Alternative Temporary Park and Ride and Heavy Goods Vehicle Marshalling Area - Environmental Statement Volume 2 Chapter 6: Water Environment

United Utilities Water Limited

Haweswater Aqueduct Resilience Programme

Planning Application Document RVBC–P&R-APP-RP-002 / ES-CH-06
February 28, 2025

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Volume 2 Chapter 6: Water Environment

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6. Water Environment

6.1 Overview and Scope of the Assessment

1) This chapter details the likely significant effects of the Alternative Facility in relation to the water environment. This includes the sub-disciplines of surface water hydrology, surface water quality, fluvial geomorphology and flood risk. To support the Environmental Statement a Water Framework Directive (WFD) assessment, geomorphology and flood risk assessment (FRA) have been undertaken.

2) FRA has been undertaken as part of the requirements of the National Planning Policy Framework (NPPF)[1] and is attached as Appendix C.1 to this report. The outcomes of the assessment are confirmed also by the location of the Alternative Facility in relation to the flood risk (Figure 6.3).

3) An assessment of the drainage impacts of the Alternative Facility is summarised in this chapter and reported in the planning application document RVBC–P&R-APP-RP-005 Sustainable Drainage Strategy.

4) The assessment includes consideration of the following matters:

- Surface water hydrology – the change of flow path routes and distribution of surface water as it moves across the land
- Surface water quality – the quality of surface water and impacts arising from pollution
- Fluvial geomorphology – the forms and functions associated with watercourses, and their interaction with the surrounding terrestrial environment, including sediment transport, erosion and deposition.

5) This chapter has links to other topic chapters, in particular Chapter 7 Ecology, which assesses the likely significant effects on aquatic ecology. Also, Chapter 9 Soils, Geology and Land Use, which assesses the likely significant effects on geology/minerals safeguarding areas, soils and land use.

6) This chapter is supported by the following reports, figures and appendices:

- Planning application document RVBC–P&R-APP-RP-005 Sustainable Drainage Strategy
- Figure 6.1 Main River Plan
- Figure 6.2 Surface Water Flood Risk
- Figure 6.3 Fluvial Flood Risk
- Figure 6.4 Proposed Drainage Layout
- Figure 6.5 Impermeable Area
- Figure 6.6 Water Framework Directive Waterbody Catchments

[1] Ministry of Housing, Communities and Local Government (2024). National Planning Policy Framework. [Online] Available at: https://assets.publishing.service.gov.uk/media/675abd214cbda57cacd3476e/NPPF-December-2024.pdf [Accessed: October 2024].

- Figure 6.7 Geomorphology
- Figure 6.8 Topography
- Figure 6.9 Superficial Geology
- Appendix C.1 Flood Risk Assessment
- Appendix C.2 Geomorphology Assessment
- Appendix C.3 Water Framework Directive Assessment.

7) A list of abbreviations and acronyms is presented in Volume 4 Appendix A.1.

6.1.1 Scope of the Assessment

8) United Utilities issued the EIA Scoping Report for the Alternative Facility to Ribble Valley Borough Council in October 2024. This set out the proposed scope of the assessment for each environmental topic. The following matter was scoped out of the assessment, as these were unlikely to result in significant effects:

- Groundwater vulnerability – the Alternative Facility is likely to have negligible effect due to impervious surfaces and no water discharge to ground being proposed.

9) Table 6.1 presents the scope of the assessment for the water environment based on the likely significant effects that could occur as a result of the Alternative Facility. Due to the size of the development, an FRA has also been undertaken.

Table 6.1: Matters Scoped into the Assessment

Receptor	Matter/Likely Significance of Effect	Comment
During Construction		
Surface water hydrology and channel morphology	Change in surface water drainage	Scoped in. Earthworks and compaction of topsoil due to use of heavy machinery and working near watercourses may lead to a change in surface water drainage or sediment flushing into the watercourse. Site compounds and materials storage may alter runoff patterns and rates.
Surface Water Quality	Risk of pollution to watercourses and change to ecological status	Scoped in. Oil and suspended solids in runoff from vehicles and access roads may pollute the watercourse. Increased pollution risk as a result of using substances in the construction process e.g. cement. Risk of spillages and leakage from general construction equipment and plant moving around site. Unmitigated discharges could worsen water quality and affect the Mearley Brook 'Moderate' ecological status.
Abstractions	Disruption to or pollution of existing surface or groundwater abstraction	Scoped in. The extent of existing abstractions was unknown at the scoping stage, therefore they are scoped in.

Receptor	Matter/Likely Significance of Effect	Comment
During Operation		
Surface water hydrology and channel morphology	Change in surface water drainage and water quality	Scoped in. New hard surfaces (roads, car parks) may affect surface water drainage and increase runoff rates, and unrestricted discharges could impact on channel morphology.
Surface Water Quality	Risk of pollution to watercourses and change to ecological status	Scoped in. Runoff from roads, car parks and hardstanding may contain pollutants which could contaminate local watercourses. Unmitigated discharges could worsen water quality and affect the Mearley Brook 'Moderate' ecological status.
Abstractions	Disruption to or pollution of existing surface or groundwater abstraction	Scoped in. The extent of existing abstractions was unknown at the scoping stage, therefore they are scoped in.

6.2 Key Legislation, Policy and Guidance

10) Table 6.2 sets out key legislation, policy and guidance of relevance for the water environment.

Table 6.2: Key Legislation and Guidance

Applicable Legislation and Guidance	Description
Legislation	
Water Environment (WFD) (England and Wales) Regulations 2017[2]	Transposes the EU WFD (2000/60/EC), into English and Welsh law. It establishes a legislative framework for the protection of surface waters (including rivers, lakes, transitional waters and coastal waters) and groundwaters.
Water Supply (Water Quality) Regulations 2016[3]	Consolidates legislation concerning the quality of water supplies for human consumption in England. A further analytical parameter (radon) is added for the monitoring of water supplies intended for human consumption.
Water Resources Act 1991[4]	The Act legislates for the regulation of water resources, water quality, pollution and flood defence.
Water Act 2003[5]	The Act makes provision in connection with land drainage and flood defence and contaminated land as far as it relates to the pollution of controlled waters.
Environmental Protection Act 1990[6]	The Act makes provisions for the improved control of pollution arising from certain industrial and other processes; to re-enact the provisions of the Control of Pollution Act 1974[7] relating to waste on land, with modifications regarding the functions of the regulatory and other authorities concerned in the collection and disposal of waste and to make further provision in relation to such waste.

[2] The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. [Online] Available at: https://www.legislation.gov.uk/uksi/2017/407/contents [Accessed: October 2024].

[3] The Water Supply (Water Quality) Regulations 2016. [Online] Available at: https://www.legislation.gov.uk/uksi/2016/614/contents [Accessed: October 2024].

[4] Water Resources Act 1991. [Online] Available at: https://www.legislation.gov.uk/ukpga/1991/57/contents [Accessed: October 2024].

[5] Water Act 2003. [Online] Available at: https://www.legislation.gov.uk/ukpga/2003/37/contents [Accessed: October 2024].

[6] Environmental Protection Act 1990. [Online] Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents [Accessed: October 2024].

[7] Control and Pollution Act 1974. [Online] Available at https://www.legislation.gov.uk/ukpga/1974/40 [Accessed: October 2024].

Applicable Legislation and Guidance	Description
Flood and Water Management Act 2010[8]	This Act defined the responsibilities for Risk Management Authorities and places a duty on them to contribute towards the achievement of sustainable development when exercising flood and coastal erosion risk management functions.
Land Drainage Act 1991[9]	This Act empowers drainage authorities to regulate works to Ordinary Watercourses (non-Main Rivers).
The Flood Risk Regulations 2009[10]	These Regulations provide a framework for managing flood risk over a six-year cycle, and require the production of Preliminary Flood Risk Assessments, identify areas of potential significant risk and undertake flood hazard mapping and Flood Risk Management Plans.
National Policy	
National Planning Policy Framework (NPPF)[11]	This states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. However, where development is necessary, it should be made safe throughout the life of the development without increasing flood risk elsewhere. It states that planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where informed by an FRA.
Planning Practice Guidance – Flood Risk and Coastal Change[12]	This provides guidance on the implementation of the NPPF for Flood Risk. It advises how to take account of the NPPF policies and address the risks associated with flooding. It provides detailed advice on how to manage and mitigate flood risks in the planning process.
Local Policy	
Ribble Valley Borough Council Core Strategy[13]	The following local planning policies are relevant to the water environment: DME6: Water Management

6.3 Study Area

11) The study area for the water environment is defined as the planning application boundary of the Alternative Facility with a further 100 m buffer zone.

[8] Flood and Water Management Act 2010. [Online] Available at: https://www.legislation.gov.uk/ukpga/2010/29/contents [Accessed: October 2024].

[9] Land Drainage Act 1991. [Online] Available at: https://www.legislation.gov.uk/ukpga/1991/59/contents [Accessed: October 2024].

[10] The Flood Risk Regulations 2009. [Online] Available at: https://www.legislation.gov.uk/uksi/2009/3042/contents/made [Accessed: October 2024].

[11] Ministry of Housing, Communities and Local Government (2024). *Op. cit.*

[12] Ministry of Housing, Communities and Local Government (2022). Flood risk and coastal change. [Online] Available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change [Accessed: October 2024].

[13] Ribble Valley Borough Council (2014). Core Strategy 2008 – 2028 A Local Plan for Ribble Valley, Adoption Version. [Online] Available at: https://www.ribblevalley.gov.uk/downloads/file/1700/adopted-core-strategy [Accessed: October 2024].

6.4 Baseline Environment

6.4.1 Data Sources

12) The following data sources have been used to help establish an understanding of the baseline environment:

- Environment Agency Flood Map for Planning[14]
- Ribble Valley Borough Council Strategic FRA - Level One[15]
- Northwest River Basin District Flood Risk Management Plan[16]
- Environment Agency Surface Water Flood Mapping[17]
- British Geological Survey (BGS) BGS Geology Viewer[18]
- Environment Agency Catchment Data Explorer[19]
- Groundsure Report B27070EP Park and Ride
- Abstraction Licence, Freedom of Information Request from Ribble Valley Borough Council.

6.4.1.1 Site Work

13) A site walkover was undertaken in June 2024 to identify relevant water features and constraints.

14) A fluvial geomorphology site walkover was undertaken in November 2024. The site walkover included a walkover of the length of Worston Brook that could be immediately impacted by the Alternative Facility. Fluvial geomorphological features and processes were identified and recorded using ArcGIS.

6.4.2 Existing Baseline

15) The nearest Main River to the site is Worston Brook, located at its nearest point approximately 25 m to the north of the planning application boundary. Worston Brook feeds another Main River, Mearley Brook, which lies approximately 200 m to the west. Worston Brook joins Mearley Brook downstream of the Alternative Facility at a confluence which feeds firstly into Pendleton Brook and then ultimately to the River Ribble (see Figure 6.6). Worston Brook contributes to

[14] Environment Agency (2021). Flood Map for Planning. [Online] Available at: https://flood-map-for-planning.service.gov.uk/ [Accessed: October 2024].

[15] Ribble Valley Borough Council (2017). Strategic Flood Risk Assessment Level One, revised 2017. [Online] Available at: https://www.ribblevalley.gov.uk/downloads/file/2029/strategic-flood-risk-assessment-level-1-revised-2017- [Accessed: October 2024].

[16] Environment Agency (2022). North West River Basin District Flood Risk Management Plan 2021 to 2027. [Online] Available at: https://assets.publishing.service.gov.uk/media/63809c7ee90e072345afbd65/North-West-FRMP-2021-2027.pdf [Accessed: October 2024].

[17] Environment Agency (2024). Surface Water Flood Mapping. [Online] Available at: https://check-long-term-flood-risk.service.gov.uk/map [Accessed: October 2024].

[18] British Geological Survey (2017). BGS Geology Viewer. [Online] Available at: https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/ [Accessed: October 2024].

[19] Environment Agency (2023). Catchment Data Explorer. [Online] Available at: https://environment.data.gov.uk/catchment-planning [Accessed: October 2024].

the Mearley Brook catchment (WFD GB112071065510) which has a 'Moderate' ecological status. During a site visit undertaken in June 2024 there was evidence of existing land drainage in the north-eastern corner of the site.

16) The Environment Agency Flood Map for Planning shows that the site is designated as Flood Zone 1, i.e., low risk of flooding with a probability of less than 1 in 1,000 (or less than 0.1%). The land adjacent to Worston Brook is designated as Flood Zone 2 and 3 and is within a small portion of the planning application boundary. There are no flood defences in vicinity of the site and no information concerning historical flooding at the site.[20]

17) The Alternative Facility would have a 'Medium Vulnerability' to groundwater flooding based on the hydrological, geological, hydrogeological and soil properties within a single square kilometre. Groundwater flooding is not considered to be a significant factor across the Ribble Valley Area.

18) The Alternative Facility is located in an area at 'Very Low Risk' of surface water flooding. The only area of 'High' surface water flood risk is along Pimlico Link Road to the east of the site (see Figure 6.2).

19) The Alternative Facility is not within, or in proximity to, a groundwater source protection zone, however, Secondary A aquifers are present within the planning application boundary.

20) At the time of the assessment there were no licensed water abstraction or discharge licences from or to Worston Brook. A Groundsure Environmental Report identified no licensed abstractions within 1 km of the site.[21] A request was made to Ribble Valley to provide information on any private abstractions, with no response.

21) Appendix C.2 Geomorphology Assessment provides an assessment of the fluvial geomorphology within the study area which could interact with the Alternative Facility. Worston Brook exhibits varying flow types and geomorphological characteristics. Worston Brook is active with extensive erosion along both banks, with depositional features associated with meanders and obstructions (i.e. fallen trees) in the channel. A potential historic cut off channel was also noted, however, it was unclear whether this is natural or excavated, though historic maps indicate that the channel has undergone planform changes (from straight to meandering) in this section. Table 6.3 below outlines a summary of the baseline geomorphology conditions as recorded during the site visit.

Table 6.3: Summary of Baseline Geomorphology Conditions of the Study Area

Attributes	Description
Valley Shape	U-shaped
Floodplain Extent	Semi-continuous along both banks
Floodplain Width	Varied. Constrained at culvert outlet, under Pimlico Link Road to approximately 50-60 m wide throughout most of study area, where left bank is more connected to the flood plain and the right bank is semi-connected.
Riparian Zone	Continuously vegetated along both banks up to and beyond 10 m.
Riparian Vegetation	Largely deciduous trees along left-hand bank. Some hawthorns. Grasses and occasionally a tree or shrub along the right-hand bank.

[20] Ribble Valley Borough Council (2017). *Op. Cit.*

[21] Groundsure Report GS-C6K-M1B-7M3-7TR 12/07/2024

Attributes	Description
Bank Conditions	Largely vertical and undercut showing cantilever through much of the study reach. On the inside of any channel bends, bank gradient was gently sloping (i.e. less than 45 degrees). Some gently sloping inner banks along bends. Intermittent poaching – extensive at site of outfall along left-hand bank.
Bank Composition	Composite earth (i.e., soils, gravels and cobbles)
Bed Conditions	Largely coarse gravel to cobble. Finer gravels within interstices. Poorly sorted, mobile with light-coloured substrate; some consolidation in places. There is more silt where trees have fallen into the channel and silt is noted at the site of the proposed outfall.
Flow Types	Varied. Reflect step pool at top of reach and pool riffle for remainder. Broken and unbroken standing waves at bed forms and smooth or rippled at pools/plane-beds.
Morphological Processes and Features	Extensive erosion along both banks. Alternates depending on bend direction. Step pool sequences for first 30 – 40 m, but shallow. Pool-riffle for remainder. Inside bends and obstructions (i.e., trees) facilitate bar formation. Potential cut-off channel approximately 30 m downstream of outfall location, unsure whether natural process or excavated.
Dominant Reach-scale Process	Lateral adjustment
Reach Function	Sediment exchange
Water Width	Approximately 4 m for first 100 m or so and then approximately 6 m for remainder of reach, on average
Water Depth	Approximately 0.1 m on average
Bankfull Width	Approximately 5 m on average
Bankfull Depth	Approximately 0.8 m on average

22) Appendix C.3 Water Framework Directive Assessment provides a WFD assessment of Worston Brook and Mearley Brook, evaluating the potential impacts of the Alternative Facility on its ecological status. The assessment considers whether the Alternative Facility could result in a deterioration of the rivers' status or hinder their ability to achieve the objectives set out under the WFD. Table 6.4 below outlines the water body parameter for the Mearley Brook. Worston Brook is considered to take on the parameters of the WFD catchment of Mearley Brook downstream.

Table 6.4: Water Body Parameter for Mearley Brook

WFD Attributes	Mearley Brook
Waterbody Type	River
Waterbody ID	GB112071065510
Hydromorphological Designation	Not designated artificial or heavily modified
National Grid Reference	SD7668241876
Catchment Area (km^2)	24.77 km^2
Length (km)	11.00 km
Current Status/Potential	Moderate ecological status
Objective Status/Potential	Good ecological status (2015, reason not achieved "Disproportionately expensive")
Reasons for Not Achieving Good	Point source – Domestic General Public. Phosphate. Diffuse source agricultural.

WFD Attributes	Mearley Brook
Biological Quality Elements	Measures delivered to address reason, awaiting recovery – No sector responsible. Polybrominated diphenyl ethers (PBDE) and Mercury and its compounds.
Physico-chemical Quality Elements	Diffuse source – Agriculture and rural land management. Phosphate (Reasons for Deterioration)
Hydromorphological Supporting Elements	Good
Specific Pollutants	Moderate (Phosphate)
Chemical Quality Elements	Supports Good
Priority Substances	High
Other Pollutants	Fail (Mercury and its compounds and PBDE)
Protected Areas	Good

6.5 Methodology

23) This section provides a summary of the criteria used in the assessment.

24) Table 6.5 presents the criteria to assess the value (sensitivity), this being based on a combination of the importance or rarity of the receptor (e.g. level of designation) and also its susceptibility or vulnerability to the Alternative Facility. Further details can be found in the Scoping Report (Alternative Temporary Park and Ride and Heavy Goods Vehicle Marshalling Area EIA Scoping Report).

Table 6.5: Criteria to Assess the Value/Sensitivity for the Water Environment

Importance	Criteria	Typical Example
Very High	Feature has a high quality and rarity on a regional or national scale	▪ Surface Water: Watercourse having a WFD classification shown in a River Basin Management Plan (RBMP) and Q95 ≥ 1.0 m^3/s; or a site protected/designated under European Commission (EC) or UK legislation (Special Area of Conservation, Special Protected Area, Site of Special Scientific Interest, Ramsar site, salmonid water), or species protected by EC legislation ▪ Flood Risk: Essential infrastructure or highly vulnerable development – land where water must flow or be stored in times of flood, referred to as Functional Floodplain (Flood Zone 3b) ▪ Fluvial Geomorphology: A watercourse that appears to be in complete natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present with limited signs of modification or other anthropogenic influences. Morphological features and processes would be highly sensitive to change as a result of temporary or permanent works.
High	Feature has a high quality and rarity on local scale	▪ Surface Water: Watercourse having a WFD classification shown in a RBMP and Q95 <1.0 m^3/s; or species protected under EC or UK legislation ▪ Flood Risk: More vulnerable development – land having a 1% Annual Exceedance Probability (AEP) or greater, of river flooding (Flood Zone 3) ▪ Fluvial Geomorphology: A watercourse that appears to be in natural equilibrium and exhibits a natural range of morphological features (such as pools and riffles). There is a diverse range of fluvial processes present, with limited signs of modification or other anthropogenic influences. Morphological features and processes would be sensitive to change as a result of temporary or permanent works.

Importance	Criteria	Typical Example
Medium	Feature has a medium quality and rarity on local scale	▪ Surface Water: Watercourses not having a WFD classification shown in a RBMP and Q95 >0.001 m^3/s ▪ Flood Risk: Less vulnerable development – land having between a less than 1% AEP but greater than 0.1% AEP of river flooding (Flood Zone 2) ▪ Fluvial Geomorphology: A watercourse showing signs of modification and exhibiting a limited range of morphological features (such as pools and riffles). The watercourse is one with a limited range of fluvial processes and is affected by modification or other anthropogenic influences. Morphological features and processes could be sensitive to change as a result of temporary or permanent works.
Low	Feature has a low quality and rarity on local scale	▪ Surface Water: Watercourses not having a WFD classification shown in a RBMP and Q95 ≤0.001 m^3/s ▪ Flood Risk: Water compatible development – land having a less than 0.1% AEP of river flooding (Flood Zone 1) ▪ Fluvial Geomorphology: A highly modified watercourse that exhibits no morphological diversity and has a uniform channel, showing no evidence of active fluvial processes. Has likely been significantly affected by anthropogenic factors which could include modification of flow regime, resulting in a dry channel during prolonged dry periods. Morphological features and processes would be unlikely to be sensitive to temporary or permanent works.

25) Table 6.6 presents the criteria used to assess the magnitude of impact (change), this being the extent to which the Alternative Facility would impact a receptor based on whether the impact is temporary, permanent or reversible. The criteria provide a framework for consideration of the significance of environmental impacts.

Table 6.6: Criteria to Assess the Magnitude of Impact for the Water Environment

Magnitude	Criteria	Typical Example
Major	Results in loss of Feature and/or quality, and integrity of the Feature	▪ Surface Water: Compliance failure with Environmental Quality Standards values[22] ▪ Loss or extensive change to a fishery or a designated nature conservation site. ▪ Loss of regionally important public water supply ▪ Reduction in waterbody WFD classification ▪ Fluvial Geomorphology: Loss or extensive damage to habitat due to extensive modification of natural channel planform and/or sediment and flow processes ▪ Flood Risk: Increase in peak flood level (>100 mm).
Moderate	Results in effect on integrity of Feature or loss of part of Feature	▪ Surface Water: Partial loss in productivity of a fishery ▪ Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies ▪ Contribution to reduction in waterbody WFD classification ▪ Fluvial Geomorphology: Moderate deterioration from baseline conditions, with partial loss or damage to habitat due to modifications and/or changes to natural fluvial forms and processes ▪ Flood Risk: Increase in peak flood level (>50 mm).

[22] Environment Agency and Department for Environment, Food and Rural Affairs (2022). Surface water pollution risk assessment for your environmental permit. [Online] Available at: https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit [Accessed: October 2024].

Magnitude	Criteria	Typical Example
Minor	Results in some measurable changes in Features quality or vulnerability	▪ Surface Water: Minor adverse effect on water supplies ▪ Fluvial Geomorphology: Slight deterioration from baseline conditions, with partial loss/damage to habitat due to modifications and/or changes to natural fluvial forms and processes ▪ Flood Risk: Increase in peak flood level (>10 mm).
Negligible	Results in effect on Feature, but of insignificant magnitude to affect the use or integrity	▪ The Alternative Facility is unlikely to affect the integrity of the water environment.

26) Likely significant effects have been assessed using professional judgement considering the value (sensitivity) of the receptors, and the magnitude of change (impact) likely to be caused by the Alternative Facility. These factors are combined to give an overall significance of effect.

27) Significance of effect has been derived using Table 6.7 below. This has been supplemented by professional judgement which, where applicable, has been employed to provide rationale behind the values assigned. Likely significant effects, in the context of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017[23], are effects of moderate or greater significance.

Table 6.7: Significance of Effects

		Magnitude of Impact			
		Negligible	Minor	Moderate	Major
Importance/ Sensitivity of Feature	Low	Neutral	Neutral	Slight	Moderate/Large
	Medium	Neutral	Slight	Moderate	Large
	High	Neutral	Slight/Moderate	Moderate/Large	Large/Very Large
	Very High	Neutral	Moderate/Large	Large/Very Large	Very Large

6.6 Assessment of Likely Significant Effects

6.6.1 Introduction

28) The assessment has been undertaken on the assumption that embedded and good practice measures would be carried out to provide a reasonable worst-case basis for the assessment. Key measures include appropriate design of outfall (as necessary), appropriate storage and management of potential pollutants and treatment of surface/construction water prior to discharge.

[23] The Town and Country Planning (Environmental Impact Assessment) Regulations 2017. [Online] Available at: https://www.legislation.gov.uk/uksi/2017/571/contents [Accessed: October 2024].

6.6.2 Likely Significant Effects Prior to Mitigation

6.6.2.1 Construction

29) The water environment would be affected by the following components of the Alternative Facility during construction:

Surface Water Quality

- The site access and highway works (interaction with highway drainage), through the release of polluting substances (oils, fuels, chemicals and cement) from construction vehicles and plant machinery, spillages, as well as storage
- The site surfaces (earthworks, including soil stripping, construction of hardstanding, surface water drainage network and sustainable drainage system (SuDS))
- The surface water drainage infrastructure construction, comprising piping, retention and attenuation ponds, oil interceptor and drainage outfall.

30) Without any mitigation during construction, the following works would have the potential to cause negative effects on water quality which are described in more detail below:

- Chemical pollution
- Bed and bank disturbance
- Sediment-laden runoff
- Water nutrient conditions.

Chemical Pollution

31) During the construction phase, several potential pollutants would be present, including oils, fuels, cement, waste and wastewater. There would also be potential for pollution to occur within the construction compound due to spillages from moving construction plant and vehicles. Most of the potential pollutants would be stored within the compound. If any of the potential pollutants were to reach the watercourse this would adversely impact surface water quality. The magnitude of impact would depend on the volume of the spill/leak and the conditions on site at the time (e.g. weather). Worston Brook is considered to have a 'high' sensitivity due to having a 'Moderate' WFD classification. Any changes would be localised and temporary, therefore the works would have a 'minor' impact with a 'Slight/Moderate' adverse significance of effect.

Bed and Bank Disturbance

32) During the construction of the new outfall into Worston Brook for surface water discharge, there is potential for this to disturb the bed and bank of the brook. In-channel works could increase turbidity, affect pH and increase suspended solids leading to changes in surface water quality. Outfall construction could disturb bed and bank features and cause compaction of bed substrate on the Worston Brook. Loss of banks and bed due to outfall construction could displace invertebrates and macrophytes. Excavations and construction of the concrete outfall structure would lead to the release of fine sediment and pollutants, leading to increased fine sediment loads and alteration of nutrient conditions along the channel. Impacts would likely be localised and temporary and as such, bed and bank disturbance would have a 'minor' impact with a 'Slight/Moderate' adverse significance of effect.

Sediment-Laden Runoff

33) Adverse water quality impacts caused by sediment-laden runoff could be caused by activities associated with topsoil stripping, vegetation clearance, hardstanding construction, and new drainage installation. Increased impermeable areas could increase the volume of surface water runoff carrying suspended solids to Worston Brook. Likely effects from release of fine sediment would include localised smothering of invertebrate and fish. In turn, this could impact surface water quality. Impacts would likely be localised and temporary and as such, sediment-laden runoff would represent a 'minor' impact with a 'Slight/Moderate' adverse significance of effect.

Water Nutrient Conditions

34) The increase in surface water runoff from hardstanding (including the drainage outfall) could result in changes to water nutrient conditions, sediment loading, pH and water temperature. Impacts would likely be localised and temporary and as such, changes to water nutrient conditions would have a 'minor' impact with 'Slight/Moderate' significance of effect.

35) Without mitigation it is possible for the Alternative Facility to have 'Significant' effects on water quality during construction.

Surface Water Hydrology

36) During construction the way in which water is collected and conveyed on the land may change. Impacts from the Alternative Facility would include:

- Alteration of surface water catchment, runoff rates and flow patterns due to creation of site compounds and hardstanding, as well as materials storage
- Construction of surface water drainage network.

37) Without any mitigation, these activities for the construction works would have the potential to cause the following effects on surface water hydrology which are described in more detail below:

- Changes to surface water flow routes and runoff rates
- Increased impermeable surfaces.

Changes to Surface Water Flow Routes and Runoff Rates

38) During the construction of the drainage network, there would likely be impacts on the natural conveyance of water across the site. This process would disrupt existing surface water flow routes and may alter water distribution across the site, potentially leading to the diversion of water. Worston Brook is considered to have a 'high' sensitivity due to having a 'Moderate' WFD classification, being a very dynamic watercourse with some modifications. However, impacts would be limited locally within the extents of the reach prior to the confluence with Mearley Brook. Any changes would be localised and temporary and would therefore have a 'minor' impact with a 'Slight/Moderate' adverse significance of effect.

Increased Impermeable Surfaces

39) The creation of impermeable surfaces during construction, including site compounds, hardstanding areas and material storage, would prevent water from soaking into the ground, leading to increased surface runoff. This runoff may also carry pollutants such as oils into the watercourse. Any changes would be localised and temporary and would therefore have 'minor' impact with a 'Slight/Moderate' adverse significance of effect.

40) Without mitigation it is possible for the Alternative Facility to have 'Significant' effects on surface water hydrology during construction.

Fluvial Geomorphology

41) During construction without mitigation, there would be an impact of development on the forms and processes in any receiving watercourse, in this case, Worston Brook:

- Disturbance of channel bed/bank and removal of riparian vegetation during construction of the proposed outfall
- Changes to flow regime during construction of the proposed outfall
- Increased fine sediment input during construction of site compounds, hardstanding areas and access roads.

42) Without any mitigation, these activities for the construction works would have the potential to cause the following effects on water quality which are described in more detail below:

- Increased fine sediment input
- Discharge of contaminants
- Discharge of waste effluent.

Increased Fine Sediment Input

43) Construction activities within the catchment and along the bank (for the outfall) could result in the delivery of fine sediment to the channel. This could result in the smothering of bed features within the channel. Any changes would likely be localised and temporary. Worston Brook is considered to have 'medium' sensitivity for fluvial geomorphology due to it being a very dynamic watercourse with some modifications. Any changes would be localised and temporary and would therefore have 'moderate' impact with a 'Moderate' adverse significance of effect.

Changes to Flow Regime and Dynamics

44) Drainage from the Alternative Facility would flow into Worston Brook through a temporary outfall which could change the flow regime and cause erosion of the bed and cause erosion locally. The estimated existing greenfield runoff rate, based on the proposed collected impermeable and collected areas of the site has been identified as 30.2 litres per second (l/s). Discharge to Worston Brook would be attenuated to 2.4 l/s by attenuation lagoons or tanks and would therefore have 'minor' impact with a 'Slight' adverse significance of effect.

Channel Instability

45) Construction activities on the bank and bed for the installation of the new outfall could alter the bank stability. The channel is already exhibiting erosion on the bank opposite the proposed new outfall and at meanders upstream and downstream of this location. The channel is also currently poached by livestock at the outfall location. Removal of riparian vegetation for any construction works could lead to further instability of the banks. This could therefore lead to a 'major' impact due to loss of integrity of the channel, with a 'Large' adverse significance of effect.

46) Without mitigation it is possible for the Alternative Facility to have 'Significant' effects on geomorphology during construction.

6.6.2.2 Operation

47) The Water Environment would be affected in the following ways during operation:

Surface Water Quality

- Release of polluting substances from vehicles and trafficked surfaces
- Spillages
- Storage of sediment.

48) Without any mitigation, these activities for the operation would have the potential to cause the following effects on water quality which are described in more detail below.

Sediment-Laden Runoff

49) Once the site access is established and hardstanding is in place, sediment transfer from HGVs and vehicle movements would be significantly reduced. Any accidental release of fine sediment from washoff and from the stockpiles, into the watercourse would likely remain local to Worston Brook. Likely effects would include localised smothering of invertebrates, fish, bed substrate material and depositional features, but impacts would be temporary. Worston Brook is considered to have a 'high' sensitivity due to having a 'Moderate' WFD classification and being a very dynamic watercourse with some modifications. Effects would be limited in distance from the source of the pollution and unlikely to impact Mearley Brook. Any changes would be localised and temporary therefore it would have 'minor' impact with a 'Slight/Moderate' adverse significance of effect.

50) Without mitigation it is possible for the Alternative Facility to have 'Significant' effects on water quality during operation.

Surface Water Hydrology

51) Increased impermeable surfaces including hardstanding areas and material storage would prevent water from soaking into the ground, leading to increased runoff. This runoff may also carry pollutants such as oils and chemicals into the river. Any changes would be localised and temporary and would therefore have 'minor' impact with a 'Slight/Moderate' adverse significance of effect.

Fluvial Geomorphology

52) Some development activities would impact on fluvial geomorphology, including:

- Discharge from the outfall into Worston Brook.

53) Without any mitigation, these operational activities would have the potential to cause the following effects on fluvial geomorphology which are described in more detail below:

- Channel adjustment
- Changes to flow regime and dynamics.

Channel Adjustment

54) Channel stabilisation, for example with fencing to protect from poaching, could result in erosion and deposition elsewhere in the reach. Fencing off the bank may also result in

poaching elsewhere on the bank, which could result in erosion and deposition changes. For a feature with high importance, this would have a 'moderate' impact with a 'Moderate' adverse significance of effect.

Changes to Flow Regime and Dynamics

55) A new outfall for operational drainage from the Alternative Facility to Worston Brook could alter the flow regime and cause erosion locally. The reach is already unstable from erosion on the bank opposite the outfall location and along meanders upstream and downstream of the proposed outfall location. Discharge rates without mitigation are likely to be greater than estimated greenfield runoff at 30.2 l/s and would be provided as a point discharge. Therefore, there would be a 'major' impact on the watercourse with a 'Large' adverse significance of effect.

56) Without mitigation it is possible for the Alternative Facility to have 'Significant' effects on fluvial geomorphology during operation.

6.6.2.3 Decommissioning

Surface Water Quality

57) As decommissioning would give rise to similar impacts to the construction phase but in reverse, this phase would have the same effects on surface water quality as the construction phase (refer to Section 6.6.2.1). Without mitigation it is possible for the Alternative Facility to have 'Significant' effects on water quality during decommissioning.

Surface Water Hydrology

58) Removal of hardstanding, outfall, Site Drainage Attenuation Area (SDAA) and surface water drainage network has the potential to alter runoff patterns and catchment drainage.

59) Without any mitigation, these activities for the decommissioning works would have the potential to cause effects on water quality which are described below.

Changes in Surface Water Flow Routes and Runoff Rates

60) During decommissioning there would be the removal of hardstanding areas and of the surface water drainage system. The land would be reprofiled and the field drains, subsoil and topsoil would be reinstated. The land would be reseeded as it was before. This means the natural hydrological processes would be restored allowing surface water to flow and infiltrate the soil as it did prior to the development. These measures would return the land to its original state, maintaining the natural water cycle. Therefore, there would be a 'negligible' impact on the watercourse with a 'Neutral' significance of effect.

61) No likely significant effects are anticipated for surface water hydrology during decommissioning.

Fluvial Geomorphology

62) Without any mitigation, activities for the decommissioning works would have the potential to cause the effects described below, on fluvial geomorphology.

Increased Fine Sediment Input

63) Removal of the SDAA, outfall, hardstanding area and access roads could result in the delivery of fine sediment to the channel. This could result in the smothering of bed features within the

channel. Any changes would likely be localised and temporary. Therefore, as Worston Brook has high importance there would be a 'moderate' impact on the watercourse with a 'Moderate' adverse significance of effect.

Changes to Flow Regime

64) Removal of the proposed new outfall to Worston Brook could alter the flow regime locally, which could impact channel morphology. Therefore, as Worston Brook has high importance there would be a 'minor' impact on the watercourse with a 'Slight' adverse significance of effect.

Disturbance of Bed and Banks

65) Removal of the operational outfall to Worston Brook could alter the bed and bank morphology locally. Removal of riparian vegetation for any works could lead to instability of the banks. Therefore, there would be a 'moderate' impact on the watercourse with a 'Moderate' adverse significance of effect.

66) Without mitigation it is possible for the Alternative Facility to have 'Significant' effects on fluvial geomorphology during decommissioning.

6.6.3 Proposed Mitigation and Residual Effects

67) Embedded mitigation is inherent to the design. Good practice measures are standard industry methods and approaches used to manage commonly occurring environmental effects. Good practice measures are contained within Appendix A.2 Construction Code of Practice (CCoP).

68) Embedded mitigation to limit the potential effects on the water environment during construction is detailed within the CCoP. Mitigation includes, but is not limited to:

- Consulting with the Environment Agency when working within a river, or when work would be within 8 m of a Main River to ensure the activities are appropriately permitted (where applicable)
- Providing standby pumping equipment to allow removal of surface water runoff that enters the working area during construction
- Constructing topsoil and subsoil mounds with regular spaces between heaps to preserve existing low points and flow paths, and if required, to allow surface water to flow through
- Monitoring weather forecasts and water levels to determine events that could significantly increase sediment runoff
- Designated diesel storage areas would be lined or bunded to prevent the escape or infiltration to the ground of contaminated runoff or accidental spillage incidents.

69) For the proposed outfall, design would follow good practice guidance (e.g. CIRIA C786[24]), and consider:

- Outfalls should be directed downstream to minimise impacts to flow patterns and erosion of opposite bank

[24] Construction Industry Research and Information Association (CIRIA) (2019). Culvert, screen and outfall manual (C786F). [Online] Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C786F [Accessed: October 2024].

- Outfalls should not project into the channel, to minimise risk of localised bed scour
- Positioning in flow convergence zones should be avoided (e.g. at a confluence or opposite an existing outfall, or where there is evidence of active bank erosion/instability)
- The size/extent of the outfall headwall should be minimised to reduce the potential impact on the banks.

70) The Sustainable Drainage Strategy outlines that during operation, water will be collected on the site, attenuated within the SDAA, treated through SuDS and would include treatment through an oil interceptor before being released at restricted discharge rates and low velocity, to Worston Brook.

71) Table 6.8 summarises the residual effects that have been identified on the Alternative Facility following the application of mitigation identified in the CCoP, Sustainable Drainage Strategy and summarised in this section.

Table 6.8: Summary of Mitigation and Residual Effects

Receptor	Description	Likely Effect Prior to Mitigation	Proposed Mitigation	Likely Effect Following Mitigation
Worston Brook Surface Water Quality	Impacts on water quality	Short-term, minor impact, Slight/Moderate adverse effect	Construction ▪ Good practice site working methods ▪ Early inclusion of proposed drainage to include silt busters, SuDS, oil interceptor and runoff control. Operation ▪ SDAA, SuDS and oil interceptor would provide water quality mitigation.	Negligible impact with Neutral effect
Surface Water Drainage – Surface Water hydrology	Changes to surface water flow paths and distribution, runoff	Short term, localised minor impact, Slight/Moderate adverse effect	Construction ▪ Good practice outfall design, permitting from the Environment Agency and early implementation of flow control will reduce runoff rates to Worston Brook. Operation ▪ To reduce the impact on the natural hydrological regime, the site drainage would mimic the greenfield runoff response through the adoption of sustainable drainage principles as noted in the Sustainable Drainage Strategy, by use of the SDAA and design of flow controls to restrict runoff rates.	Negligible impact with Neutral effect
Worston Brook – Fluvial Geomorphology	Changes to flow regime, increased sediment input, disturbance of banks and bed	Long-term and temporary, localised moderate impact, Moderate/Large adverse effect	Construction ▪ Construction impacts caused by works on the bank and in-channel can be mitigated by following the CCoP. In particular, positioning and design of the proposed outfall will be controlled by Environment Agency permit. Any impacts during construction should be short term during the installation of the outfall. Operation ▪ Once constructed, the permitted outfall design will enable operation with no significant impact on geomorphology.	Minor impact with Slight adverse effect

6.7 Conclusion

72) This chapter of the Environmental Statement considered the potential impacts on the water environment associated with the construction, operation and decommissioning of the Alternative Facility.

73) While the Alternative Facility could have significant adverse effects on the water environment, the adoption of appropriate embedded mitigation, good practice mitigation and specific mitigation measures would result in no likely significant effects.