats, of the surrounding watercourses. ▪ The River Team would be temporarily culverted during the construction stage of the Kingsway Viaduct extension. This approach is favoured by the Environment Agency over the original sheet piling approach. The conveyance of the watercourse would be maintained throughout construction. Any disturbance to riparian habitats would be minor and temporary and the river would be reinstated accordingly following construction.	None predicted	Yes
			▪ The Allerdene Burn, in the vicinity of the bridge area is currently heavily-engineered and manmade. Potential works around this area would involve either extending the existing Allerdene culvert and realigning a short section of the existing watercourse downstream of the new bridge (Allerdene embankment option) or constructing a new channel to replace the existing culvert (Allerdene viaduct option). The Allerdene viaduct option is preferred under the WFD as it is expected to provide betterment to the river environment given the watercourse would be de-culverted to facilitate the bridge replacement. Potential opportunities have been identified to improve the channel design and to naturalise the proposed channel, by, for example, constructing a two-stage channel, adopting bioengineering techniques, such as rock rolls and mattresses, to maintain the channel profile and by re-vegetating the banks of the proposed channel realignment. This could potentially provide biodiversity betterment and/or enhancement to the river environment. However, similar bioengineering techniques could be applied to improve the design of the channel realignment for Allerdene embankment option.		

Element	Receptor	Potential impact of Scheme on Receptor	Scheme (including mitigation)	Detrimental Impact or Change to WFD Status	Compliant with WFD Objectives
			▪ The proposed drainage strategy for the Scheme has taken into consideration the use of SuDs to improve the water quality of surrounding watercourses. Attenuation would be provided through the use of oversized pipes, geo-cellular storage and balancing ponds, and an attenuation pond would be included to capture runoff from the section between junction 66 (Eighton Lodge) and junction 67 (Coal House). The storage facilities would be designed with overflow and isolation systems to retain contaminated road drainage, allowing the contaminated water to be treated before discharge. The attenuation facilities would also allow sediment and pollutants to settle thus reduce the contaminant concentration in the water. Existing oil interceptors have been identified at Outfall 4, which discharges to the ordinary watercourse adjacent to Northside Farm, and at Outfall 11, which discharges to the River Team at junction 67 (Coal House). These would be replaced, and new oil interceptors would be installed at all the remaining outfalls to improve the water quality of the road discharge. ▪ Sediment Vortex Separators would be installed at the Longacre Dene outfalls with detailed design giving consideration to the installation of these at every outfall. However, catchpits have been specified instead of manholes to aid sediment retention within the drainage system.		
Hydro-morphology (current status: Supports Good; status objective: Supports Good by 2015)	Hydrological Regime Morphology Quantity and dynamics of flow River continuity River depth and width variation Structure and substrate of the river bed Structure of the riparian zone	Increase in surface water runoff as a result of increased impermeable area. Changes in the hydromorphological quality of watercourses due to new culverts and culvert extensions. Changes in the hydromorphological quality of watercourses due to temporary culverts for plant access Increased runoff due to bare earth on floodplain during works	▪ As part of the CEMP, a temporary surface water drainage strategy would be prepared for the construction stage to ensure: • Surface water drainage within the Scheme Extent of Works would be maintained in order to prevent significant ponding of surface water and to ensure the risk of localised flooding is not increased. • The methodology of construction would be implemented to maintain the continuation of flows for all watercourses within the Scheme Footprint. • All stockpiles and/or excavated materials would be stored in a position that minimises the risk of sediment-laden runoff from entering local watercourses. • All loose materials would be covered so as not to increase sediment load to the drainage network. ▪ Surface water run-off and excavation dewatering would be captured and settled out prior to disposal to sewer as appropriate.	None predicted	Yes

Element	Receptor	Potential impact of Scheme on Receptor	Scheme (including mitigation)	Detrimental Impact or Change to WFD Status	Compliant with WFD Objectives
		Changes in the channel morphology and the long term natural flow characteristics, such as the low flow regime or detrimental increase in flooding downstream and/or in off-site areas due to displaced floodwater and changes in flood flow characteristics of the River Team and other local watercourses as a result of the proposed works in areas around junction 67 (Coal House) and around the Allerdene Bridge.	▪ During the construction stage of the Kingsway Viaduct extension, the River Team would be temporarily culverted to ensure the continuation of flows downstream. Any changes to the natural flow regime of the watercourses are likely to be minor and temporary. ▪ Findings from the Flood Risk Assessment and hydraulic modelling of the River Team at this location demonstrate that the flood levels and velocities up and downstream will remain unchanged under post-development conditions. As such, no detrimental increase in flooding is expected within and/or outside the Extent of Works. ▪ Scour protection would be incorporated into the design of the Kingsway Viaduct extension to mitigate against erosion around the bridge pier abutments at the River Team crossing. As the piers are founded on pile foundations, this would reduce the risk of scour. Scour protection shall be considered at detailed design and would be implemented in such a way so as not to impact the morphology of the river. ▪ As part of the Scheme, the Allerdene Burn would be modified to facilitate the offline replacement of the bridge structure. In order to minimise the impacts on the channel morphology and the long term natural flow characteristics of the ordinary watercourse under the Allerdene Bridge, the following mitigation measures have been considered as part of the assessment: • Changes in the low flow regime as a result of any site surface water discharge during construction are likely to be negligible. The watercourse would also be temporarily diverted through pumping to ensure the continuation of flows downstream during the construction stage. • For the Allerdene embankment option, the existing Allerdene culvert would be removed for its entire length and replaced by a new culvert, which is extended to accommodate the Allerdene Bridge replacement to the south. The new culvert would be designed to maintain the hydraulic properties, which imitate the flow capacities, velocities and environment conditions of the existing structure. The new culvert would be constructed from corrugated steel, similar to the existing. Reinforced concrete headwalls, wingwalls and aprons would be provided at the inlet and outlet of the new culvert with appropriate scour prevention measures to minimise the risk of erosion. For Allerdene viaduct option, the existing culvert length would be channelled to form an open ditch. Potential opportunities have been identified to improve the channel design to provide enhancement to the river environment and morphology. ▪ Any new and/or channel realignments proposed as part of the Scheme would be appropriately designed to mimic the flow conditions of the existing watercourse so to minimise the impacts to the channel morphology and to ensure flood risk is not increased within and outside the Footprint ▪ Findings from the hydraulic modelling of the two proposed options for Allerdene culvert show that the flood peaks/levels will remain unchanged from the existing for all modelled events up to and including the 0.1% AEP (1 in 1000 year). However, as the proposed channels, for both Allerdene embankment option and the Allerdene viaduct option, have a slightly larger capacity than the existing, flow control culverts have been considered to maximise the channel storage and subsequently utilise the storage in the floodplain to minimise the change in flow contribution to the River Team. Results from the modelling show that the flow control culverts act to transfer flow from the proposed channels to the	None predicted	Yes

Element	Receptor	Potential impact of Scheme on Receptor	Scheme (including mitigation)	Detrimental Impact or Change to WFD Status	Compliant with WFD Objectives
			floodplain for events equal to and greater than the 1% AEP (1 in 100 year) plus 25% climate change event, which is comparable to the flooding regime of the watercourse under existing condition.		
		Increase in surface water runoff from the Scheme Footprint as a result of an overall increase in impermeable area.	▪ Although the highway contributing area is increased due to larger extent of the road surfacing and reduced greenfield areas, the proposed drainage strategy is designed to maintain or provide betterment on the existing runoff rates with the inclusion of flow control devices and storage attenuation. Existing outfalls along the A1 would be utilised but storage facility and associated flow control structure would be installed at each outfall to reduce the rate of surface water runoff, which, under current condition, would have flowed freely into the River Team. With the implementation of the proposed drainage strategy, no increase in runoff is expected from the Scheme Footprint, even in areas where the impermeable area is increasing.	None predicted	Yes
Physicochemical/ Chemistry (current status: Moderate; status objective: Good by 2027)	Acid neutralising capacity; Ammonia; Dissolved oxygen; pH; Phosphate; Temperature; Copper; Triclosan; Zinc	Increase in concentration of elements due to accidental spillage of materials during construction or contaminants in site surface water discharge during construction. Increase in diffuse pollution and discharge of contaminants into receiving watercourses as a result of the increase in highway contributing area.	▪ All site works, and ground works would be undertaken in accordance with the CEMP to ensure the risk of contamination during construction is mitigated. ▪ The River Team would be temporarily culverted during construction to widen the Kingsway Viaduct at junction 67 (Coal House). This would minimise the risk of contamination of the river from polluted site surface water discharge and/or contaminated water pumped from excavations, which would be stored outside the floodplain. ▪ The Highways Agency Risk Assessment Tool (HAWRAT) has been used to assess the potential pollution impacts of routine runoff from the Scheme on the water quality of the River Team. The results indicate that there would be no short term or long term impacts on the water quality of the River Team in association with routine road runoff from the Scheme, i.e. the annual average concentrations of soluble pollutants including dissolved copper and dissolved zinc would not exceed the published standards or thresholds. ▪ As mentioned above, the proposed drainage strategy has incorporated the use of SuDs to improve the water quality of the road discharge. This includes the use of oil interceptors and storage facilities equipped with overflow and isolation systems to retain the contaminated water.	None predicted	Yes
Element	Receptor	Potential impact of Scheme	Scheme (including mitigation)	Detrimental impact or Change to WFD status	Compliant with WFD objectives
River Team – Chemical					
Chemical elements (current status: Fail; status	1,2-dichloroethane; Atrazine; Lead; Nickel; Pentachlorophe-nol; Simazine;	Increase in concentration of elements due to accidental spillage of materials during construction or	▪ All site works and ground works would be undertaken in accordance with the CEMP to ensure the risk of contamination during construction is mitigated. For example, the fuel storage and refuelling area would be established well away from the watercourse to minimise the risk of spillage.	None predicted	Yes

Element	Receptor	Potential impact of Scheme on Receptor	Scheme (including mitigation)	Detrimental Impact or Change to WFD Status	Compliant with WFD Objectives
objective: Good by 2027)	Trichlorobenzen-es; Trichloromethan-e; Aldrin, Dieldrin, Endrin & Isodrin; Carbon Tetrachloride; DDT total; para DDT; Tetrachloroethyl-ene; Trichloroethylen-e; Cadmium; Hexachlorocyclo-hexa; Tributyltin Compounds; Trifluralin	contaminants in site surface water discharge during construction. Increase in diffuse pollution and discharge of contaminants into receiving watercourses as a result of the increase in highway contributing area.	▪ The River Team would be temporarily culverted during construction to widen the Kingsway Viaduct at junction 67 (Coal House). This would minimise the risk of contamination of the river from polluted site surface water discharge and/or contaminated water pumped from excavations. ▪ The proposed drainage strategy has incorporated the use of SuDs to improve the water quality of the road discharge. This includes the use of oil interceptors and storage facilities equipped with overflow and isolation systems to retain the contaminated water.		

Table 6-2 - Assessment of the potential for the Scheme to result in deterioration in the current quantitative and chemical potential of the Tyne carboniferous limestone and coal measures groundwater catchment

Element	Receptor	Potential Impact of Scheme	Scheme (including mitigation)	Detrimental Impact or Change to WFD Status	Compliant with WFD Objectives
Tyne Carboniferous Limestone and Coal Measure – Quantitative					
Quantitative Elements (current status: Good; status objective: Good by 2015)	Impact on wetlands; impact on dependent surface water bodies; saline intrusion; water balance	Disturbance of the geological strata during construction which could lead to changes in groundwater regime, particularly in relation to the piling for bridge pier extension (Kingsway Viaduct) at the River Team crossing.	It is anticipated that impacts on the groundwater regime as a result of deep excavations and/or piling activities would be minor and temporary. Any dewatering activities that may be required are considered likely to be limited to perched water tables given the Coal Authority pumping regime (as detailed in the FRA) and therefore no impact on surface water bodies is predicted.	None predicted	Yes
Tyne Carboniferous Limestone and Coal Measure – Chemical					
Chemical elements (current status: Poor; no known objectives to improve the current status)	Drinking water protected area; general chemical test; impact on wetlands; impact on surface waters; saline intrusion	Alteration in the regional groundwater quality due to contaminants in site surface water discharge or accidental spillages of materials during construction.	All site works and ground works would be undertaken in accordance with the CEMP to ensure the risk of contamination during construction is mitigated.	None predicted	Yes

6.4. SURFACE WATER BODY MITIGATION MEASURES

6.4.1. In order for all waterbodies to achieve good status by 2027, the Northumbria RBMP sets out a number of mitigation measures. These measures include elements that are already in place, as well as practices, structures or features that could be put in place in the future in order to help improve the ecological status of the waterbodies.

6.4.2. **Table 6-3** sets out the mitigation measures for the Tyne Lower and Estuary Operational Catchment and provides an assessment of the potential for the Scheme to impact on each of the measures.

Table 6-3 - Mitigation measures set out for the Tyne lower and estuary operational catchment to achieve water body objectives by 2027 and beyond

Mitigation Measure	Potential Impact of the Scheme	Details
Reduce diffuse pollution pathways (i.e. control entry to water environment through surface water runoff and drainage management)	None	The Scheme will not prevent this mitigation measure from being delivered. Furthermore, the proposed drainage strategy would incorporate the use of SuDs, including oil interceptors, storage attenuation and overflow/isolation systems, to improve the water quality of the road drainage.
Mitigate/Remediate point source impacts on receptor and reduce point source pollution at source (prohibit/control quantities/volumes of substances entering sewers; mine water discharge remediation/treatment; install/improve grit and sediment treatment)	None	No significant point source impacts are foreseen, these would be limited to accidental spillage during construction. However, all site works and ground works be undertaken in accordance with the CEMP to mitigate the risk of contamination or accidental spillage.
Improvement to condition of channel/bed and/or banks/shoreline; improvement to condition of riparian zone and/or wetland habitats; removal or modification of engineering structure (managed	None	The Scheme will not prevent this mitigation measure from being delivered. Potential opportunities have been identified to naturalise the proposed channels for Allerdene culvert (Allerdene embankment option and Allerdene viaduct option), which is currently heavily-engineered and manmade, to provide

Mitigation Measure	Potential Impact of the Scheme	Details
realignment; improve floodplain connectivity; modify structures; increase in-channel morphological diversity; habitat creation; bank rehabilitation/re-profiling)		betterment and/or enhancement to the river environment. Furthermore, the adoption of SuDs in the proposed drainage strategy would improve the water quality of the road drainage discharging into the River Team and the ordinary watercourse through Longacre Dene Ancient Woodland.

6.5. ENVIRONMENT NET GAIN

6.5.1. In accordance with the Governments "A Green Future: Our 25 Year Plan to Improve the Environment"[19] which seeks to ensure that new developments should demonstrate environmental net gains, the Scheme provides:

- Improved water quality within the River Team and associated water features as a result of the surface water drainage strategy
- Silt reduction as a result of the surface water drainage strategy
- Enhanced in channel habitat as a result of the Allerdene Burn re-alignment
- Habitat changes as a result of the works detailed within **Chapter 8 Biodiversity** of the ES (**Application Document Reference: TR010031/APP/6.1)**

6.6. EXISTING HIGHWAYS ENGLAND CULVERTS AND OUTFALLS

6.6.1. The Scheme is based upon widening of the existing road, therefore the only works to the existing culverts or outfalls are described above, as these are the only ones which are possible to undertake within the Red Line Boundary/Scheme Footprint. The Scheme Extents are set as close as possible to the existing highway landownership so as to avoid impacts on third party land as well as that on existing biodiversity. For instance, the proposed widening has been designed to minimise the impacts on Longacre Dene, which is an ancient woodland by undertaking the works on the opposite side of the highway.

6.6.2. Additionally, the watercourses cross the A1 at around 90º therefore there is no scope to make modifications to the watercourse/channels on the approach or exit to the A1.

[19] A Green Future: Our 25 Year Plan to Improve the Environment. Crown Copyright. 2018. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

6.6.3. However, where existing surface water outfalls fall within the Extent of Works, detailed design will consider modifications to the outlet structure to ensure that they are set back from the watercourse, to reduce the impacts to flow.

6.7. HEAVILY MODIFIED WATERBODY DESIGNATION

6.7.1. As part of the consultation with the Environment Agency they have requested that a range of potential mitigation measures are considered and where possible enhancement measures implemented with respect to the Heavily Modified Designation: Urbanisation. These mitigation measures are detailed below in italics and the Scheme compliance is outlined below each bullet point:

- Align and attenuate flow to minimise impact on ecology
  - The surface water drainage strategy as detailed within the FRA has been designed to provide the required degree of attenuation. The Scheme also includes a commitment to realign (where necessary) any outfalls that are within the redline boundary to ensure that they are set back from the watercourse and have a flow apron, where feasible.
- Alter culvert channel bed to allow longitudinal connectivity
  - The Allerdene Culvert is to be replaced as part of the Scheme, no other culverts/underpasses are to modified. The detailed design of the new Allerdene Culvert will include a bed as appropriate.
- Create habitat
  - Water specific habitat creation is associated with the realigned 2-stage Allerdene Burn with additional biodiversity habitat works detailed within the Biodiversity Chapter of the ES (Chapter 8).
- Educate landowners impacts to Hydromorphology and Hydromorphological harm
  - Highways England will remain the landowner for the realigned section of the Allerdene Burn, the maintenance strategy for the channel (to be developed during detailed design) will include measures to prevent hydromorphological harm.
- Enhance existing structures to improve ecology
  - There is no scope within the Scheme to improve the existing underpasses and culverts, other than the Allerdene Burn. The outfalls will be improved where they are located within the Scheme Footprint and the water quality discharged will be enhanced through the inclusion of hydrocarbon interceptors, catchpits and sediment vortexes.
- Ensure maintenance minimises habitat impact
  - Highways England will have responsibility for the maintenance of the Scheme, the maintenance strategy (to be developed during detailed design) will be designed to minimise habitat impact.
- Ensure maintenance prevents sediment transfer

- Highways England will have responsibility for the maintenance of the scheme, the maintenance strategy (to be developed during detailed design) will be designed to ensure appropriate maintenance of the catchpits and sediment vortexes to reduce and prevent sediment transfer.

- Implement bank rehabilitation
  - The Allerdene Burn will be realigned as such will include an appropriately designed bank. The section of the River Team which is to be culverted as part of the temporary construction works will require bank rehabilitation as part of the culvert removal.
- Implement changes to locks etc.
  - There are no locks or other structures within the Scheme Footprint that can be modified.
- Implement channel maintenance strategy and/or technique
  - Highways England will have responsibility for the maintenance of the channels of the Allerdene Burn and River Team as they pass beneath the Scheme. However, this notes that the River Team is a Main River and the maintenance may under some circumstances be undertaken by the Environment Agency.
- Implement sediment management strategy
  - The Scheme includes catchpits, attenuation ponds and sediment vortexes as part of the sediment management strategy.
- Install fish passes
  - No structures have been identified that require the installation of fish passes
- Manage in-channel and riparian vegetation
  - Highways England will have responsibility for the maintenance of the channels of the Allerdene Burn and River Team as they pass beneath the Scheme (including management of the in-channel and riparian vegetation), this will be detailed within the maintenance strategy (to be developed during detailed design).
- Manage realignment of flood defences
  - There are no flood defences within the Scheme Footprint that could be considered for realignment
- Preserve or restore habitats
  - The biodiversity chapter details the works that can be undertaken to preserve and enhance habitats.
- Reduce fish entrainment
  - No areas in which fish may become entrained within the Scheme Footprint have been identified

- Remove and prevent further dispersal of invasive non-native species
  - The biodiversity chapter of the ES considers the implications associated with invasive non-native species.
- Remove obsolete structure(s)
  - There are no obsolete structures that can be removed as part of the Scheme.
- Remove or enhance set-back embankments
  - No embankments have been identified within the Scheme Footprint
- Remove or soften hard bank engineering
  - The removal of the temporary culvert on the River Team will enable sections of the bank that have engineered hard bank to be enhanced, this is subject to detailed design once the construction methodology is determined.
- Re-opening of culverts
  - The Scheme will involve daylighting all or part of the Allerdene Culvert, dependent upon the option that is to be progressed.
- Restore or increase floodplain (lateral) connectivity
  - The floodplain connectivity will be enhanced as part of the Allerdene Burn realignment, particularly for the viaduct option
- Restore or Increase In-channel morphological diversity
  - The Allerdene burn realignment will provide an opportunity for an increase in-channel morphological diversity, subject to a geomorphological assessment to be completed during detailed design.
- Retain habitats
  - The biodiversity chapter details the works that can be undertaken to retain habitats.

6.8. TEMPORARY WORKS

6.8.1. The temporary works have yet to be fully determined and will be addressed as part of the Flood Risk Activity Environmental Permit and Ordinary Watercourse Consent. However, they are likely to be short in timescale and largely limited to the River Team (culverting a section of the channel) and works to the culvert on the Allerdene Burn. The design and method statement for these works will be developed by the contractor with appropriate measures in place to ensure that there is no deterioration in status of the waterbodies, following completion of the works. It may be appropriate to ensure that the culverted section retains the natural bed or allows the creation of an appropriate bed to ensure that there are no changes to the sediment transfer processes. This will ensure that the impacts upon ecology including fish and their habitat, invertebrates and macrophytes is neutral or minimised (in the case of the loss of daylight). Additionally, the culverted section will be set

an appropriate distance from the current culverted section (i.e. downstream of the Kingsway Junction), which, as identified in the ES Biodiversity chapter, is assumed to hinder ecology.

6.9. GEOMORPHOLOGY

6.9.1. No significant works to large watercourses are proposed as part of the construction or operation of the Scheme, as the piers that require extension are to remain outside of the 1 in 100-year flood plain. Additionally, the design of the scour prevention measures (as required) beneath the Kingsway Viaduct and the improved and realigned section of the Allerdene Burn channel will be supported by a geomorphological assessment as appropriate during detailed design to ensure that the Scheme will enhance the area over the long term.

7. CONCLUSIONS

7.1.1. This assessment concludes that the Scheme would not impact on the WFD status or objectives of any associated surface water or groundwater bodies in close proximity to the Scheme Footprint.

7.1.2. The Scheme would help to contribute moving the River Team towards achieving good status particularly through the improvements in the surface water discharged from the Scheme and the realigned section of the Allerdene Burn.

7.1.3. Furthermore, the Scheme would not prevent the achievement of the wider WFD objectives in the Northumbria River Basin District and is not predicted to have an impact on any other waterbody within the Northumbria River Basin District or mitigation measures developed to achieve ‘Good’ status.

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