Jacobs

Slough Sewage Treatment Works Upgrade

EIA Screening Opinion Request Report

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Thames Water

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Contents

Executive Summary

The purpose of this report is to support a request for an Environmental Impact Assessment Screening Opinion from the local planning authorities, Buckinghamshire Council (South Bucks Area) and Slough Borough Council, in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 for the proposed upgrade to the Slough Sewage Treatment Works and the associated new outfall to the River Thames. Jacobs has carried out an assessment of the scheme on behalf of Thames Water Utilities Limited (TWUL) and prepared this report to enable Buckinghamshire Council (South Bucks Area) and Slough Borough Council to provide a formal Screening Opinion of the scheme.

As described in this report, given the location, type and scale of the project, it is considered that the proposed works are not likely to give rise to any significant environmental effects that would trigger the need for an EIA.

Subject to an EIA Screening Opinion being issued confirming that EIA is not required, TWUL plan to utilise permitted development rights as a statutory sewerage undertaker for the majority of the scheme. A separate planning application for the temporary highway access to the works compound will be submitted if deemed necessary following consultation with the Local Planning Authority (LPA).

Details of the embedded mitigation measures outlined within this report will be included in a Construction Environmental Management Plan (CEMP) produced and provided by a contractor employed by TWUL undertaking the construction of the scheme. The CEMP, as well as an outline Environmental Management Plan, will form part of the contractor's documentation to be integrated into the delivery of the scheme.

Slough STW is a large treatment works on the south-western edge of Slough, just to the south of Cippenham, and is accessible via Wood Lane, Berkshire SL1 9EB.

The proposed works on the operational STW site will comprise new tanks plant and equipment as follows: new ferric sulphate dosing and storage, upgraded inlet screening, extension to existing elevated inlet works, new concrete aeration lane, new aeration lane distribution chamber and returned activated sludge (RAS) mixing chamber, new RAS pumping station, new centrate liquors buffer tank (reuse of existing tank) and pumping station, two new concrete final settlement tanks (FSTs), outfall pumping station (for a portion of the final effluent), and associated pipework, cabling for power and telemetry, access and security upgrades. All the above upgrade works will be located within the existing STW site operational boundary.

The offsite works will consist of a new below ground outfall pipe and outfall structure to the River Thames. The outfall pipe utilises open cut and pipe jacking / tunnelling methods to reach the outfall structure. The total length of the pipe route is approximately 1.7km.

The outfall structure itself will comprise of a concrete headwall with base structure, which will be angled accordingly to help move the discharge away within the river flow and include protection to help prevent impacts from debris, build-up of sediment, and river traffic. The intention is to use a precast headwall to further limit the need for high-risk concrete works adjacent to the river, which will appear as an extension to the existing concrete wall as part of the quay.

The scheme is regulatory driven and included in the Ofwat approved Business Plan for 2020 to 2025 and has a number of benefits to the environment, public and surrounding area and will provide increased capacity and resilience to accommodate population growth within the catchment. A primary function will be the improvement to the constrained ditch system into which the current treated effluent and stormwater discharges. By removing the peak final effluent flow and pre-treated (having undergone screening and settlement) storm flows into the ditch system there will be a reduction in the flood impact to the Eton Wick residents and users of Dorney Common, caused by the overtopping and overwhelming of the ditches.

The improvements to the existing STW treatment process to create a more effective and resilient system will have benefits to the wider water quality parameters, positively affecting the habitats and species, with the aim of improving the WFD status. In addition, the removal of the pre-treated storm flows into the ditch system and directing them underground to the River Thames means the public that live near to and the animals that live in and use the ditches are not exposed to the storm effluent.

There will be some limited temporary disruption while the improvements and new infrastructure are installed and constructed but these will be outweighed by the long-term benefits highlighted above. Furthermore, measures will be put in place to mitigate construction impacts, for example the provision of an Ecological Clerk of Works to supervise works undertaken, construction drainage management, and an archaeological watching brief.

The primary objective of the scheme is to make the STW compliant with its future permit requirements and more resilient to accommodate future growth.

A summary of the environmental assessments in relation to the STW upgrade, outfall pipe route and outfall is outlined below:

Assessment of Effects	Significance of Effects	Mitigation Measures
Air Quality and Odour		
During construction: *Impacts from odour are not expected during construction.* *Negligible to low risk of dust impacts.* *Negligible risk of impacts of emissions from construction plant and machinery and emissions from construction-related road traffic.*	*No significant environmental effects are expected from air quality and odour during the construction phase.*	*Provide general site management and good housekeeping procedures (see Section 2.5.6 and 2.6.5 for details).* *Implement a CEMP, which includes measures to control or mitigate potential adverse impacts caused by the construction works (see Section 2.5.6 and 2.6.5 for details).*
During operation: *Odour impacts are unlikely to have significant effects due to the design of the site upgrades and the proposed particular plant items not being significant sources of odour (see Section 1.3.1 for list of assets).* *Negligible risk of impacts of emissions from operation-related road traffic.*	*No significant environmental effects are expected from air quality and odour during the operation phase.*	*The proposed changes to the STW will result in an improvement (i.e., reduction) in odour emissions at the site through the design.* *TWUL will continue to operate Slough STW in accordance with the existing Odour Management Plan (document reference AM-OMP Slough STW dated March 2016) and their Asset Standards .*

Assessment of Effects	Significance of Effects	Mitigation Measures
Carbon and Climate Change		
During construction: *Embodied carbon related to the construction: 113,500 tCO2e* *Plant Machinery fuel use: 770 tCO2e*	*The most significant contributor to the total amount of carbon equivalent emission from the project is from embodied carbon of materials and products used in construction*	- *Use low carbon and recycled materials.* - *Use of carbon management tools* - *Reduce material quantity where possible* - *Use hybrid and electric plant* - *Use of low emission or electric vehicles* - *Seek to minimize number of construction days*
During operation: *Operational Energy use of the new STW upgrade assets: 250 tCO2e*	*Other operational carbon emissions such as embodied carbon from maintenance materials and operational waste are expected not to have a significant impact on the overall emissions.*	- *Potential use of renewable energy on site* - *Increased production of renewable energy from existing assets.* - *Offsetting measures*

Assessment of Effects	Significance of Effects	Mitigation Measures
Ecology		
During construction: *No designated sites or priority habitats will be negatively affected during construction.* *The scheme will result in the minor, temporary loss of Deciduous Woodland priority habitat at the Cress Brook temporary crossing.* *Protected species surveys identified a badger footprint on the STW site and Schedule 1 and priority bird species were seen or heard on the STW site and along the route of the outfall. No other signs have been found on the STW site and along the route of the outfall. Some trees with potential bat roost features were identified, of which one tree with low potential is likely to be felled.* *The proposed outfall on the River Thames has the potential to disrupt riparian, bankside and marginal habitat.*	*No significant environmental effects are expected from terrestrial and aquatic ecology during the construction phase.*	*A CEMP will be prepared for works within Jubilee River and Dorney Wetlands LWS and Dorney Common and Cress Brook LWS. Additionally, the LPA will be contacted regarding the works in these areas (see details in Section 4.3.3 and 4.4.3).* *A CEMP will be prepared to detail the mitigation measures for the construction of the outfall on the River Thames, temporary bridge across the Cress Brook, and to ensure overall environmental protection and management during the works (see details in Section 4.4.3.11).* *TWUL has a performance commitment that on all projects where there is permanent habitat loss, a net gain in biodiversity must be achieved as a result of the project. Outline areas for reinstatement (including the Deciduous Woodland at the Cress Brook crossing), replacement and enhancement have been identified and are shown on the Landscape and Biodiversity Enhancement Plan.*
During operation: *No designated sites, priority habitats or protected species will be affected during operation.* *A beneficial impact of the scheme relates to improvements to water quality in the Roundmoor and Boveney Ditch upon operation of the proposed new outfall and maintenance of a base-flow.*	*No significant environmental effects are expected from terrestrial and aquatic ecology during the operation phase. Beneficial impacts are anticipated due to improved water quality in the Roundmoor and Boveney Ditch.*	*No mitigation measures recommended for operational phase.* *TWUL has a performance commitment that on all projects where there is permanent habitat loss, a net gain in biodiversity must be achieved as a result of the project. Outline areas for reinstatement, replacement and enhancement have been identified and are shown on the Landscape and Biodiversity Enhancement Plan.*

Assessment of Effects	Significance of Effects	Mitigation Measures
Flood Risk and Water Environment		
During construction: *The STW site is not within an area of flood risk (Flood Zone 1). The pipe and outfall are located in Flood Zone 2 and 3.* *Construction impacts are largely associated with localised scour of channel bed and banks, riparian vegetation clearance, and potential fine sediment release. These will all be managed via implementation of construction best practice.*	*No significant environmental effects are expected from flood risk and water environment during the construction phase.*	*Prior to construction activities an Environmental Management Plan (EMP) will be written to provide details of the specific measures to mitigate impacts of construction activities on local watercourses. This would include the management of dewatering, silt-laden runoff, riparian vegetation removal, pollutants, and construction drainage.* *Environmental Permits would be applied for relevant activities such as discharges with appropriate risk assessments and methodologies approved.* *The EMP will be provided to the contractor to incorporate into the CEMP.*
During operation: *The STW site is not located in an area of flood risk (Flood Zone 1). The pipe and outfall are located in Flood Zone 2 and 3.* *The proposed upgrade of the STW site will not generate major areas of new hardstanding. Any hardstanding areas that are no longer required once construction has been completed will be returned to their original state and thus surface water run-off will be reduced.* *The additional new structures within the STW site should not impede any groundwater flow.* *The proposed new outfall will reduce flood risk from the Roundmoor Ditch, including at Eton Wick and Dorney Common.* *The quality of the water that will be discharged will be improved which will have a beneficial impact on the environment.*	*No significant environmental effects are expected from flood risk and water environment during the operation phase.* *Beneficial impacts are anticipated due to reduced flood risk from Roundmoor Ditch and improved water quality discharge.*	*No mitigation measures recommended for operational phase. Residual risks and their management are included in Appendix X.*

Assessment of Effects	Significance of Effects	Mitigation Measures
Geology and Soils		
During construction: *The proposed works within the STW and along the outfall route are not expected to result in significant adverse impacts to identified receptors (agricultural soil, surface water, groundwater, construction and maintenance workers and local residents) based on the implementation of mitigation measures and best practice in construction to sever potential contaminant pathways during the works and protect soil resources.* *There is potential to cause damage to high grade agricultural soils if mitigation measures are not incorporated into the proposed construction works.*	*Given the existing site use and the best practice mitigation measures proposed, the construction activities are not expected to result in significant adverse impacts on sensitive receptors with regards to ground contamination.* *No significant environmental effects are expected from geology and soils during the construction phase.*	*A Soil Management Plan will be developed for the topsoil and subsoil strip which will be required to install the temporary construction compound. The land will be reinstated following the construction phase.* *A CEMP will be developed for the construction works to outline mitigation measures in accordance with environmental commitments. The CEMP will include measures for the storage and handling of soils, unforeseen contamination, materials and waste, and waste management.*
During operation: *No adverse impacts are anticipated from the operation of the scheme as it is not expected to result in potential pollutant linkages.*	*No significant environmental effects are expected from geology and soils during the operation phase.*	*No mitigation measures recommended for operational phase.* *Any adverse operational effects from ground contamination will be prevented by industry standard control measures as is currently practised at the STW.*

Assessment of Effects	Significance of Effects	Mitigation Measures
Heritage and Archaeology		
During construction: *The STW upgrade, pipeline and outfall will not physically affect the status of any statutory designations.* *The primary impacts to setting are during the construction period, and effects will only be temporary.* *In terms of non-designated archaeological remains, following implementation of mitigation measures the residual impact of the route would be negligible. The outfall structure is located on previously disturbed ground, reducing potential risk to archaeological assets.*	*No significant environmental effects are expected to heritage and archaeology during the construction phase.*	*Given the likely extent of ground disturbance within the STW boundary, the need for archaeological mitigation would likely be determined by the survival, or otherwise, of historic soil profiles which is not thought to be likely due to previous disturbance.* *Implementation of pre-construction archaeological investigation, which would inform the need for and provide the scope of a robust programme of mitigation. These phases of investigation will be carried out at the earliest opportunity to leave sufficient time for the formulation of an appropriate mitigation strategy which will be incorporated within the CEMP.*
During operation: *Given the scale of the design proposals, changes to setting from the proposed upgrade within the STW boundary are negligible.*	*No significant environmental effects are expected to heritage and archaeology during the operation phase.*	*No mitigation measures recommended for operational phase.*

Assessment of Effects	Significance of Effects	Mitigation Measures
Landscape and Visual		
During construction: *Very localised effects on landscape character and landscape receptors with permanent effects are limited to the removal of scrub and recent planting within the STW, and removal of small numbers of mature trees along the outfall route at the Cress Brook temporary crossing. Landscape character and landscape effects are considered likely to be significant adverse at Dorney Common only, and this will only be during the construction phase for a short duration. The effects on residential visual amenity are not significant.* *Temporary effects upon visual receptors during the construction phase will be short in duration and will vary with distances between the construction activities and the receptors.*	*No significant permanent environmental effects are expected from landscape and visual impacts during the construction phase.*	*A CEMP will be implemented that will include mitigation measures identified in Section 8.3.3 and 8.4.3, for example: construction works and temporary facilities should be located greater than 15m from the root protection area of retained trees and hedgerows; breaks in the linear vegetation on the STW southern boundary should be planted with hedgerows and trees consistent with operational access and depth of cover over new infrastructure; and, compensatory planting in nearby locations within the STW should be provided where direct replacement of lost vegetation is not possible. The Outline Landscape and Biodiversity Enhancement Plan also outlines mitigation opportunities (see Appendix W).*
During operation: *Ongoing restoration of disturbed areas to original uses can be expected to continue during the first year of the operational phase. During this period ongoing local degrading of the landscape character will remain temporary and will not cause significant adverse effects.* *During the operational phase the new infrastructure within the STW will be low level and of low visibility in the wider landscape and no significant visual effects will arise. Incidence of new infrastructure within the landscape outside of the STW will be restricted to access covers at ground level along the outfall route which will not lead to significant adverse effects at any location.* *It is considered that the adverse visual effects of the new outfall installation will not be significant.*	*No significant environmental effects are expected from landscape and visual impacts during the operation phase.*	*Ongoing mitigation measures to be outlined in the CEMP and Outline Landscape and Biodiversity Enhancement Plan (Appendix W).*

Assessment of Effects	Significance of Effects	Mitigation Measures
Noise and Vibration		
During construction: *It is considered unlikely that there would be any adverse impact during the construction phase of the STW upgrade, pipeline and outfall at the closest noise sensitive receptors.* *There would be no adverse impacts from vibration during the STW upgrade. Vibration from construction activities along the pipeline may result in very limited annoyance to sensitive receptors.* *Given the busy nature of the roads in the area it is not anticipated that the addition of the required construction traffic would cause a significant effect.*	*No significant environmental effects are expected from noise and vibration during the construction phase.*	*Embedded mitigation includes the use of plant no older than five years within the STW, which is likely to be the quietest available plant.* *All construction activity will be managed in accordance with BS 5228-1, which requires that noise control measures should be adopted. The contractor will implement a management plan to control noise and vibration during the construction phase. The management plan would include general procedural measures that represent examples of best practice on construction sites (see Section 9.3.3 and 9.4.3 for details).*
During operation: *It is considered unlikely that there would be any noticeable increase in operational noise from the STW at residential receptors on Wood Lane, therefore, significant operational noise impacts are not anticipated.* *The operation of the outfall once complete would not be noise generating. The discharge of the outfall into the River Thames would be underwater and therefore not generate noise. Significant noise impacts are therefore not anticipated.*	*No significant environmental effects are expected from noise and vibration during the operation phase.*	*No mitigation measures recommended for operational phase.*

Assessment of Effects	Significance of Effects	Mitigation Measures
Traffic and Transport		
During construction: *The construction assessment considers the phasing of works (that includes a high-level construction schedule), routing of construction traffic, access to the works, and vehicle movements.* *All routes take account of the identified project stakeholders and receptor, as well as avoiding the major centres of Eton Wick and Eton.*	*No significant environmental effects are expected from traffic and transport during the construction phase.*	*Construction traffic will be required to use identified preferred routing options and traffic management. All routes take account of the identified project stakeholders and receptors, as well as avoiding the major centres of Eton Wick and Eton.*
During operation: *Traffic movements will be no greater than current levels during operation.* *Future sludge vehicle movement projections indicate that there would be a 4% decrease in vehicle movements per day up until the scheme design horizon and decrease further beyond.* *Routine maintenance is not considered to significantly impact traffic movements during operation.*	*No significant environmental effects are expected from traffic and transport during the operation phase.*	*No mitigation measures recommended for operational phase.*

1. Introduction

1.1 Purpose of the Report

The purpose of this report is to support a request for an Environmental Impact Assessment (EIA) Screening Opinion from the local planning authorities (LPA), Buckinghamshire Council (South Bucks Area) and Slough Borough Council, in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (hereafter referred to as 'the EIA Regulations') for the proposed upgrade to the Slough Sewage Treatment Works (STW) and the associated new outfall to the River Thames (hereafter referred to as 'the scheme'). Jacobs has carried out an assessment of the scheme on behalf of Thames Water Utilities Limited (TWUL) and prepared this report to enable Buckinghamshire Council and Slough Borough Council to provide a formal Screening Opinion of the scheme. It must be noted that although the scheme passes by the constituency of the Royal Borough of Windsor and Maidenhead (RBWM), it does not enter it.

As described in this report, given the location, type and scale of the project, it is considered that the proposed works are not likely to give rise to any significant environmental effects that would trigger the need for an EIA and hence permitted development rights would remain.

The GPDO 2015, Article 3, paragraph 10, references The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the "EIA Regulations"). This stipulates that any development determined to be EIA Development under the EIA Regulations cannot be a permitted development. Subject to an EIA Screening Opinion being issued confirming that EIA is not required, TWUL plan to utilise permitted development rights for the majority of the scheme where applicable.

TWUL, as a statutory Sewerage Undertaker, benefits from permitted development rights through Schedule 2, Part 13, Class B of the Town and Country Planning (General Permitted Development) Order 2015 (GPDO) (as amended). This includes: "development not above ground level required in connection with the provision, improvement, maintenance or repair of a sewer, outfall pipe, sludge main or associated apparatus" and "any other development in, on, over or under their operational land, other than the provision of a building but including the extension or alteration of a building".

As discussed and further detailed in the letter that accompanies this report, it is considered that the works proposed on the Slough STW site and the outfall pipe and outfall structure fall within the scope of TWUL's permitted development rights, except for the provision of the temporary construction access required onto the classified road that runs through Dorney Common (B3026), which would be the subject of a separate planning application to Buckinghamshire Council.

1.1.1 Assessments and Surveys

As part of the progression of the scheme, and to support this report, a number of assessments and surveys have been undertaken and reports have been produced:

- Terrestrial Ecology surveys including;
    - Preliminary Ecological Appraisal (Appendix O)
    - Badger assessment (Appendix O)
    - Ground based bat roost potential assessment, resulting in dusk / dawn ground based surveys of specific trees (Appendix T)
    - Common reptiles and amphibian assessment (Appendix O)
    - Great crested newt (GCN) – Habitat Suitability Index and environmental DNA (Appendix O)

- Riparian species surveys (Appendix Q)
- Habitat Characteristic Assessments (UKHabs) (Appendix R)
- Botanical Surveys (Appendix O)

- Aquatic Ecology surveys (incorporated in Section 4)
- Arboricultural Constraints Assessment (Appendix AA)
- Preliminary Landscape and Visual Assessment (incorporated in Section 8)
- Cultural Heritage baseline assessment and Desk Based Assessment (DBA) (Appendix Z)
- Flood Risk Assessment (Appendix X)
- Geotechnical and Geoenvironmental Desktop Assessment (Appendix Y)

This report should be read in conjunction with the reports associated with the above studies.

1.1.2 Methodology and Report Structure

As specified in Section 1.8.1, the method of construction for particular elements of the scheme was also assessed, in particular the methods for crossing the Cress Brook, the Jubilee River and the B3026 including the gas main and high voltage cable at this location.

This report has also used early stakeholder engagement to benefit the assessment of environmental effects, particularly in exploring options and solution development. Engagement to date has included discussions with the relevant Local Planning Authorities, Environment Agency, community groups, and landowners. Further engagement and project updates are proposed with the above stakeholders along with community groups, parish councils, and the general public up until the commencement of construction.

Mitigation measures embedded in this report and in addition with TWUL Asset Standards and the chosen contractors Environmental Policies, will be included in a Construction Environmental Management Plan (CEMP) provided by the contractor. The CEMP, as well as an outline Environmental management plan (EMP), will form part of the contractors' documentation to be integrated into the delivery of the scheme.

The environmental assessments included in this report consider the two aspects of the scheme in separate sections for ease of reference, although the scheme has been assessed in its entirety. The sections titled 'STW upgrade' assess the upgrade works proposed on the STW site, whilst the sections titled 'route and outfall' assess the works proposed for the outfall pipeline and associated outfall structure.

This report consists of the following sections and topics:

- Description of the Site and Surrounding Area
- Description of Proposed Development
- Benefits of Scheme
- Need for Scheme
- EIA Screening Considerations
- Information Sources
- Alternatives and Options
- Specific topic;

- Air Quality and Odour
- Carbon and Climate Change
- Ecology
- Flood Risk and Water Environment
- Geology and Soils
- Heritage and Archaeology
- Landscape and Visual
- Noise and Vibration
- Population and Human Health
- Major Accidents and Disasters
- Traffic and Transport
- Cumulative Effects

- Summary and Conclusions
- References
- Appendices

A glossary is provided in Appendix A, and acronyms and abbreviations are provided in Appendix B. Environmental Constraints Plans (ECP) have been produced for the scheme, which can be found in Appendix C. The ECPs present some of the potential environmental constraints outlined in each topic section, within a 1km and 5km boundary of the STW site, outfall and associated pipeline.

1.2 Description of the Site and Surrounding Area

1.2.1 Operational STW Site

Slough STW is a large treatment works on the south-western edge of Slough, just to the south of Cippenham, and is accessible via Wood Lane, Berkshire SL1 9EB. TWUL's Slough STW boundary extends to an area of approximately 48.5ha. The site is bounded by the M4 motorway to the north and by the Jubilee River to the south. An overview of the location is shown in Figure 1.1 below. Surrounding land south of the M4 is predominately rural, with Dorney located to the south-west and Eton Wick to the south, both to the south of the Jubilee River and within a kilometre of the site boundary.

Slough STW is situated entirely within the boundary of Slough Borough Council Local Planning Authority, in the south-west corner of the borough. The section of the Jubilee River to the south of the STW is also within Slough Borough. The Local Planning Authority for the land to the west and south of the STW is Buckinghamshire Council (South Bucks Area); Dorney Common and the villages of Dorney and Boveney also lie within the Buckinghamshire Council area.

The whole area from the M4 to the River Thames is located within the Green Belt; however, the majority of the Slough STW site has been designated by Slough Borough as an existing Major Developed Site in the Green Belt through Core Strategy (2008) Policy CP2, which permits some infilling within the designated area, 'provided it has no greater impact upon the Green Belt'.

Figure 1.1: Slough STW Plan View (Source: Jacobs Geospatial Imagery Locator).

Slough STW currently provides wastewater treatment for a population equivalent (PE) of approximately 223,300 and receives sewage flows from the catchment area covering Slough, Chalvey, Oakley Green, Burnham, Langley and Eton, Taplow, Hedgerley Hill, Stoke Poges, Eton Wick, Eton College, Dorney and Datchet. The catchment receives both domestic and considerable trade waste discharges, including food and chemical manufacture.

In accordance with the current environmental permit, Slough STW's treated effluent and storm flows currently discharge to the Roundmoor Ditch, which runs just to the southwest of the site, then through a culvert to cross the Jubilee River and south along the western edge of Eton Wick via ditches to the River Thames.

The works will necessitate the modification of existing and provision of new structures and assets on the current operational STW site, and the provision of a new outfall and associated pipework to the River Thames. TWUL is proposing the development of the elements as set out below.

1.2.2 Offsite Development

Slough STW's effluent and pre-treated storm flows currently discharge to the Roundmoor Ditch. Due to constrained capacity of the Roundmoor Ditch, degradation of the water quality parameters and projected PE growth within the Slough catchment area, a new discharge point is required to divert the pre-treated storm flows and increased peak effluent flows away from the Roundmoor Ditch and general ditch system around Dorney Common and Eton Wick. TWUL is proposing a new discharge point to be located on the River Thames downstream of Boveney Lock, with a limited remainder flow to the Roundmoor Ditch. The route plan and outfall location has been included in Appendix D.

It is estimated that Slough STW currently provides 95% of all the flow in the Roundmoor Ditch, downstream of its discharge point. A compensation flow in the ditch is intended to be maintained as part of the proposed solution. This preferred solution has been determined as it ensures compliance by discharging to the River Thames removing pre-treated storm and peak treated effluent flows from the Roundmoor Ditch and it is the shortest route diverting flow to the River Thames with the least interaction with stakeholders, infrastructure, and natural features.

1.3 Description of Proposed Development

TWUL's Slough STW boundary extends to an area of approximately 48.5ha. The red line boundary of the entire scheme includes an area of approximately 30ha, with the works on the operational STW site comprising approximately 24ha of this total. The new structures and areas of hardstanding for the entire scheme will total less than 0.5ha. The following sections describe the proposed development, as well as providing a breakdown of the footprint of the new structures. It should be noted that some of the new structures on the STW site involve extensions or reuse of existing assets, which is identified below.

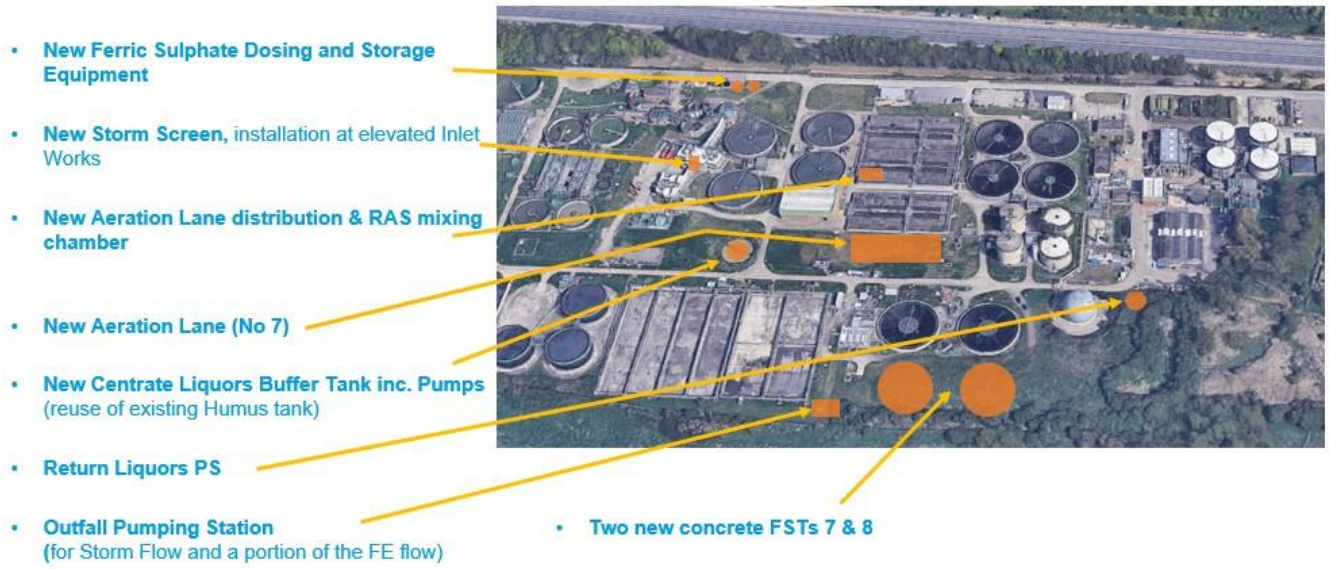
1.3.1 Operational Site

The proposed works on the operational STW site will comprise the following:

- New Ferric Sulphate Dosing and Storage Equipment (to replace the existing Ferrous chloride dosing equipment within the same footprint)
- New stormwater screen, extension to existing Elevated Inlet Works
- New concrete (activated sludge plant (ASP)) aeration lane (approximately 64m length x 16m width x 2.5m height), aeration lane distribution chamber and return activated sludge (RAS) mixing chamber
- New centrate liquors buffer tank (reuse of existing tank) and pumping station (PS)
- Two new concrete final settlement tanks (FST) (approximately 35m diameter x 1.5m high)
- Outfall pumping station (for a portion of the treated flows and pre-treated storm flows) (approximately 8.5m x 5m x 2.5m)
- Associated pipework, cabling for power and telemetry, access and security upgrades (approximately 12m x 40m x 2.5m high)

All the above works are located within the existing main built up area of the operational STW site. A figure indicating their location and aspect is present below in Figure 1.2, as well as Appendix E.

Figure 1.2: Slough STW new assets plan (illustrative only, not to scale).



1.3.2 Offsite Development

The new outfall pipe and outfall structure at the River Thames will comprise the following and is illustrated in the plans in Appendix F.

The 2031 design Flow to Full Treatment (FtFT) is 20% greater than the existing FtFT (1,150 l/s to 1,380 l/s) and it is proposed that a proportion of the FtFT is pumped to the new storm outlet chamber instead of being sent to the Roundmoor Ditch. This flow is in the range of 250 l/s and 400 l/s. This will aim to maintain the existing flow to the Roundmoor Ditch, therefore ensuring the levels are maintained and the current water quality parameters are in accordance with the Water Framework Directive (WFD) requirements for improvement, taking into consideration the new permit requirements and improved treatment process. A new pumping station will be constructed adjacent to the storm tank outlet chamber to lift the 400 l/s to the chamber that will then gravitate to the outfall under the design conditions.

The outfall pipe from the proposed storm outlet chamber to Boveney Lock will consist of 1.4m diameter pipe and be installed by open cut and 1.5m diameter pipe jacking under the Jubilee River, with a section of open cut within Dorney Common before going into tunnel again to pass under the Common Road, B3026 and an existing gas main, high voltage cable and rising main that cross Dorney Common. Construction will then revert to open cut techniques for the extent to Cress Brook where it will be taken under by pipe jacking before being in open cut across the agricultural field to Boveney Lock. Ahead of the pipe meeting with the outfall structure the 1.4m diameter pipe will be split into twin 1.0m diameter pipes within a chamber situated either in between the two public rights of way (PRoW) parallel to the River Thames or further back away from the river within the border of the agricultural field. This is to ensure the majority of the outfall is maintained below the average top water level in the River Thames so that full flows are established for the majority of that time. The total length of the route is approximately 1750m with approximately 500m tunnelled/pipe jacked and 1250m open cut. See Appendix D for the proposed long section of the outfall route. Any manhole covers associated with washouts, air valves and other chambers will be flush to the surrounding ground levels as to be unintrusive visually and negate the loss of flood storage capacity.

The outfall structure itself will comprise of a concrete headwall with base structure set within the river bank to negate the loss of flood storage; and which will be angled accordingly to help move the discharge away within the river flow and include protection to help prevent impacts from debris and build-up of sediment. The intention is to use a precast headwall to further limit the need for high-risk concrete works adjacent to the river. The headwall is being constructed directly adjacent to the existing concrete quay side extending from the lock , as to reduce its visual impact in comparison to other areas downstream along the River Thames, as well as minimising vegetation removal as much as is practicable. Some reprofiling and landscaping of the riverbank above and to the sides the outfall structure will further reduce the visual impact.

1.3.3 Temporary Development

For construction purposes there will be a need to temporarily use areas beyond the final operational and development permanent areas, to provide safe working zones and compounds for storage of equipment, plant, materials, offices and welfare. There will be a main compound in the STW site to facilitate those upgrade elements of the scheme. There will also be satellite compounds to facilitate the tunnelling/trenching for the pipe; south of the STW on the north side of the Jubilee and on the Dorney Common, and for the construction of the outfall structure adjacent to the River Thames path. The safe working zones and compounds will be temporary and have been included within the development red line boundary (see Appendix D).

The width of the construction area needed beyond the STW and the location of main and satellite compounds has been carefully considered to provide the least level of disturbance possible whilst still maintaining a suitable working zone, along with providing the required safety measures for the general public and the workforce. The temporary site compounds will also be fully reinstated once construction is complete.

The proposed locations of the temporary site compounds and working width for the outfall pipe are illustrated on the figure in Appendix D.

1.3.4 Traffic and Transport

An assessment of traffic and transport has considered the phasing of works (Appendix H presents a construction schedule and Appendix I presents construction phasing), routing of construction traffic (Appendix J), access to the works (Appendix K), and vehicle movements (Appendix K), as well as during operation. These are detailed in Section 12.

1.4 Benefits of Scheme

The scheme is regulatory driven and has a number of benefits to the environment, public and surrounding area. A primary function will be the improvement to the constrained ditch system into which the current discharge flows enter. By removing the peak final effluent flow and pre-treated storm flows into the ditch system there will be a reduction in the flood impact to the Eton Wick residents and users of Dorney Common, caused by the overtopping and overwhelming of the ditches. Another primary function and benefit of the STW upgrade will be the increased capacity to accommodate population growth, as detailed in Section 1.5.

The improvements to the treatment process to create a more effective and resilient system will have benefits to the wider water quality parameters, positively affecting the habitats and species, with the aim of improving the WFD status. In addition, the removal of the storm flows into the ditch system and directing them underground to the River Thames means the public that live near to and the animals that live in and use the ditches are not exposed to the pre-treated storm effluent. The improvements at the STW site will further moderate the likelihood of the effluent stagnating and becoming septic, reducing the potential for odour.

There will be some temporary disruption while the improvements and new infrastructure are installed and constructed but this is far outweighed by the long term benefits highlighted above.

1.5 Need for Scheme

Slough STW is one of Thames Water's larger STWs with significant investment planned in AMP7 to resolve existing compliance risks, meet future consent requirements and provide capacity to meet future growth in the catchment.

Slough STW's effluent and storm flows currently discharge to the Roundmoor Ditch. Due to constrained capacity of the Roundmoor Ditch and projected PE growth, a new discharge point is required. This new discharge point will be to the River Thames near to the Boveney Lock, approximately 400m up-stream of where the discharges currently enter the River Thames via the current Boveney Ditch. As Slough STW provides a significant proportion of total flow in the Roundmoor Ditch, which is considered an amenity, a compensation flow is will be maintained as part of the proposed solution.

Slough STW also has a new AMP7 quality permit requiring an ammonia consent reduction from 3mg/l to 1mg/l for 31st March 2025 (based on the current discharge to the Roundmoor Ditch).

Slough STW is currently at risk of breaching dry weather flow (DWF) consent conditions (three consecutive years) and is on the Environment Agency (EA) concern list, which further demonstrates the needs for the scheme to take place with the aim to removing the chance of pollution events occurring.

A summary of the needs is provided in Table 1.2, and include the following additional compliance issues:

- Storm Environmental Permit breaches
- Effluent compliance breach (iron dosing without upper tier (UT) consent)
- FST hydraulically overloaded
- Effluent compliance risks (ammonia and solids)
- Environmental Permit breach – site liquors returned upstream of storm separation.

There is also a Water Industry National Environment Programme (WINEP) output to increase the FtFT for April 2025 to 1,364l/s (from 1,150l/s).

Thames Water Major Projects issued brief FA1300 Capital professional services support Slough STW AMP7 Form of Service Order to Jacobs, under which they were appointed in March 2021, to undertake a feasibility and optioneering study for engineering and environmental aspects to enable the site to be compliant with its future Environmental Permit and catchment increases.

Table 1.2: Scheme requirements from TWUL AMP7 Business Plan.

Need No.	Title	Objective
N45654	Slough STW Wastewater Quality AMP7 New Permit (S33730)	Ammonia consent reduction from 3 mg/l to 1 mg/l for 31st March 2025
N46705	Effluent discharge point Slough STW (S35233)	New effluent discharge location required for projected PE growth; Projected PE 257,115 in 2026 (c. 11% growth from 2016)
N49065	Slough STW Go to Green (S35945)	Numerous compliance issues identified (i.e. Storm Permit; liquor returns before storm separation and stormwater volume, FtFT; Effluent Permit; DWF, ammonia, solids and iron dosing with no UT in effluent Consent)
N44604	(S35873) – Small STW increased FtFT	WINEP output to increase FtFT for 31st March 2025

It is important to highlight that the works proposed do not involve the construction of a new STW but rather seeks to improve existing treatment facilities and provide a new discharge point for the effluent, and in doing so reducing the STW's impact on the environment and providing benefit.

In summary, the primary objective of the scheme is to make the site compliant with its future Environmental Permit requirements and be more resilient for the future growth. Four issues need to be addressed by the scheme:

- Slough STW has a new Environmental Permit in AMP7 for the effluent discharge, requiring an ammonia consent reduction from 3mg/l to 1mg/l from 31st March 2025 (based on the current discharge to the Roundmoor Ditch); the requirements of this permit need to be addressed.

- Numerous water quality compliance issues have been identified in association with current discharges, particularly in association with storm flows; these need to be addressed.

- The maximum flow of effluent (FtFT) that can be treated at the STW needs to increase, thus reducing the number of storm discharges, to meet commitments under the WINEP by 31st March 2025.

- The constrained capacity of the Roundmoor Ditch and projected population equivalent (PE) growth (projected PE is 257,115 in 2026, an 11% increase from 2016) are such that a new discharge point is required.

1.6 EIA Screening Considerations

The need for an EIA screening opinion for this project has utilised a sequential screening test in accordance with the EIA Regulations, which has been summarised in Table 1.3.

The sequential screening test determined that the scheme is not considered to fall within Schedule 1 of the EIA Regulations, as it does not relate to the development of a new waste water treatment plant as defined in Paragraph 13. The entire scheme, including both the STW upgrade and the outfall, could potentially be classed as 'EIA Development' under Schedule 2, Paragraph 13(a) of the EIA Regulations as a change to or extension of an executed development of a description listed in Schedule 1 (Paragraph 13: Waste water treatment plants with a capacity exceeding 150,000 population equivalent). The total area of the development will be over the 1000m^2 threshold set out under Schedule 2, Paragraph 11(c) (waste-water treatment plants), which is the threshold that would be applied here.

The EIA Regulations state that proposed developments listed in Schedule 2 may require an EIA if the development is deemed '…likely to have a significant effect on the environment by virtue of factors such as its size, nature or location'. To establish if the proposed development could potentially have such effects, Schedule 2 requires a selection criterion, set out in Schedule 3 of the EIA Regulations, to be applied to the development. The national Planning Practice Guidance (PPG) provides guidance on EIA and sets out at Paragraph: 018 Reference ID: 4-018-20170728 stating that: "When screening Schedule 2 projects, the local planning authority must take account of the selection criteria in Schedule 3 of the 2017 Regulations. Not all of the criteria will be relevant in every case. Each case should be considered on its own merits in a balanced way. Only a very small proportion of Schedule 2 development will require an Environmental Impact Assessment". This report aims to support the EIA Screening Opinion request for the scheme to outline potential environmental impacts resulting from its construction and operation along with appropriate mitigation and control measures as necessary.

With reference to the guidance on screening provided in Schedule 2 and Schedule 3 'Selection criteria for screening Schedule 2 development' of the EIA Regulations, and best practice screening advice, the proposed scheme has been considered with regards to:

- Characteristics of development (outlined in Section 1.3);

- Location of development (outlined in Section 1.2); and,

- Types and characteristics of the potential impact (outlined in Sections 2-12).

Table 1.3: EIA Sequential Screening Test.

Step	Answer	Comments
1 – Is the project described in Schedule 1 of the EIA Regulations?	No	The development is not described as a Schedule 1 development. Schedule 1, Paragraph 13 refers to the carrying out of development to provide waste water treatment plants. The existing development has a capacity exceeding 150,000 PE; however, planning consent is not sought for the existing plant and the scheme does not relate to the development of a new treatment plant. Schedule 1, Paragraph 24 refers to changes to or extensions of developments listed in Schedule 1 where the change or extension meets the thresholds or description set out. The increased capacity of the scheme does not meet the threshold set out in Schedule 1, Paragraph 13.
2 – Is the project described in Schedule 2 of the EIA Regulations?	Yes	The development falls under Schedule 2, Paragraph 13 "changes and extensions", and thereby Schedule 2, Paragraph 11(c) "waste-water treatment plants".
3 – Does the development meet any of the relevant thresholds and criteria of Schedule 2? *	Yes	Schedule 2, Paragraph 13 is defined as follows: *"(a) Any change to or extension of development of a description listed in Schedule 1 (other than a change or extension falling within paragraph 24 of that Schedule) where that development is already authorised, executed or in the process of being executed.* *(i) The development as changed or extended may have significant adverse effects on the environment; or* *(ii) in relation to development of a description mentioned in a paragraph in Schedule 1 indicated below, the thresholds and criteria in column 2 of the paragraph of this table indicated below applied to the change or extension are met or exceeded. "* The table indicates applicable thresholds and criteria for Schedule 2, Paragraph 1(c), which is defined as follows: *"The area of the development exceeds 1,000 square metres. "* The STW site occupies an area of approximately 30ha. The proposed upgrades will occupy an area less than 24ha, within the existing developed and operational land. The new pipeline will occupy approximately 55,000m2, and the outfall will occupy approximately 2m2.
4 – Is it a 'sensitive area'?	No	See Sections 2-10.
5 – Taking account of the selection criteria in Schedule 3, is the development likely to have significant effects on the environment?	No	See Sections 2-10.
6 – Is the project likely to have a significant environmental effect?	No	There are not considered to be any significant environmental effects, with the scheme providing enhancements and environmental benefit long term.

*The Annex (paragraph 058, Reference ID: 4-058-20140306) to the national PPG on EIA advises that the following key indicative criteria and thresholds should be taken into account, and key issues considered when determining whether EIA is required in respect of developments of the types listed in Schedule 2:

- Paragraph 11 (c) in relation to waste-water treatment plants : "Indicative Criteria & Thresholds: Site area of more than 10 hectares or capacity exceeds 100,000 population equivalent." and "Key Issues to Consider: Size, treatment process, pollution, and nuisance potential, topography, proximity of dwellings and the potential impact of traffic movements".

The footprint of the upgrade works additional assets and hardstanding areas is less than 0.5ha, and the population equivalent will increase by approximately 20,000, therefore, not exceeding the thresholds above.

1.7 Information Sources

This report has been produced using information made available by TWUL and the design team, along with the outputs and reports identified in Section 1.1 produced specifically for the scheme. Other resources utilised by the individual disciplines has been specified in the associated sections. These resources include both freely available information and information purchased from third parties.

1.8 Alternatives and Options

1.8.1 Outfall and discharge pipe route

For the new outfall pipe, three main route options were assessed by TWUL. These comprised the following with two other potential alternative options:

- Route 1 – Romney Lock discharge point (Lock-Southern Gravity Route)
- Route 2 – Romney Lock discharge point (Lock-Northern Gravity Route)
- Route 3 – Boveney Lock discharge point
- Route 4 – Jubilee River Discharge point
- Route 5 - Roundmoor Ditch

These five options were developed using outline design criteria based on the requirements listed in section 1.5 along with the overall need to limit disruption to the environment, general public, other infrastructure and maintain regulatory compliance, whilst being cost effective and achievable.

Outfall option route plans have been included in Appendix L to provide an indication of the possible outfall routes that were considered.

Early Multicriteria Assessment (MCA) was used to better define each of the routes' constraints, risks, opportunities or benefits and ultimately whether they will ensure compliance and meet the scheme requirements. This MCA was compiled at that stage utilising the currently available information provided by TWUL along with desk top studies and other preliminary assessments.

It was imperative to understand the most suitable route with clarity at this stage where possible to be able to focus any site based assessments and surveys, to meet the programme and regulatory deadline and ultimately define the least impactful, and most appropriate, feasible and beneficial option.

Route 3 was considered the preferred route as it ensures compliance by discharging to the River Thames and it is the shortest route diverting flow to the River Thames with the least interaction with stakeholders, infrastructure, and natural features.

In addition to the route optioneering exercise, variations to the preferred route were assessed along with the methods of construction for the particular elements. Variations of Route 3 with longer and shorter tunnelling sections, open cut portions at the Cress Brook and crossing of the B3026, gas main and rising main, were all considered. Factors including but not limited to the engineering feasibility, health and safety, capital and operational costs, environmental, social and sustainability factors were all taken into account in the decision process.

1.8.2 Sewage Treatment Works

For the STW upgrade requirements a similar process was undertaken with a series of options assessed based on the ability to deliver the required treatment outcomes and quality parameters, whilst meeting certain criteria set out by TWUL Asset Standards, available and utilised technologies, along with input and requirements from TWUL Operational personnel. The new assets are to built be in line and be operational with the existing treatment process flow.

The above optioneering activities were driven by distinct results and outcomes from the gap analysis process, early hydraulic modelling, environmental and geoenvironmental desktop assessments and the Basis of Design Report.

2. Air Quality and Odour

2.1 Introduction

2.1.1 Overview

The main pollutants of potential concern for air quality in the United Kingdom (UK), which are relevant to the scheme, are those associated with combustion emissions, which typically arise from road traffic, domestic and commercial combustion and industry. These are, primarily, oxides of nitrogen (NOx), nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 10 microns or less and 2.5 microns or less, respectively)). Air pollutants can affect human health and cause damage to sensitive plants and ecosystems.

Air quality also refers to odour, which if at high levels could give rise to annoyance. Odour can be generated during construction if works involve, for example, the opening of live sewers or interface points with the existing operational works of high odour generation. During operation, odour control currently implemented at the STW site reduces odour levels from assets that are particularly odorous.

Air quality also refers to dust, which could affect health or give rise to annoyance due to the soiling of surfaces through deposition. The term 'dust' refers to all particulate matter including all solid particles suspended in air or settled and deposited on a surface after having been suspended in air. This includes the smaller-sized particles associated with potential health impacts (i.e. PM_{10} and $PM_{2.5}$) and the larger particles associated with causing annoyance or affecting sensitive vegetation through deposition on a surface. Dust can be generated during construction activities such as demolition and earthworks, and in the absence of appropriate mitigation, can result in human health and dust effects.

2.1.2 Potential Impacts

Construction and operation of the scheme and supporting infrastructure can have the following potential impacts on air quality:

- emissions of odours from the operation of the proposed STW upgrade;
- emissions of pollutants to air from construction plant and machinery;
- emissions of pollutants from construction and operational related road vehicles travelling on the local road network; and
- dust emissions generated by construction activities, including earthworks and material storage.

2.2 Information Sources

- Slough Borough Council, Buckinghamshire Council (South Bucks Area), and Royal Borough of Windsor and Maidenhead Local Air Quality Management (LAQM) reports and air quality monitoring;
- Defra air quality background maps;
- Slough STW Environmental Risk Assessment;
- Slough STW Odour Management Plan (OMP);

- Slough STW Odour Survey, November 2011; and
- Odour complaints record provided by Thames Water.

2.3 Legislation and Policy

2.3.1 Legislation

Table 2.1 summarises legislation specific to air quality and odour which may influence the scheme.

Table 2.1: Summary of relevant air quality legislation.

Legislation	Implication for the Scheme
The Environmental Protection Act 1990	Defines provisions for statutory nuisance for dust and odour and details the principal controls over it for local authorities.
The Environment Act 1995, Part IV	Defines the requirements for Local Air Quality Management and the role of local authorities in systematically reviewing and assessing air quality within their boundaries on a regular basis.
The Air Quality (England) Regulations 2000 / The Air Quality (England) (Amendment) Regulations 2002	Gives statutory force to the limit values for pollutants set out in the National Air Quality Strategy 2007. The National Air Quality Strategy (AQS) sets out a strategy for compliance with the statutory Air Quality Objectives (AQO) for NO_2, PM_{10} and $PM_{2.5}$ (to protect human health) and the AQO for NOx (to protect vegetation and ecosystems). The AQS includes other pollutants but these aren't relevant to this scheme.
The Air Quality Standards Regulations (England) 2010	Has the objective to improve air quality by reducing the impact of air pollution on human health and ecosystems. The regulations transpose the air quality limit values set out in the EU ambient air quality directive (2008/50/EC) into UK law. Of which, the limit values for NO_2, PM_{10} and $PM_{2.5}$ and NOx are relevant to this scheme.

2.4 Baseline

2.4.1 Air Quality

Slough Borough Council has declared AQMAs within its administrative boundary. However, the scheme is located adjacent to AQMA 1 but is not located within it.

There are four automatic air quality monitoring stations operated by Slough Borough Council within 2 km of the STW. The measured annual mean NO_2 and PM_{10} concentrations at these locations are all less than the relevant air quality objectives.

The closest nitrogen dioxide diffusion tube is located approximately 1.1 km east north-east of the STW adjacent to the M4. The measured annual mean concentration at this location is less than 40 µg/m^3.

The Defra 2018-based background maps for NO_2, PM_{10} and $PM_{2.5}$ concentrations in the vicinity of the STW are shown in Table 2.2, are all less than the relevant air quality objectives.

Table 2.2: Summary of background map pollutant concentrations.

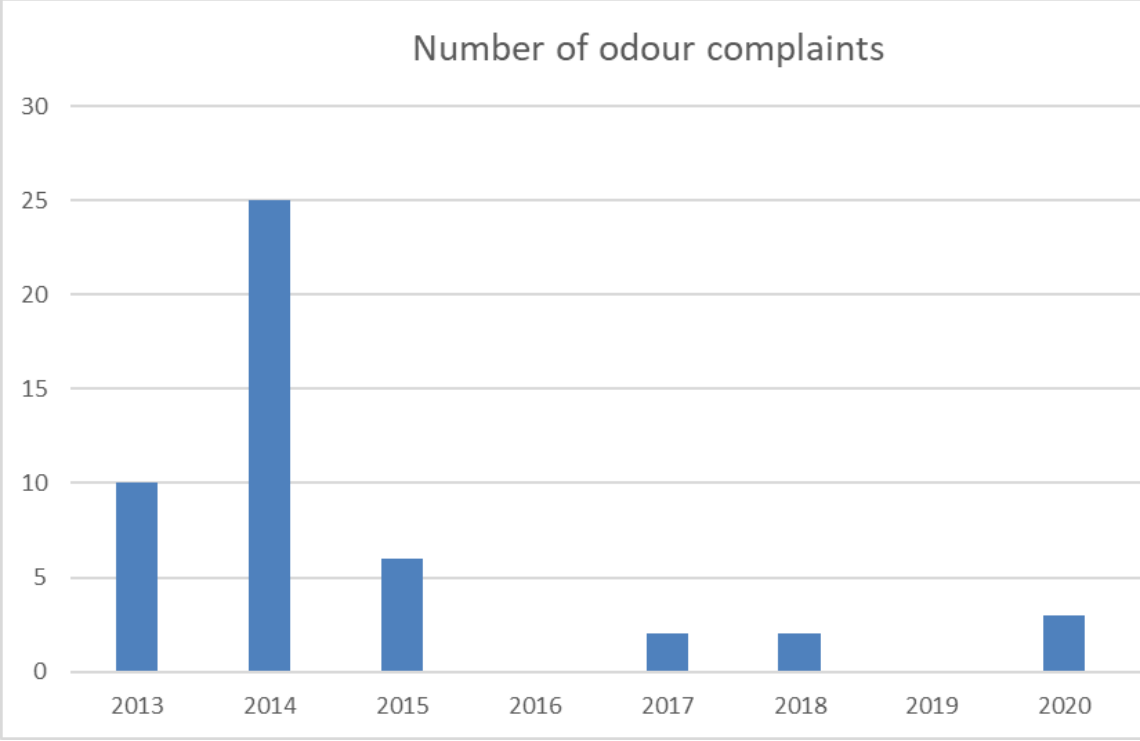
Pollutant	Air Quality Objective	2021 annual mean concentration (µg/m³)	
		Minimum	Maximum
NO_2	40	13.6	22.9
PM_{10}	40	14.1	17.8
$PM_{2.5}$	25	9.7	12.0

Based on the measured air quality concentrations and Defra background mapping set out above, the existing air pollutant concentrations do not represent a significant constraint.

2.4.2 Odour

For background information the odour complaint history for the existing works was analysed. A total of 48 No. odour complaints were reported to Slough Borough Council from year 2013 to 2020 with the highest 25 complaints in year 2014. A summary of complaint frequency per year is presented in Chart 2.1. It is notable that the number of complaints associated with the site has significantly decreased over the last five years.

Chart 2.1: Number of odour complaints 2013-2020.



2.5 STW upgrade

2.5.1 Construction Phase: Dust

Construction activities associated with the proposed scheme have the potential to generate fugitive dust emissions. These may give rise to annoyance due to the soiling of surfaces, risk of health effects due to the increase in

exposure to fine particulates such as PM_{10} and $PM_{2.5}$ and damage to vegetation and ecosystems (where very high levels of dust soiling occur).

The main construction activities associated with the scheme that could generate dust include earthworks for new structures, installation of the equipment, tanks and associated infrastructure and temporary material storage and handling. Dust may also be generated by vehicle movements on haul routes predominantly within the construction areas.

The screening distances to identify where there is a need to consider construction dust are set out within the IAQM dust guidance as follows:

- the presence of human receptor locations within 350 metres of the construction site boundaries and/or within 50 metres of the access route(s) used by construction vehicles on the public highway; and
- the presence of ecological receptors within 50 metres of the construction site boundaries and access routes.

There are sensitive human receptors within 350 metres of the STW. The closest receptors are located adjacent to the site access road, over 100 m from the closest proposed works at the STW. The closest receptors to the north of the STW are on the opposite side of the M4, over 150m from the closest proposed works. Therefore, in line with the IAQM dust guidance, the sensitivity of the area to dust impacts would be low. There are no ecological receptors within 50 m of the STW.

Given this is an existing STW, there would be approximately 5,500 m^3 amount of demolition (i.e. building volume for demolition less than 20,000 m^3. This represents a "small" dust emission magnitude for demolition. The earthworks would require approximately 22,500 m^3 of material to be removed from site and 2,800 m^3 of fill material to be imported (i.e. between 20,000 and 100,000 tonnes). The construction works would also require the use of screeners, crushers and processing buckets. This represents a "medium" dust emission magnitude for earthworks.

The works would include construction of various new tanks and structures on site with associated infrastructure (including new activated sludge plant (ASP) lanes and new final settlement tanks (FST). The total building volume is likely to be in excess of 25,000m^3 and the construction stage would utilise potentially dusty construction materials such as concrete. On-site batching activities are not anticipated. On this basis, the assessment for construction is based on a dust emission class of 'medium'.

For "trackout", there would be a maximum of 20 outward heavy goods vehicles (HGV) and buses movements per day from the STW, although it should be noted that this is for a short peak during the construction of a particular element. Therefore, it is considered that there would be a "medium" dust emission magnitude for trackout (based on the IAQM dust guidance).

In line with the IAQM dust guidance, the small emission magnitude for (demolition) and medium emissions magnitude for earthworks and trackout in areas considered to be low sensitivity means that there would be a negligible to low risk of dust impacts during the construction phase of the works at the STW.

Although the risk of dust impacts from these activities would be negligible to low, emissions of dust would be controlled through the adoption of standard good practice dust mitigation measures to prevent or reduce dust emissions. The relevant good practice mitigation measures for the construction phase of the proposed scheme have been taken from the IAQM dust guidance. These mitigation measures and controls are set out in Section 2.5.6 and would be required to be included in the CEMP, which would be implemented during the construction phase. The IAQM dust guidance acknowledges that taking these mitigation measures into consideration, the environmental effect from dust emissions would not be significant at any off-site receptor.

2.5.2 Construction Phase: Emissions from Construction Plant and Machinery

The type and numbers of construction plant and machinery would vary over the construction period of the scheme.

Based on a typical section of the proposed pipeline route, the construction plant and machinery are anticipated to consist of a mixture of the following types:

- tracked machines, such as excavators (up to 21 tonne – demolition only)
- and dozers;
- rear tipping dumper trucks (12 tonne);
- mini excavators 1 tonne to 12tonne.
- 6 and 8-wheel tipper trucks for removal of trench arisings and demolition materials
- mobile and crawler cranes for lifting in plant and installing tanks
- concrete pumps
- telehandlers
- Mobile elevating work platforms (MEWPs)
- screeners, crushers and processing buckets; and
- tractors / trailers.

Small diesel generators might be required for various construction activities (including welfare units and lighting) where connection to the mains electricity grid is not available. Additionally, various petrol chain saws, chippers and welding plant may be required during construction.

The IAQM dust guidance specifies the following in relation to the assessment of emissions to air from construction plant and machinery:

"Experience of assessing the exhaust emissions from on-site plant (also known as Non-road Mobile Machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed."

Construction plant and machinery would be in operation for only a relatively short duration. There would also only be a relatively low number and limited size of plant and machinery items operating during construction simultaneously. Therefore, the potential effect on local air quality at human receptors and ecological receptors in the vicinity of the construction works would be negligible. On this basis, and in line with the IAQM dust guidance, the effect on air quality from construction plant and machinery emissions is considered to be not significant.

2.5.3 Construction Phase: Emissions from Road Traffic

Engine exhaust emissions from HGVs and buses, and light duty vehicles (LDVs) associated with construction of the proposed scheme have the potential to affect local air quality.

The Land Use Planning and Development Control: Planning for Air Quality guidance (IAQM/EPUK, 2017) sets out screening criteria for identifying the need for an air quality assessment, as follows:

- the change in LDV flows is greater than 100 vehicles per day (as annual average daily traffic (AADT) within or adjacent to an AQMA or greater than 500 vehicles per day elsewhere; and
- the change in HGV and bus flows is greater than 25 vehicles per day within or adjacent to an AQMA or greater than 100 vehicles per day elsewhere.

Based on the information provided in the assessment of traffic and transport (see Section 12), the estimated total number of HGVs and buses associated with construction traffic would be 1,974. As an AADT this is less than 12 movements per day. The change in LDVs during construction would also be a lot less than 100 vehicles per day.

Therefore, as an AADT, the changes in daily vehicle numbers associated with construction traffic would not exceed the EPUK/IAQM screening criteria for locations inside or outside of AQMAs set out above in this section.

On this basis, emissions from construction-related road traffic are not considered to represent a significant air quality effect on receptors adjacent to the local road network. The effects would be described as negligible.

Therefore, the air quality impacts from construction traffic on human and ecological receptors are unlikely to have significant effects on the environment.

2.5.4 Operation Phase: Emissions of Odour

The proposed changes to the STW will result in an improvement (i.e., reduction) in odour emissions at the site. This improvement is associated with the change in treatment processes, which will remove the anaerobic sections from the ASP lanes. This change will reduce the odour emissions by approximately 14% (equivalent to around 9,800ou/s).

Where changes/upgrades are proposed to more odorous areas of the plant, such as the storm screening and centrate liquor storage, the works will comply with our Asset Standards for odour control. This means that where necessary existing odour control units will be upgraded, and/or new units will be installed to maintain performance.

In addition to the odour control works associated with this upgrade TWUL has identified additional odour control improvement works on the STW site. These works will be completed as part of their routine capital maintenance.

TWUL is committed to ensuring that the proposed development does not result in unacceptable odour emissions and have incorporated measures into the design minimise emissions.

Therefore, the odour impacts from operation phase of the upgrades on human receptors will be reduced and result in environmental improvements.

2.5.5 Operation Phase: Emissions from Road Traffic

The number of daily LDVs are not expected to change and only a minor increase in HGVs associated with a marginal increase in sludge production, but which is offset by a decrease in sludge import over time. These changes in daily vehicle numbers associated with operational traffic would not exceed the EPUK/IAQM screening criteria for locations inside or outside of AQMAs set out above in this section.

On this basis, emissions from operation-related road traffic are not considered to represent a significant air quality effect on receptors adjacent to the local road network. The effects would be described as negligible.

Therefore, the air quality impacts from operation phase traffic on human and ecological receptors are unlikely to have significant effects on the environment.

2.5.6 Mitigation

In relation to odour, TWUL will continue to operate the Slough STW in accordance with the existing Odour Management Plan (document reference AM-OMP Slough STW dated March 2016) and their Asset Standards. The OMP details operational and control measures appropriate to the reduction or elimination of the impact of odours from the Slough STW to avoid unacceptable impacts on surrounding receptors.

The contractor would undertake and implement the following management and control measures, where the measure is relevant in the context of the works being undertaken and the construction plant in use.

- Provide general site management and good housekeeping procedures, including:
    - plan the site layouts so that machinery and dust-generating activities are located as far as practicable from nearby receptors, such as residential properties; and
    - appropriate training of the construction workers to increase awareness of dust management and control measures.

- Use of modern plant and equipment no older than 5 years and compliant with current emissions standards and legislation.
- Record all dust, odour and air quality complaints and any exceptional incidents, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken.
- Implement a CEMP, which could include the following measures to control or mitigate potential adverse impacts caused by the construction works:
    - control runoff of water or mud to reduce spread of particulates that could subsequently be disturbed and become airborne;
    - signpost a maximum speed limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas;
    - where there is a risk of dust nuisance, use cutting, grinding or sawing equipment fitted, or in conjunction, with suitable dust suppression techniques;
    - where there is a risk of dust nuisance, use enclosed chutes and conveyors and covered skips;
    - when loading/unloading vehicles, drop heights must be kept to a minimum;
    - ensure equipment is readily available on site to clean any dry spillages. Clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
    - dry sweeping of large areas should be avoided;
    - no bonfires or the burning of waste materials;
    - avoid scabbling (roughening of concrete surfaces) where possible;
    - ensure sand and other aggregates are not allowed to dry out. If drying out is required for a particular process, ensure that appropriate additional control measures are in place; and
    - sheet vehicle loads during the transportation of loose or potentially dusty material or spoil.

Therefore, with the implementation of the dust mitigation measures and controls, the likely effect of dust emissions on human health, amenity and ecological receptors during construction works at the STW is concluded to be not significant.

2.5.7 Opportunities

There are considered to be no required additional opportunities to reduce potential air quality, odour and dust impacts at the STW above those considered.

However, the contractor could look to use electric construction plant and machinery (such as electric excavators, cranes and dump trucks) where appropriate, which could further reduce the emissions of air pollutants and the carbon output.

2.6 Route and outfall

2.6.1 Construction Phase: Dust

Construction activities associated with the proposed scheme have the potential to generate fugitive dust emissions. These may give rise to annoyance due to the soiling of surfaces, risk of health effects due to the increase in exposure to fine particulates such as PM_{10} and $PM_{2.5}$ and damage to vegetation and ecosystems (where very high levels of dust soiling occur).

The main construction activities associated with the proposed scheme that could generate dust include construction site establishment, earthworks, trench excavation for the installation of the pipeline, shaft construction and temporary material storage and handling. The temporary access track is proposed across fields and commons to reduce damage to land. The generation of dust on this proposed access track system is not as likely as dust from a conventional stone haul road.

The screening distances to identify where there is a need to consider construction dust are set out within the IAQM dust guidance as set out in Section 2.5.1.

Along the proposed pipeline route there are sensitive human receptors within 350 metres. The closest receptors to the route are those in Eton Wick, over 100 m to the east from the route. Therefore, in line with the IAQM dust guidance, the sensitive of the area to dust impacts would be low. There are no ecological receptors within 50 m of the proposed route and outfall.

The main dust generating activities would be earthworks activities, which would include topsoil stripping (where required) along the proposed pipeline route, at the construction compound, the excavation of trenches (typically utilising an open cut method) to install the pipeline. The material excavated during the excavation of the trenches would be placed in temporary stockpiles. Topsoil and subsoil intended for reinstatement would be temporarily stockpiled as close to where they were stripped as practicable to minimise the risk of dust emissions.

A number of site compounds are proposed along the route, which would be approximately 2,500 m^2. However, there would be a relatively small volume of earthworks (mainly for vegetation clearance to form hardstanding areas) (i.e. less than 20,000 tonnes of material) and typically less than five heavy earth moving vehicles operating at any one time. Therefore, taking these factors into account, the earthworks associated with the compounds and proposed pipeline route would be representative of a "small" dust emission magnitude (based on the IAQM dust guidance).

The rate at which the pipeline is estimated to be laid could be between 70 and 280 metres of pipeline per week but would vary depending on ground and weather conditions. This means that typically the main construction activities would only occur at any one specific location for a relatively short time and be within 350 metres of any receptor for between three to 10 weeks.

No requirement for demolition of any buildings or structures has been identified at this stage for the outfall route. However, if any demolitions are required as part of the scheme, these would be limited to a very small amount of works, this could include the removal of fences and outbuildings etc.

Therefore, based on the limited activities associated with the construction of the proposed pipeline and the short duration that each receptor would potentially experience any adverse impacts from the construction works it is considered that there would be a "small" dust emission magnitude potential for construction activities (based on the IAQM dust guidance).

For "trackout", there would be less than 20 outward HGV and bus movements per day from the proposed site compounds. Therefore, it is considered that there would be a "medium" dust emission magnitude for trackout (based on the IAQM dust guidance).

In line with the IAQM dust guidance, the low emission magnitude of construction activities (earthworks, construction and trackout) in areas considered to be low sensitivity means that there would be a negligible risk of dust impacts during the construction of the route and outfall.

Although the risk of dust impacts from these activities would be negligible, emissions of dust would be controlled through the adoption of standard good practice dust mitigation measures to prevent or reduce dust emissions. The relevant good practice mitigation measures for the construction phase of the proposed scheme have been taken from the IAQM dust guidance. These mitigation measures and controls are set out in Section 2.6.5 and would be required to be included in the Construction Environmental Management Plan (CEMP), which would be implemented during the construction phase. The IAQM dust guidance acknowledges that taking these mitigation

measures into consideration, the environmental effect from dust emissions would not be significant at any off-site receptor.

2.6.2 Construction Phase: Emissions from Construction Plant and Machinery

The type and numbers of construction plant and machinery would vary over the construction period of the route. The typical construction techniques and methodologies are outlined in Sections 1.3, 2.5.2 and below.

Based on a typical section of the proposed pipeline route, the construction plant and machinery are anticipated to consist of a mixture of the following types. It must be noted that this list is not exhaustive and will also be subject to the final design and contractors' requirements. It is indicative of typical types of plant and the numbers required to construct this type of structure:

- pipe jacking equipment including; generators, bentonite plant, and pumping systems;
- well pointing drilling rig and associated dewatering equipment such as pumps and generators;
- tracked excavators between 21 and 40 tonne;
- 6 and 8-wheel tipper trucks;
- 4x4 vehicles;
- mobile and crawler cranes for shaft construction and servicing the pipejacking activities;
- concrete pumps;
- piling hammer powerpacks for outfall cofferdam works; and
- safety boat for works in water.

Small diesel generators (4-6 kVA) would be required for various construction activities such as de-watering pumps, lighting towers and welfare units and also generators required at site compounds where connection to the mains electricity grid is not available. Additionally, various petrol saws, chippers and welding plant may be required during construction.

The construction areas would generally be long and narrow with the works spread out across different parts of the proposed scheme at any one time. Where there would be an overlap in construction activities, these would typically be undertaking different elements of the works rather than all plant operating at the same location simultaneously carrying out the same construction activities. For example for open cut pipe laying, construction plant associated with the excavation of the pipeline trench would operate in one area initially, followed further behind by the plant laying the pipe itself, and then the plant required to refill the excavated material and the levelling of the new surface.

The IAQM dust guidance specifies the following in relation to the assessment of emissions to air from construction plant and machinery:

"Experience of assessing the exhaust emissions from on-site plant (also known as Non-road Mobile Machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed."

Construction plant and machinery would be in operation at any one location for only a relatively short duration. There would also only be a relatively low number and size of plant and machinery items operating during construction simultaneously. Therefore, the potential effect on local air quality at human receptors and ecological receptors in the vicinity of the construction works would be negligible. On this basis, and in line with the IAQM dust guidance, the effect on air quality from construction plant and machinery emissions is considered to be not significant.

2.6.3 Construction Phase: Emissions from Road Traffic

The estimated total number of HGVs and buses associated with construction traffic would be 1,054. As an AADT this is less than six movements per day. The change in LDVs during construction would also be a lot less than 100 vehicles per day. Therefore, these changes in daily vehicle numbers associated with construction traffic would not exceed the EPUK/IAQM screening criteria for locations outside of AQMAs set out above in this section.

On this basis, emissions from construction-related road traffic associated with the proposed route and outfall are not considered to represent a significant air quality effect on receptors adjacent to the local road network. The effects would be described as negligible.

Therefore, the air quality impacts from construction-related road traffic associated with the proposed route and outfall on human and ecological receptors are unlikely to have significant effects on the environment.

2.6.4 Operation Phase

There are no significant sources of air quality or dust effects associated with the operational phase of the route and outfall.

2.6.5 Mitigation

The contractor would undertake and implement the following management and control measures, where the measure is relevant in the context of the works being undertaken and the construction plant in use.

- Provide general site management and good housekeeping procedures, including:
  - name and contact details for air and dust issues displayed at site boundary;
  - plan the site layouts so that machinery and dust-generating activities are located as far as practicable from nearby receptors, such as residential properties;
  - erect a screen or barrier around dust activities at the site compounds, where required and where water suppression is not effective; and
  - appropriate training of the construction workers to increase awareness of dust management and control measures.
- Use of modern plant and equipment no older than 5 years and compliant with current emissions standards and legislation.
- Record all dust and air quality complaints and any exceptional incidents, identify cause(s), take appropriate measures to reduce emissions in a timely manner and record the measures taken.
- Implement a CEMP, which should include the following measures to control or mitigate potential adverse impacts caused by the construction works:
  - control runoff of water or mud to reduce spread of particulates that could subsequently be disturbed and become airborne;
  - return subsoil and topsoil at the earliest suitable time of year;
  - manage earthworks and exposed areas or soil stockpiles to prevent wind whipping. Use methods such as covering, sealing of stockpiles, re-vegetating or using water suppression;
  - signpost a maximum speed limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas;
  - where there is a risk of dust nuisance, use cutting, grinding or sawing equipment fitted, or in conjunction, with suitable dust suppression techniques;
  - where there is a risk of dust nuisance, use enclosed chutes and conveyors and covered skips;

- when loading/unloading vehicles, drop heights must be kept to a minimum;
- ensure equipment is readily available on site to clean any dry spillages. Clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
- dry sweeping of large areas should be avoided;
- no bonfires or the burning of waste materials;
- avoid scabbling (roughening of concrete surfaces) where possible;
- ensure sand and other aggregates are not allowed to dry out. If drying out is required for a particular process, ensure that appropriate additional control measures are in place;
- water assisted road sweepers should be deployed on public roads when necessary, and on haul roads when the easement is particularly dry, to prevent excessive dust or mud deposits;
- sheet vehicle loads during the transportation of loose or potentially dusty material or spoil; and
- adequate wheel washing facilities could be provided at access points on to the public highway from the site compounds, where required.

Therefore, with the implementation of the dust mitigation measures and controls, the likely effect of dust emissions on human health, amenity and ecological receptors during construction of the route and outfall is concluded to be not significant.

2.6.6 Opportunities

There are considered to be no other required additional opportunities to reduce potential air quality and dust impacts along the outfall route.

However, the contractor could look to use electric construction plant and machinery (such as electric excavators, cranes and dump trucks) where appropriate, which could further reduce the emissions of air pollutants and the carbon output.

2.7 Summary

Following a review of the baseline air quality and odour situation and the likely works to be undertaken during construction there are unlikely to be any significant air quality impacts on human and ecological receptors from construction and operation traffic and construction plant and machinery for the STW and route and outfall.

Although the risk of dust impacts during construction would be negligible to low, emissions of dust would be controlled through the adoption of standard good practice dust mitigation measures to prevent or reduce dust emissions. These mitigation measures and controls and would be required to be included in the CEMP, which would be implemented during the construction phase. The IAQM dust guidance acknowledges that taking these mitigation measures into consideration, the environmental effect from dust emissions would not be significant at any off-site receptor.

The proposed changes to the STW will result in an improvement (i.e. reduction) in odour emissions. This improvement is associated with the change in treatment processes, which will remove the anaerobic sections from the ASP lanes. This change will reduce the odour emissions by approximately 14% (equivalent to around 9,800 ou/s).

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Consistent with the current operations, the proposed screens at the inlet works (if required) and centrate buffer tank will be covered and connected to an odour control unit. The new centrate liquor pumping station this would be covered and connected to an odour control unit.

The remaining changes to the site will not involve upgrades or work to inherently odorous assets, instead, the upgrade relates to less significant sources of odour at the site. The other plant upgrades involve assets at the end of the treatment process before treated effluent is discharged to the watercourse, thereby being less odorous, such as the outlet works and FSTs (a description of the proposed upgrades to the Slough STW is provided in Section 1.3.1). It is considered that the odour levels during operation will be no higher than currently existing levels.

Therefore, the odour impacts from operation phase of the upgrades to the STW on human receptors are unlikely give rise to significant effects on the environment.

Therefore, air quality, dust and odour from construction and operation of the STW upgrade and route and outfall are determined to have no significant environmental effects.

Table 2.3: Summary of the assessment of air quality and odour.

Assessment of Air Quality and Odour Effects	Significance of Effects	Mitigation Measures
During construction: *Impacts from odour are not expected during construction.* *Negligible to low risk of dust impacts.* *Negligible risk of impacts of emissions from construction plant and machinery and emissions from construction-related road traffic.*	*No significant environmental effects are expected from air quality and odour during the construction phase.*	*Provide general site management and good housekeeping procedures (see Section 2.5.6 and 2.6.5 for details).* *Implement a CEMP, which includes measures to control or mitigate potential adverse impacts caused by the construction works (see Section 2.5.6 and 2.6.5 for details).*
During operation: *Odour impacts are unlikely to have significant effects due to the design of the site upgrades and the proposed plant upgrades not being significant sources of odour (see Section 1.3.1 for list of assets).* *Negligible risk of impacts of emissions from operation-related road traffic.*	*No significant environmental effects are expected from air quality and odour during the operation phase.*	*The proposed changes to the STW will result in an improvement (i.e., reduction) in odour emissions at the site through the design.* *TWUL will continue to operate the Slough STW in accordance with the existing Odour Management Plan (document reference AM-OMP Slough STW dated March 2016) and their Asset Standards .*

3. Carbon and Climate Change

3.1 Information Sources

The following information has been reviewed to undertake this Screening Opinion Report:

- Slough Borough Council, Carbon management plan (2020).
- Slough STW-Relocation of Outfall to River Thames Presentation (Thames Water, 2020).
- Slough STW Environmental Desktop Study.
- Slough STW Outfall Option Presentation for Savills and TW Property 23.06.21.
- K222-AJ-SLOUS1ZZ-101-DR-C-0011 (STW Upgrade draft layout).
- Equipment List Option 3a excel document.
- Machineries fuel consumption data.
- UK Government GHG conversion factors.

3.2 Policy

There is an important focus by the UK government to reduce carbon emissions and build a green economy. The UK Government's main statutory policy target is to reduce the UK's net emissions of greenhouse gases by 100% relative to 1990 levels by 2050. (The Climate Change Act 2008 (2050 Target Amendment) Order 2019). The ultimate receptor for the climate is the atmosphere. The release of greenhouse gases is not considered to have a localised effect, as regardless of location, the release of emissions adds to the cumulative atmospheric concentration of climate-change proliferating greenhouse gases. Nevertheless, for this project, the release of any carbon emissions will, however, occur within the administrative boundary of Slough Borough Council.

In October 2020, Slough Borough Council released its carbon management plan where it has set four targets/outcome to be achieved:

- A 10% reduction of CO2e net emissions per annum of all Council operations by 2029/30, relative to 2018/19.
- A 100% reduction of CO2e net emissions by 2029/30 against the 2018/19 baseline.
- A reduction of 10.5 tonnes CO2e to 0 tonnes per Full Time Equivalent Employee (FTE) by 2029/30.
- A revenue saving of 10% over lifetime of the plan against 2018/19 baseline operating costs for the Council.

Thus, any carbon emissions would be contextualised within the local councils' carbon budget as part of their climate strategies.

Moreover, carbon emissions need to also align with TWUL emissions targets set out below; TWUL has already reduced their greenhouse gas emissions by 34% in 2020 compared to 1990 levels:

- Achieve net zero carbon emissions from operations by 2030.
- Committing to going beyond net zero by 2040.

In addition, any carbon emissions from the scheme will need to be contextualised as part the UK climate action plan and associated carbon budgets.

3.3 STW upgrade

3.3.1 Baseline

Carbon will be broken down into Capital and Operational carbon considerations which are defined as follows according to the principles of Publicly Available Specification PAS 2080 – Carbon Management in infrastructure:

- Capital carbon which covers greenhouse gas emissions arising from the creation, refurbishment, and end of life treatment of assets such as buildings and infrastructure.

- Operational carbon which covers the greenhouse gas emissions associated with the operation and maintenance of assets during delivery of their function and services.

3.3.1.1 Capital Carbon

Capital carbon for the STW upgrade includes:

- Materials and product embodied carbon: all new buildings and most material or product used during the STW upgrade will possess embodied carbon. Appendix M lists all the main construction that will result in the embodied carbon emissions.

- Material transportation: the transportation of materials for the STW upgrade will have greenhouse gasses emissions to be accounted for.

- Site utilities: these represent emissions from operation of electrical assets used to operate the facility during the construction.

- Plant and machinery fuel use: during the STW upgrade there will be emissions related to plant and machinery fuel usage in the construction of relative assets.

- Waste material transport: the transport of waste material also needs to be considered as part of the capital carbon emitted as part of the STW upgrade construction.

- Land use change: carbon emissions related to the land use change; for instance, forestry or vegetation.

3.3.1.2 Operational Carbon

Operational carbon for the STW upgrade includes:

- Embodied carbon in operation and maintenance activities: replacement of equipment throughout the operational life of the facility will have an embodied carbon content

- Site energy usage: these represent emissions from operation of electrical assets used to operate the facility.

- Waste Material Transport: the transport of waste material while the site is in operation also needs to be considered as part of the STW upgrade operational life span.

3.3.2 Assessment

To carry out the construction carbon assessment, the following data has been used on indicative information where necessary: material quantities and specifications; material procurement; earthwork requirements; construction period; demolition quantities; and, land-use change.

3.3.2.1 Capital Carbon

Materials and product embodied carbon

At this stage of the assessment, the embodied carbon is calculated with the initial design data specification. The total embodied carbon emissions calculated for the STW upgrade results to **110,000 tCO2e** . This results in the most significant contributor of CO2 emissions as the STW requires substantial construction materials. Appendix M shows the relative embodied carbon for each asset description.

To better understand where the high emission come from table 3.1 breaks down into categories the different embodied carbon:

Table 3.1: STW upgrade plant and machinery fuel use total emissions calculations.

Asset Category	Embodied Carbon **tCO2e**	%
Tanks Related Materials and Products	63151.33	57%
Sedimentation	21795.53	20%
Activated Sludge Plant	15596.65	14%
Main Screens	6422.41	6%
Other	2283.65	2%
Pumping Station Related	566.70	1%
Initial Set Up Activities	92.54	~0%
Sum	**109908.81**	**100%**

As can be observed, tank related materials and products, and sedimentation works account for the most significant share of embodied carbon: 57% and 20%, respectively. As the project design becomes more detailed, the embodied carbon emissions are expected to decrease. The mitigation and opportunities sections outline the different ways the embodied carbon can be lowered.

Materials Transportation

At this stage of assessment, high-level information is available to calculate the carbon emissions related to material transport. For the STW upgrade, the only material expected to be transported for the construction is concrete. In addition to materials, also construction plant machinery needs to be considered for in-site transportation. The total tonnes of concrete are expected to be 10963 tonnes. To calculate the GHG emissions, two key numbers were used:

- The emission factor of an HGV with average laden: 0.10749 kgCO2e/t.km. This was taken from the UK Government conversion factors.
- The total km from the material's origin to the construction site. In this case, a value of 11km has been assumed; because the concrete contractor is still to be determined, the average distance of different possible contractors from the site has been calculated.

Using the above, the equivalent GHG emission for the transport of concrete equates to approximately 13tCO2e. As expected, the transport of materials has a low impact on tCO2e.

Finally, at this stage there isn't enough data to calculate the GHG emissions corresponding to the transport of the construction plant machinery. Nevertheless, because it would be a nationwide delivery and only correspond to a one-time delivery, the CO2e emission would be negligible.

Site utilities

At this stage of the assessment, information on site utilities is not sufficient to deliver an approximated value of emissions. Specifics on the number of compounds and lightning towers are still to be determined. Nevertheless, even if important to be considered, site utilities are usually not a significant contributor to the greenhouse gasses emissions.

Plant and machinery fuel use

At this stage of assessment, the following list of plant and machinery has been provided:

- Excavators 1tn to 12tn to install trenching and work in and around existing STW plant.
- 6 and 8-wheel tipper trucks for removal of trench arisings and demolition materials
- Mobile and crawler cranes for lifting in plant and installing tanks
- Articulated flatbed lorries for delivery of materials and plant
- Ready mix concrete wagon
- Concrete pump
- Telehandler
- Mobile elevating work platforms (MEWPs)

From the above list, emissions from tipper trucks and lorries have already been assessed in the transport of materials and waste. Moreover, both the concrete pump and the ready to mix wagon should be incorporated into the embodied carbon of concrete. Thus, these are not accounted for fuel use.

Table 3.2 shows the key figures needed to calculate the total emissions. The fuel consumption has been assumed using external sources of usual fuel data of the listed plant. The number of days for excavation is currently anticipated to be a total of 60 days (according to the project delivery plan); however, the days are not specified for the other plant. As a result, because the total amount of days for the construction of the STW is expected to be 470 (compound site excluded), it is assumed that each item of plant will be used for half amount of the time (235 days).

Table 3.2: STW upgrade plant and machinery fuel use total emissions calculations.

Plant	Days	Litres of Diesel per Hour assumed	Diesel kgCO2e/litres	kgCO2e
Excavators 1tn to 12tn to install trenching and work in and around existing STW plant	60	5.5	2.7	7100
Mobile and crawler cranes for lifting in plant and installing tanks	235	5.5		28000
Telehandler	235	6		30000
MEWPs	235	4		20000

The total tCO2e emissions are predicted to be: 85 tCO2e. The greenhouse gasses emission related to the plant construction does have an important impact on the overall emissions. The mitigation and opportunities sections outline the potential different ways this number can be decreased.

Waste Material Transport

At this stage of assessment, high-level information is available to calculate the carbon emissions related to waste transport. For the STW upgrade, the only waste expected to be transported from the construction is soil. The total volume of earth soil to be exported is expected to be 17819 m3; using a general density of soil of 1.33 g/m3, the total tonnes equate to 0.024 t. Further, using an average distance of 10 km to the disposal site and the 0.10749 kgCO2e/t.km value for the HGV, the total emissions expected are 0.03 kgCO2e. Thus, the emission can be considered to be negligible compared to the rest of the construction.

Land Use Change

There are no significant land changes expected that will impact the amount of greenhouse gasses emissions. Any removal of forestry will be regrown unless it is an invasive plant.

3.3.2.2 Operational Carbon

Embodied Carbon in operation and maintenance materials

At this stage of the assessment, information on operation and maintenance material is unknown, so it is not possible to assess its impact on emissions.

Operational Energy use

Appendix N outlines the expected energy usage and its equivalent greenhouse gas emissions per asset used.

The kWh/year for each asset has been calculated by multiplying their relative power consumption with the number of operational hours per year. The kg CO2e is measured by using UK electricity 2021 conversion factor of: 0.21233 kg CO2e/kWh.

The total estimated emissions from the operational electrical assets amount to 250 tonnes CO2e/year. It is essential to mention that this value will decrease as the National Grid energy is decarbonised.

Waste Material Transport

At this stage of assessment, information on waste generation or disposal is unknown so it is not possible to assess its impact on emissions.

3.4 Route and outfall

3.4.1 Baseline

3.4.1.1 Capital Carbon

Capital carbon for the route and outfall includes:

- Materials and product embodied carbon: the route requires the construction of a tunnel section under the Jubilee River. This would require extensive engineering works to facilitate and could have the potential to

consume a considerable amount of energy and materials. The outfall construction will also possess embodied carbon to be considered.

- Material transportation: the transportation of materials for the STW's route and outfall will have greenhouse gasses emissions to be accounted for.
- Site utilities: these represent emissions from operation of electrical assets used to operate the route and outfall during the construction.
- Plant and machinery fuel use: during the STW route and outfall there will be emissions related to plat and machinery fuel usage in the construction.
- Waste material transport: the transport of waste material also needs to be considered as part of the capital carbon emitted as part of the route and outfall.
- Land use change: as aforementioned, this relates to the carbon emissions related to the land use change; for instance, forestry or vegetation.

3.4.1.2 Operational Carbon

Operational carbon for the route and outfall includes:

- Embodied carbon in operation and maintenance materials: all operational equipment and maintenance materials used during the operation and maintenance of the route and outfall will possess embodied carbon.
- Operational energy use: these represent emissions from operation of electrical assets used to operate the route and outfall.
- Waste Material Transport: the transport of waste material while the site is in operation also needs to be considered as part of the outfall's operational life span.

3.4.2 Assessment

As aforementioned in section 3.3.2 to the same data has been used to carry out the construction carbon assessment.

3.4.2.1 Capital Carbon

Materials and product embodied carbon

At this stage of the assessment, the embodied carbon is calculated with the initial design data specification. For this section, only the embodied carbon of the outfall and route are specified.

The total embodied carbon calculated for the outfall and route results to **3500 tCO2e** . This results in the second-highest carbon equivalent emission contributor in the project. Table 3.3 outlines how the open cut and the shafts embody the most significant share of emissions, 38% and 30%, respectively.

Table 3.3: STW upgrade plant and machinery fuel use total emissions calculations.

Asset Category	Embodied Carbon **tCO2e**	%
Open Cut	1294.06	38%
Shafts	1020.30	30%
Landscaping	467.25	14%
Other	412.49	12%
Pipework	181.40	5%
Sewers	53.74	2%
Sum (Rounded)	**3500**	**100%**

As aforementioned for STW upgrade, the embodied carbon emissions are expected to decrease as the project design becomes more detailed. The mitigation and opportunities sections outline the potential different ways that the embodied carbon can be reduced.

Site Utilities

At this stage of the assessment, information on site utilities is not sufficient to deliver an approximated value of emissions. Specifics on the number of compounds and lightning towers are still to be determined. Nevertheless, even if important to be considered, site utilities are usually not a significant contributor to the greenhouse gasses emissions.

Materials Transportation

At this stage of assessment, high-level information is available to calculate the carbon emissions related to material transport. For the route and outfall, the materials expected to be transported for the construction are:

- Concrete, pre-cast concrete shafts, new fill (earth soil), and pipes.

In addition to materials, as aforementioned, also construction plant machinery needs to be considered for in-site transportation. For concrete the total tonnes expected are 192 t. To calculate the equivalent CO2 emissions two key parameters were used:

- The emission factor of an HGV with average laden: 0.10749 kgCO2e/t.km. This was taken from the UK Government conversion factors.

- The total km from the material's origin to the construction site. In this case, a value of 11 km has been assumed; because the concrete contractor is still to be determined, the average distance of different possible contractors from the site has been calculated.

Using the above, the equivalent GHG emission for the transport of concrete equates to approximately 0.2tCO2e. As expected, the transport of materials has a low impact on tCO2e.

For the pre-cast concrete shafts, using the provided volume information, the total tonnes have been calculated to be 1291 t; as the material is expected to be concrete, the emissions are 1.3tCO2e.

For the pipes using the provided volume information, the total tonnes have been calculated to be 16 t. The material is assumed to be concrete; thus, the corresponding emissions are 0.02tCO2e.

For the new fill of earth/soil the expected volume is 4810m^3; using an average density of 1.33 g/m^3, the total tonnes are 0.004 t. As this is related to only a one way trip, the tCO2e is negligible and rounded to 0.

Finally, similarly to the STW, at this stage, there isn't enough data to calculate the CO2 emissions corresponding to the transport of the construction plant machinery. Nevertheless, because it would be a nationwide delivery and it will only correspond to a one-time delivery, the CO2e emission would be negligible.

To conclude this section, the total emission related to the material transport for the route and outfall is expected to be: 1.5tCO2e. Thus, it does not represent a significant contributor.

Plant and machinery fuel use

Tunnelling under the Jubilee River could result in high carbon impact due to the energy intensive nature of tunnel construction. Therefore, it is expected to have high carbon impacts. At this stage of assessment, the following list of plant and machinery that still have not been incorporated in other sections is:

- Pipe jacking equipment including generators, bentonite plant, and pumping systems.
- Well pointing drilling rig and associated dewatering equipment such as pumps and generators.
- Tracked excavators between 21 and 40tn for installation of trench box, excavation, pipe installation, and backfilling of trenches.
- 4x4 vehicles for moving personnel around the site.
- Mobile and crawler cranes for shaft construction and servicing the pipejacking activities.
- Piling hammer powerpacks for outfall cofferdam works.
- Safety boat for works in water.

Table 3.4 shows the key numbers needed to calculate the total emissions. The fuel consumption has been assumed using external sources of usual fuel data of the listed machineries. For the excavation and the pipe jacking, the number of days is anticipated to be 340 days and 180 days, respectively (according to the project delivery plan); however, the days are not specified for the other machinery. As a result, because the total amount of days for the construction of the route and outfall is expected to be 465 (compound site excluded), it is assumed that each item of plant will be used for half amount of the time (232 days).

Table 3.4: Route and outfall plant and machinery total emissions calculations.

Plant	Days	Litres of Diesel per Hour assumed	Diesel kgCO2e/litres	kgCO2e
Pipe Jacking Equipment including; generators, bentonite plant, and pumping systems	180	20	2.7	78000
Well Pointing drilling rig and associated dewatering equipment such as pumps and generators.	232	45		230000
Tracked excavators between 21 and 40tn for installation of trench box, excavation, pipe installation, and backfilling of trenches.	340	45		330000
Mobile and crawler cranes for shaft construction and servicing the pipejacking activities.	232	5.5		28000
Piling hammer powerpacks for outfall cofferdam works	232	20		100000

The total tCO2e emissions are predicted to be: 770 tCO2e. The greenhouse gasses emission related to the machinery construction does have a significant impact on the overall emissions, as expected. The mitigation and opportunities sections outline the potential different ways this number can be decreased.

Waste Material Transport

At this stage of assessment, high level information is available for the calculation of the carbon emissions related to waste transport. For the route and outfall, the only waste expected to be transported from the construction is

soil. The total volume of earth soil to be exported is expected to be 4810 m3; using a general density of soil of 1.33 g/m3, the total tonnes equate to 0.006 t. Further, using an average distance of 10 km to the disposal site and the 0.10749 kgCO2e/t.km value for the HGV, the total emission is negligible 0.007 tCO2e. Thus, the emissions can be considered to be null compared to the rest of the construction.

Land Use Change

There are no significant land changes expected that will impact the amount of greenhouse gasses emissions. Any removal of forestry will be regrown unless it is an invasive plant.

3.4.2.2 Operational Carbon

Embodied Carbon in operation and maintenance materials

At this stage of the assessment, information on operation and maintenance material is unknown, so it is not possible to assess its impact on emissions.

Operational Energy Use

At this stage of the assessment the operational energy use for the operational carbon of the route and outfall is not yet available. This will be assessed at a later stage. However, it is not anticipated to be significant comprising only the function of pumps for part of the effluent flow.

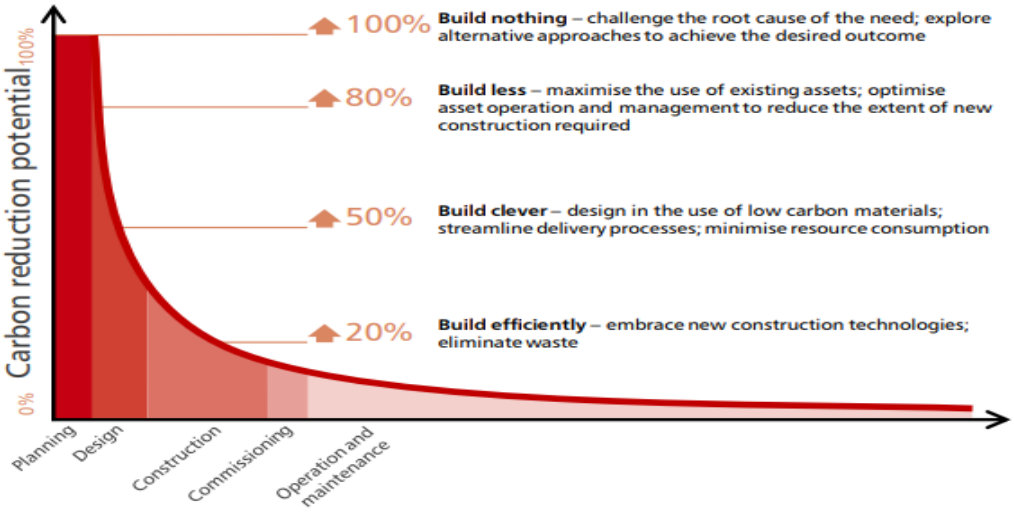
Waste Material Transport

At this stage of assessment, information on waste generation or disposal is unknown so it is not possible to assess its impact on emissions.

3.5 Mitigation

The earlier carbon saving opportunities are identified, the greater impact they will have in influencing carbon reduction within the project design phase. Reducing carbon is not just about building new assets in a more intelligent way, it is about demanding better performance from what you already have. Taking the 2013 Infrastructure Carbon Review into consideration, the best way to reduce carbon is to 'build nothing' or 'build less'. In the context of the Slough STW Upgrade, the construction work needs to be carried out and there are no specific mitigation practices to be highlighted. Regarding, the route for the outfall, it is the only viable route. As a result, there aren't any mitigation practices to be outlined. Nevertheless, the sub-section below outlines different opportunities that can lower the carbon footprint of the construction and operation of the scheme.

Figure 3.1: Carbon reduction curve (Source: Infrastructure Carbon Review 2013).



3.6 Opportunities

There is a corresponding trend towards infrastructure schemes giving greater consideration to the carbon impact. Table 3.5 highlights some standard and best practice examples of carbon management and carbon reduction in infrastructure.

Table 3.5: Carbon management and reduction in infrastructure – standard and best practices examples

Standard Infrastructure Carbon Practice	Best Infrastructure Carbon Practice
i. Policies considering energy consumption and carbon ii. Measuring and reporting capex and Opex carbon iii. Alignment to relevant industry standards (e.g. ICR, Greenhouse Gas Protocol, ISO 50001)	i. Ambitious carbon reduction targets aligned to 'net zero' ii. Alignment or accreditation to relevant standards (e.g. PAS 2080) iii. Development of a comprehensive Carbon Management Plan iv. Whole life approach to carbon management v. Carbon reduction targets embedded in contracts and / or contractual incentivisation mechanisms to reduce carbon vi. Generation of renewable energy using owned assets vii. Carbon quantified and weighted in procurement decisions viii. Programmes and/or tools building workforce capacity (e.g. carbon literacy) throughout the supply chain ix. Setting minimum standards for carbon intensive materials (e.g. concrete or steel) and / or whole life approach to carbon management across the supply chain e.g. life cycle scores for major materials x. Targets for use of hybrid or electric vehicles and plant

Use of any of the above techniques is clearly dependent on the nature and scope of the infrastructure project. However, some of the above approaches that may be the most relevant to the scheme are expanded upon below.

Use of carbon management tools. TWUL already employ their own Carbon Tool and other methods are commonly used for calculating emission of a project, including the Greenhouse Gas Protocol. However, the PAS2080:2016 Carbon Management in Infrastructure standard can be an exceptionally useful tool for managing emissions over the lifetime of project. This standard looks at the carbon emissions throughout the whole project value chain and allows the user to consistently and transparently categorise, track and manage emissions throughout the infrastructure project life cycle. It also provides a framework for carbon management activities by different stakeholders throughout the lifetime of a project, making it useful for the later implementation phases of any carbon reduction plan.

Use of hybrid and electric plant. A variety of hybrid and electric plant is now being employed on infrastructure projects throughout the UK. Examples include electric telehandlers operating on HS2, electric hydrofraises at Tideway (Construction Index, 2020) and the contractor Mace Group's use of hydrogen generators across a number of UK construction sites (Mace Group, 2020). These approaches have the benefit of reducing noise, dust and air pollution in addition to carbon emission reduction. This technology is developing at a rapid pace and the increased range of options could therefore present an opportunity to employ elements of low carbon plant.

The use of low emission or electric vehicles. The use of low emission or electric vehicles for work travel represent as an opportunity to lower the carbon footprint both for the capital and operational carbon.

Minimise the number of construction days. As seen in previous sections the number of construction days have a high impact on plant GHG emissions. Thus, trying to minimise the days of construction or overall use of plant will lower the capital carbon.

Use of low carbon and recycled materials. Both the concrete and steel industries are attempting to pivot towards net zero carbon. These industries are important for infrastructure as they usually represent between 25-50% of the capital emissions from construction. The UK Concrete and Cement Industry Roadmap to Beyond Net Zero (UK Concrete and Cement Industry, 2020) has no short-term targets (within the timeframe of the Slough STW) for a reduction in carbon intensity of 'standard' concrete and cement. As the decarbonisation of these key material-supply industries cannot be relied upon to deliver low carbon materials by default, it is necessary to actively specify and procure these. Relevant virgin low carbon materials, for example cement free concrete are available on the market and have been specified in a number of major infrastructure schemes.

The opportunities listed above apply for both the route and outfall and the STW upgrade. In addition to the opportunities listed above, there is a further one that only apply to the route and outfall: **reducing the environmental impact of the construction tunnelling.** Tunnelling is relevant to climate change mitigation, with CO_2 emissions ranging from 0.42 to 1.45 tCO_2e per metre. A 2015 study by Huang et al in Norway investigated the environmental impacts of a common construction method; drill and blast tunnelling, using life cycle assessment to identify areas that could be targeted to reduce its environmental impact (Huang et al., 2015). The study identified three main sources of environmental damage and potential mitigation opportunities:

1. Diesel consumption: Diesel is used to power the engines of tunnelling machines and vehicles, leading to combustion emissions. Using biodiesel would reduce CO_2 emissions and could be implemented relatively easily with existing technology

2. Electricity consumption: Used for drilling and blasting and ventilation. This was the major contributor to climate change. To reduce this, it was recommended to tunnel from both sides (which is usually possible when a tunnel is longer than 3 km) and optimising the design of ventilation systems.

Although this study was based on Norwegian practices, it concluded that their findings can be applied to construction sites elsewhere. Therefore, these mitigation opportunities should be considered in the context of outfall route options construction which require tunnelling or pipe jacking, a method of micro-tunnelling

underground. The route and lengths of tunnelling compared to open cut construction have been stringently considered not only to take into account the carbon and emissions impacts but also the balance with other impacts and design requirements, such as future maintenance and operability, health and safety and ecology.

3.7 Summary

The total amount of carbon equivalent emission for the project account to **115,000 tCO2e**. The most significant contributor comes from the embodied carbon of the materials and products used in the construction: 110,000 accounting for STW upgrade and 3500 for the outfall and route.

The total operational carbon only accounts for 250 tCO2e emissions at the moment. This relates solely to the operational energy use of the STW upgrade. It is essential to mention that other operational carbon emissions such as embodied carbon from maintenance materials and operational waste are still unknown. Nevertheless, these are expected not to have a significant impact on the overall emissions.

Finally, as the project's design develops and information becomes more precise, the overall carbon, especially related to the embodied carbon of materials, is expected to decrease. Table 3.6 outlines the mitigation measures. In any case, optimizing the number of construction days alongside the quantity of material being used will significantly reduce tCO2e emissions.

Table 3.6: Summary of the assessment of carbon and climate change.

Assessment of Carbon and Climate Change Effects	Significance of Effects	Mitigation Measures
During construction: *Embodied carbon related to the construction: 113,500 tCO2e* *Plant Machinery fuel use: 770 tCO2e*	*The most significant contributor to the total amount of carbon equivalent emission from the project is from embodied carbon of materials and products used in construction.*	- *Use low carbon and recycled materials.* - *Use of carbon management tools* - *Reduce material quantity where possible* - *Use hybrid and electric plant* - *Use of low emission or electric vehicles* - *Seek to minimize number of construction days*
During operation: *Operational Energy use of the new STW upgrade assets: 250 tCO2e*	*Other operational carbon emissions such as embodied carbon from maintenance materials and operational waste are expected not to have a significant impact on the overall emissions.*	- *Potential use of renewable energy on site.* - *Increased production of renewable energy from existing assets.* - *Offsetting measures*

4. Ecology

4.1 Information Sources

The following information has been reviewed to undertake this Screening Opinion Report:

- Slough Sewage Treatment Works Outfall Relocation: Ecological Desk-based Assessment (JBA Consulting, 2020a),
- Thames Valley Environmental Record Centre (TVERC) and Buckinghamshire and Milton Keynes Environmental Record Centre (BMERC) (requested, 2021),
- MAGIC mapping service (MAGIC map, accessed 2021),
- National Biodiversity Network (NBN) Atlas (NBN Atlas, accessed 2021),
- Satellite imagery and Ordnance Survey maps,
- Environment Agency (EA) Fish and Ecology Data Explorer Tool (Environment Agency, accessed 2021a),
- Online searches: Thames21 River Restoration Project (Thames21, accessed 2021),
- Bat Conservation Trust, Bat Surveys for Professional Ecologists: Good Practice Guidelines 3rd Edition (Collins, 2016),
- Environment Agency Catchment Data Explorer (EA, accessed 2021b),
- Slough STW Outfall Relocation Aquatic Ecology Survey Report (Jacobs, 2021),
- Slough STW Preliminary Ecological Appraisal (Jacobs, 2021) (see Appendix O),
- Slough STW Bat Survey Report (Jacobs, 2021) (see Appendix P), and
- Slough STW Riparian Mammal Report (Jacobs, 2021) (see Appendix Q).

4.2 Policy and Legislation

A range of sites, habitats and species are legally protected under environmental legislation in the UK. Additionally, there are habitats and species that are of increased nature conservation status due to their relative rarity or importance at a local, regional, national or international scale. The legislation and nature conservation designations relevant to this Screening Opinion Report are as follows:

- Natural Environment and Rural Communities (NERC) Act 2006,
- UK Post 2010 Biodiversity Framework (formally UK Biodiversity Action Plan 1992-2012),
- Red Data Book Species (IUCN, 2021),
- Wildlife and Countryside Act (WCA) 1981 as amended,
- National Parks and Access to the Countryside Act 1949,

- Protection of Badgers Act 1992,
- The Eel (England and Wales) Regulations 2009,
- Salmon and Freshwater Fisheries Act 1975,
- Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (formally Council Directive (92/43/EEC),
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (formally Water Framework Directive (Council Directive (2000/60/EEC))). Reference to 'WFD class or status' in the text relates to this policy, and
- Thames Water Asset Management Asset Standard Section 1 of 1 Ecology and Heritage Screening Specification 2020 (Asset Standard).

4.3 STW Upgrade

4.3.1 Baseline

A desk study was conducted for an area of 2km radius around the proposed scheme. Due to the relatively small size and localised aspect of the proposed scheme, this search area is considered to be sufficient to cover the likely zone of influence of the works.

The desk study sought the locations and details of any statutory sites designated for their nature conservation value within 2km of the proposed scheme, European Protected Species (EPS) licence applications and returns within 2km of the proposed scheme, protected and notable species data within 2km of the proposed scheme, non-statutory designated sites and priority habitat within 1km of the proposed scheme and waterbodies within 250m. Understanding nature conservation issues within the wider area helps to determine the ecological value of a scheme and the habitats and species that it supports.

4.3.1.1 Statutory Designated Sites

The desk study returned one statutory designated site within 2km, Haymill Valley, located approximately 1.6km to the north of the STW. This is a Local Nature Reserve (LNR) and is protected under the National Parks and Access to the Countryside Act 1949. It is an old mill pond which has silted over and become a reedbed. It supports butterflies including white letter hairstreak (*Satyrium w-album*).

Additionally, the STW lies within the Site of Special Scientific Interest (SSSI) Impact Risk Zone (IRZ) of Burnham Beeches SSSI. IRZs define areas around each SSSI that reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts. If likely effects are perceived, then the LPA has a duty to consult Natural England.

4.3.1.2 Non-statutory Designated Sites

There are four non-statutory Local Wildlife Sites (LWS) located within 1km of the scheme. However, they are more relevant to the proposed route and outfall, so are discussed in Section 4.4.

4.3.1.3 Priority Habitat

Six habitats listed as priority habitats under the NERC Act were identified within 1km in the desk study. These were Coastal and Floodplain Grazing Marsh, Lowland Fens, Lowland Meadows, Lowland Mixed Deciduous Woodland,

Reedbeds and Traditional Orchards. This included Coastal and Floodplain Grazing Marsh and Deciduous Woodland priority habitat within the STW. Details of priority habitat within 1km of the STW are provided in Table 4.1 below.

Table 4.1: Priority habitats located within 1km of the STW.

Habitat	Features	Distance (km)
Coastal and Floodplain Grazing Marsh	Grassland or rush pasture largely within EA flood zone 3 and containing a network of river channels, ditches or drainage channels. Grazing marshes are particularly important for the number of breeding waders such as snipe (*Gallinago gallinago*),lapwing (*Vanellus vanellus*) and curlew (*Numenius arquata*). Internationally important populations of wintering wildfowl also occur including Bewick swans (*Cygnus bewickii*) and whooper swans (*Cygnus cygnus*).	Within 1km of the STW site
Lowland Mixed Deciduous Woodland	Mixed deciduous woodland is characterised by trees that are more than 5m high when mature, and which form a distinct, although sometimes open, canopy with a canopy cover of greater than 20%. It includes stands of both native and non-native broadleaved tree species.	Within 1km of the STW site
Reedbeds	Reedbeds are wetlands dominated by stands of the common reed (*Phragmites australis)*, wherein the water table is at or above ground level for most of the year. They tend to incorporate areas of open water and ditches, and small areas of wet grassland and carr woodland may be associated with them.	Within1km of the STW site
Lowland Fens	Fens are peatlands which receive water and nutrients from the soil, rock and ground water as well as from rainfall: they are minerotrophic.	0.3

Additional parcels of Deciduous Woodland and Reedbeds were recorded during the field surveys, their locations are shown in Appendix R.

4.3.1.4 Notable Plants

The desk study returned records of tubular water-dropwort *(Oenanthe fistulosa),* which is not listed under Schedule 8 of the WCA but is a priority species under the NERC Act.

4.3.1.5 Invasive Plants

The following Schedule 9 invasive plants were returned during the desk study: giant hogweed *(Heracleum mantegazzianum),* Himalayan balsam *(Impatiens glandulifera),* large-flowered waterweed *(Egeria densa)* and least duckweed *(Lemna minuta).*

During the field survey, an area of Himalayan balsam was recorded in the west of the STW, shown as TN1 in Appendix R. Himalayan balsam is listed under Schedule 9 of the WCA and it is therefore illegal to plant it or otherwise cause it to grow in the wild.

4.3.1.6 Badger

Desk study records of badger (*Meles meles*) were returned 0.5km to the west and 1.9km to the east of the STW.

A badger footprint was recorded in the west of the STW during the survey, shown as BS1 in Appendix R. No other evidence of recent badger activity was recorded within the study area, and no badger setts were identified either active or dis-used.

4.3.1.7 Bats

A Preliminary Roost Assessment (PRA) was performed on all trees within the STW to assess their potential to support roosting bats. The survey was performed in accordance with good practice guidelines (Collins, 2016). A total of 11 trees with bat potential were recorded, details of each are provided in Table 4.2 below and their locations are shown in Appendix T.

Table 4.2: Trees with bat roost potential inside the STW.

Tree Number	Tree Species	Potential Roost Features	Level of Potential
T1	Crack willow *(Salix fragilis)*	Wound	Low
T2	Weeping willow *(Salix babylonica)*	Woodpecker holes Lifted bark	Moderate
T3	Cherry species (dead) *(Prunus sp)*	Woodpecker holes	Moderate
T4	Cherry species	Rot	Low
T5	Black poplar hybrid *(Populus sp)*	Knot hole Woodpecker holes Trunk cavity	High
T6	Black poplar hybrid	Trunk cavities Woodpecker hole	High
T7	Poplar species *(Populus sp)*	Woodpecker hole	Moderate
T8	Poplar species	Woodpecker hole	Moderate
T9	Poplar species	Woodpecker hole	Moderate
T10	Poplar species (dead)	Woodpecker holes	Moderate
T11	Pedunculate oak *(Quercus robur)*	Woodpecker hole Split	Moderate

4.3.1.8 Birds

A high number of protected and priority bird species within 1km were returned in the desk study, they are detailed in Appendix V.

During the field surveys, 29 species of bird were seen or heard. This included Schedule 1 species including red kite *(Milvus milvus)* and Cetti's warbler *(Cettia cetti)* and priority bird species including stock dove *(Columba oenas),* starling *(Sturnus vulgaris),* song thrush *(Turdus philomelos),* skylark *(Alauda arvensis),* reed bunting *(Emberiza schoeniclus),* herring gull *(Larus argentatus)* and dunnock *(Prunella modularis subsp occidentalis).*

4.3.1.9 Great Crested Newt

One record of great crested newt (GCN, *Triturus cristatus*) was returned during the desk study. The location of this record is separated from the STW by the M4, which is considered to be a significant barrier to newt dispersal. MAGIC returned no records of European Protected Species Licences (EPSL) for GCN within 2km of the site in the last 10 years.

A search for waterbodies within 250m of the STW suitable for GCN was performed during the desk study. Habitat Suitability Index (HSI) assessments and environmental DNA (eDNA) surveys were then undertaken on all suitable waterbodies recorded. Details of the five waterbodies surveyed and the results are provided in Table 4.3 below.

Table 4.3: GCN waterbody details and survey results.

Waterbody Name	OS Grid Reference	HSI Result	eDNA Result
WB1	SU 93553 79728	Excellent (0.88)	Negative
WB2	SU 93890 79627	Good (0.79)	Negative
WB3	SU 93904 79673	N/A (dry)	N/A (dry)
WB4	SU 94413 79558	Poor (0.39)	Negative
WB7 (Roundmoor Ditch)	SU 94178 79265	Excellent (0.81)	Negative

Due to all waterbodies testing negative for GCN eDNA, the species is considered to be likely absent from the habitats within 250m of the scheme and the STW. Therefore, there are no requirements for avoidance or mitigation.

4.3.1.10 Hazel Dormouse

MAGIC returned no records of dormouse EPSL's within 2km of the scheme in the last 10 years and no records of dormouse were returned by TVERC or BMERC in the desk study.

The field survey found that the rivers and major roads surrounding the site form a barrier to dispersal for dormouse leaving pockets of fragmented, sub-optimal habitat within the site. This species is considered to be likely absent from the scheme and is therefore not considered further. No recommendations for further survey work or mitigation are required with regards to dormouse.

4.3.1.11 Invertebrates

The desk study returned records of 23 protected or priority invertebrate species. All species returned qualify as priority species including butterflies, moths and stag beetle *(Lucanus cervus)*.

No protected or priority invertebrates were recorded during the field survey and no suitable habitat for stag beetle was identified.

4.3.1.12 Reptiles

The desk study returned records of grass snake *(Natrix Helvetica)* south of the River Thames.

No reptiles were recorded within the STW during the survey, however suitable habitat is present in the form of unmanaged grassland, scrub borders and field margins with the potential to support common reptile species including grass snake, slow worm (*Anguis fragilis*) and common lizard (*Zootoca vivipara*). TWUL employees have identified common lizard present in the north-west corner of the STW.

4.3.1.13 Riparian Mammals

Records of water vole *(Arvicola amphibius)* within the west of the STW, in Roundmoor ditch, were returned during the desk study. An additional five records were identified outside of the STW to the west. However, all of these records are older than ten years, so are not considered to be current.

No suitable habitat for otter was found within the STW. Suitable habitat was identified for water vole, but no evidence was recorded over the two targeted surveys.

4.3.1.14 Aquatic Receptors

There is no pathway to effect for construction or operational works relating to the STW upgrade on the actual STW site to impact aquatic receptors. Please see Section 4.4 for consideration of aquatic receptors for the route and outfall.

4.3.2 Assessment

4.3.2.1 Statutory Designated Sites

Due to the distance of separation, and the nature and scale of the works, no negative effects on Haymill Valley LNR are anticipated.

Similarly, no effects are anticipated on Burnham Beeches SSSI. Therefore, it is not considered that likely that consultation with Natural England regarding the works with respect to Burnham Beeches will be necessary.

4.3.2.2 Non-statutory Designated Sites

No non-statutory designated sites are likely to be negatively affected by the upgrades within the STW boundary. Effects on non-statutory designated sites as a result of the proposed route and outfall are detailed in Section 4.4.2.2.

4.3.2.3 Priority Habitat

It is currently assessed that no Deciduous Woodland or Reedbed priority habitat will be lost within the STW. Should this not be the case, any habitat lost should be replaced on a like-for-like basis.

4.3.2.4 Notable Plants

No notable plant species were recorded inside the STW, so there are no recommendations with respect to notable plants and the STW upgrades.

4.3.2.5 Invasive Plants

There are currently no works scheduled that would risk the spread of Himalayan balsam within the STW. As a matter of good practice, this invasive species should be removed and destroyed by a licensed specialist. However, there is no requirement for this.

4.3.2.6 Badger

No badger setts were recorded within the STW so there are no requirements for avoidance or mitigation with regards to this species.

4.3.2.7 Bats

It has been assessed that due to the nature of the scheme, any works directly impacting the trees listed in Table 4.2, or within 30m of them, could illegally destroy or disturb a bat roost in the absence of mitigation. No trees with bat roost potential are being felled within the STW but current plans include construction of a new structure approximately 20 to 30m from trees T7, T8 and T9.

Recommendations for these trees are provided in Section 4.3.3.

4.3.2.8 Birds

In order to facilitate the STW upgrades, clearance of areas of vegetation which is considered to provide suitable breeding bird habitat will be required. There is therefore a risk of breaching the legislation relating to birds, nests and eggs in the absence of mitigation.

4.3.2.9 Great Crested Newt

All waterbodies located within 250m of the STW returned a negative GCN eDNA result. It is therefore considered that GCN are absent from the study area and no further survey work or mitigation is required with regards to the species.

4.3.2.10 Hazel Dormouse

Due to the absence of suitable habitat on site, hazel dormouse is considered to be likely absent from site and therefore no additional mitigation or survey work are required.

4.3.2.11 Invertebrates

It is assessed that there will be no significant change to habitat suitable for priority invertebrates within the STW. There is therefore no perceived risk of negatively impacting the populations of priority invertebrates as a result of the STW upgrades. No further mitigation or survey work with regards to invertebrates is required.

4.3.2.12 Reptiles

Vegetation clearance of suitable reptile habitat will be required to facilitate the works. This risks the illegal killing or injuring of common reptiles in the absence of avoidance or mitigation.

4.3.2.13 Riparian Mammals

Otter is likely absent from the STW. Similarly, due to a lack of evidence recorded over two surveys and of desk study records within the last 10 years, water vole is also likely absent from site.

4.3.3 Mitigation

4.3.3.1 Priority Habitat

If the loss of any Deciduous Woodland or Reedbed priority habitat cannot be avoided, the habitats lost should be replaced on a like-for-like basis. Under the current proposals, there will be minor loss of deciduous woodland and no loss of reedbeds.

4.3.3.2 Badger

As badger are a highly mobile species, often moving in and out of suitable habitats, it is recommended that an Ecological Clerk of Works (ECoW) should supervise the works undertaken within the STW and a pre-works check for the presence of any new badger setts located within 30m of the STW should be undertaken.

4.3.3.3 Bats

Fencing (Heras or similar) should be erected around trees T7, T8 and T9 as directed by the attending ECoW to create a works exclusion zone, with dust sheeting and sound barriers. No plant or machinery should be used within this zone and these trees should not be illuminated at night. If the upgrade plans do not accommodate this, then further surveys would need to be conducted to ascertain the presence or likely absence of roosting bats within these trees. Should any of the trees be confirmed as bat roosts, a licence from Natural England may be required in order to destroy or disturb the roost.

Artificial lighting should be hooded and directional, so it does not illuminate any buildings, trees or boundary features with bat roost potential.

4.3.3.4 Birds

Vegetation clearance should be carried out outside of the breeding bird season (March – September inclusive). Where this is not feasible, a breeding bird check will need to be conducted no more than 24 hours in advance of the works. The check will need to be conducted by a suitably experienced ecologist. Should any nesting activity be recorded, a suitable construction exclusion zone will need to be installed around the nest. The nest can only be removed or disturbed once the young have fledged, and the supervising ecologist has confirmed that the nest is no longer in use.

4.3.3.5 Great Crested Newt

Given the suitability of habitats with 250m of the STW, it is recommended that HSI assessments and eDNA sampling is repeated every two years following those completed in 2021 to keep records up to date and to ensure that potential new occupation of waterbodies is identified.

4.3.3.6 Hazel Dormouse

Unless the connectivity of the habitats in the wider landscape improves then hazel dormouse will remain likely absent from site and there will be no requirement for reassessment or mitigation.

4.3.3.7 Reptiles

All vegetation clearance should be undertaken during the reptile active season between March and October inclusive when reptiles are less vulnerable to killing and injury. Where feasible, it is recommended that the clearance take place between the end of September and the end of October to overlap with the end of the breeding bird season. Any vegetation clearance of unmanaged grassland, scrub borders or field margins during the active season for reptiles should be performed using a two-stage-cut supervised by a suitably experienced ecologist. The first cut should be to a minimum of 250mm, with the second cut down to ground level. Vegetation within the works area should then be maintained at ground-level throughout the entirety of the works.

4.3.3.8 Riparian Mammals

There are no requirements for mitigation for otter or water vole.

4.3.4 Opportunities

Below are a number of potential enhancement opportunities which can be implemented during and following the works.

- Any vegetation cleared during the works could be kept on site as brash, log or grass cutting piles in areas not used by the site to provide refugia for protected species such as reptiles.
- Unmanaged grazers, such as sheep or ponies, could be introduced to the fenced off area in the west of the STW. This would slow natural succession and encourage a greater diversity of flora, and in turn fauna.
- Areas of unused grassland within the STW could be sewn with a wildflower mix of local provenance.
- The Himalayan balsam could be legally removed and disposed of, removing the risk of natural spread in the wild. This would also encourage the recolonisation of native plant species within the STW.
- The deciduous woodland in the east of the STW could be thinned out, providing more light for ground flora to develop.
- Bird and bat boxes could be installed on buildings or trees, provided no future work is scheduled on them.

4.4 Route and Outfall

4.4.1 Baseline

4.4.1.1 Statutory Designated Sites

The desk study returned one statutory designated site, Sutherland Grange, located approximately 0.9km to the south of the proposed outfall. This is a LNR and is protected under the National Parks and Access to the Countryside Act 1949. It is designated for its variety of wildflowers, grasses, butterflies, beetles, moths and birds.

Additionally, the proposed outfall lies within the SSSI IRZ of Bray Pennyroyal Field SSSI.

4.4.1.2 Non-statutory Designated Sites

The proposed route traverses two LWSs, Jubilee River and Dorney Wetlands LWS and Dorney Common and Cress Brook LWS. A further two LWS are located 0.7km and 0.9km to the east of the route. These are Eton Meadows LWS and East Clewer LWS, respectively. Details are provided in the table below.

Table 4.4: Non-statutory Local Wildlife Sites located within 1km of the proposed route.

Site name	Designation	Value	Features	Distance (km)
Jubilee River and Dorney Wetlands	LWS	Local	An extensive area of recently created and restored habitats associated with the formation of the Jubilee River. The site is important for birds. At the west end two areas of wetland habitat have been created in association with two main islands and a number of smaller islands with areas of shallow water, scrapes and wetland vegetation. In this area and in areas along the riverbanks, areas of reed bed and other marginal vegetation have been established. The adjacent land has extensive areas of restored grassland habitat which is largely rough grassland with some meadow species such as yellow rattle *(Rhinanthus minor)* and common knapweed *(Centaurea nigra)*. There are areas of planted scrub and woodland as well. The northern edge is formed by Roundmoor ditch with adjacent scrub habitat and wetland species along the ditch. Further east there are other similar ditches and extensive areas of grassland with a significant	Scheme traverses this site

Site name	Designation	Value	Features	Distance (km)
			ephemeral component. Along the river edge further areas of reedbed are found.	
Dorney Common and Cress Brook	LWS	Local	Wetland elements of high interest. Supports only Bucks population of brown galingale *(Cyperus fuscus).*	Scheme traverses this site
Eton Meadows	LWS	Local	The site supports a ca.4.6ha floodplain hay meadow, plus additional grassland, trees and woodland, within an island created by the River Thames and a backwater channel. The hay meadow represents an impoverished remnant of an unimproved Thames floodplain meadow, most of which have been destroyed by agricultural intensification, mineral extraction and development.	0.7
East Clewer	LWS	Local	This site is one of a group of islands created by river backwaters that lie between the A322 and a railway line on the banks of the River Thames, immediately north of Windsor. The focus of interest is a small hay meadow supporting a moderately calcareous floodplain grassland and an area of fen habitat.	0.9

4.4.1.3 Priority Habitat

The proposed route traverses Coastal and Floodplain Grazing Marsh. Details of priority habitat within 1km of the proposed route and outfall location are provided in the table below.

Table 4.5: Priority habitats located within 1km of the proposed route and outfall location.

Habitat	Features	Distance (km)
Coastal and Floodplain Grazing Marsh	Grassland or rush pasture largely within EA flood zone 3 and containing a network of river channels, ditches or drainage channels. Grazing marshes are particularly important for the number of breeding waders such as snipe (*Gallinago gallinago*), lapwing (*Vanellus vanellus*) and curlew (*Numenius arquata*). Internationally important populations of wintering wildfowl also occur including Bewick swans (*Cygnus bewickii*) and whooper swans (*Cygnus cygnus*).	Within site
Lowland Mixed Deciduous Woodland	Mixed deciduous woodland is characterised by trees that are more than 5m high when mature, and which form a distinct, although sometimes open, canopy with a canopy cover of greater than 20%. It includes stands of both native and non-native broadleaved tree species.	Within site
Reedbeds	Reedbeds are wetlands dominated by stands of the common reed (*Phragmites australis)*, wherein the water table is at or above ground level for most of the year. They tend to incorporate areas of open water and ditches, and small areas of wet grassland and carr woodland may be associated with them.	Within site
Lowland Fens	Fens are peatlands which receive water and nutrients from the soil, rock and ground water as well as from rainfall: they are minerotrophic.	0.3

Traditional Orchards	Traditional orchards are structurally and ecologically similar to wood-pasture and parkland, with open-grown trees set in herbaceous vegetation, but are generally distinguished from these priority habitat complexes by the following characteristics: the species composition of the trees, these being primarily in the family Rosaceae; trees that produce fruit or nuts; the usually denser arrangement of the trees; the small scale of individual habitat patches; the wider dispersion and greater frequency of occurrence of habitat patches in the countryside.	0.6
Lowland Meadows	Lowland Meadows includes most forms of unimproved neutral grassland across the enclosed lowland landscapes of the UK. In terms of National Vegetation Classification plant communities, they primarily embrace each type of *Cynosurus cristatus - Centaurea nigra* grassland, *Alopecurus pratensis - Sanguisorba officinalis* floodplain meadow and *Cynosurus cristatus - Caltha palustris* flood-pasture.	1.0

4.4.1.4 Notable Plants

As well as the record of tubular water-dropwort as per Section 4.3.1.4, Dorney Common and Cress Brook LWS is notified for supporting brown galingale. Brown galingale is a Wildlife and Countryside Act (1981), as amended, Schedule 8 species and is therefore protected from intentional picking, uprooting or destruction. It is a semi-aquatic, rush-like flowering plant that grows on waterbody edges, flowering from July to September when water levels retreat. Due to possible presence, a targeted survey for the species was conducted on 3rd September 2021. No brown galingale was recorded within the works footprint.

During the UKHab survey, yellow vetchling *(Lathyrus aphaca)* was recorded to the south of the Jubilee River but not within the above ground works footprint. This species is not protected but is a red list species classified as vulnerable to extinction in the wild.

4.4.1.5 Invasive Plants

The desk study returned no further records of invasive plant species other than those listed in Section 4.3.1.5.

No invasive terrestrial plants were recorded during the field survey. However, invasive aquatic species were recorded and are discussed in 4.4.1.14.

4.4.1.6 Badger

Records of badger were returned located 1.6km to the west and 1.7km to the east of the proposed route.

No evidence of recent badger activity including prints, latrines, active badger setts, snuffle holes etc. were recorded within 30 meters of the route or the proposed outfall location.

4.4.1.7 Bats

A PRA was performed on all trees located within 30m of the scheme route and the proposed outfall location to assess their potential to support roosting bats. The survey was performed in accordance with good practice guidelines (Collins, 2016). A total of five trees with bat potential were recorded, details of each are provided in the table below and their locations are shown in Appendix T.

Table 4.6: Trees with bat roost potential along the scheme route and at the proposed outfall location.

Tree Number	Tree Species	Potential Roost Features	Level of Potential
T12	Crack willow	Split	Low
T13	Lime species *(Tilia sp)*	Knot hole Rams horns	Moderate
T14	Ash *(Fraxinus excelsior)*	Knot holes	High
T15	Ash (dead)	Rot	Moderate
T16	Ash	Knot holes	High

Further bat surveys of moderate and high potential trees, T13 – T16, were recommended and have been conducted. Two surveys were conducted of T13 and T15 and three surveys were conducted of T14 and T16, in accordance with current good practice guidelines. No emergences or return to roosts were identified and are therefore roosting bats are likely absent from T13 – T16.

4.4.1.8 Birds

Additional to the 29 species recorded inside the STW, a further 26 species were recorded along the route and around the outfall location. In addition to the protected and priority birds listed in Section 4.3.1.8, kingfisher *(Alcedo atthis),* which is protected under Schedule 1 of the Wildlife and Countryside Act (1981) as amended, was recorded flying west along the River Thames. Two additional priority bird species were recorded: cuckoo *(Cuculus canorus)* and house sparrow *(Passer domesticus).*

Additional to the 29 species recorded inside the STW, a further 26 species were recorded along the route and around the outfall location. In addition to the protected and priority birds listed in Section 4.3.1.8, kingfisher *(Alcedo atthis),* which is protected under Schedule 1 of the Wildlife and Countryside Act (1981) as amended, was recorded flying west along the River Thames. Two additional priority bird species were recorded: cuckoo *(Cuculus canorus)* and house sparrow *(Passer domesticus).*

4.4.1.9 Great Crested Newt

As per Section 4.3.1.9, only one record of GCN was returned during the desk study and it is separated from the scheme by a major barrier to dispersal. There are no records of EPSL's for GCN within 2km of the site in the last 10 years.

HSI assessments and eDNA surveys were undertaken on five waterbodies located within 250m of the proposed route and outfall location. Details of the waterbodies and the results of the surveys are provided in the table below.

Table 4.7: GCN HSI and eDNA results.

Waterbody Name	OS Grid Reference	HSI Result	EDNA Result
WB5	SU 94369 79245	Excellent (0.82)	Negative
WB6	SU 94564 79232	N/A (dry)	N/A (dry)
WB8	SU 94245 78975	Good (0.72)	Negative
WB9 (Cress Brook)	SU 94072 78345	Below Average (0.51)	Negative
WB10	SU 94469 79047	Poor (0.37)	Negative

4.4.1.10 Hazel Dormouse

No EPSLs or records of dormouse were returned during the desk study as per Section 4.3.1.10.

As stated in Section 4.3.1.10, this species is likely absent from site due to the presence of fragmented and sub-optimal habitat. No recommendations for further survey work or mitigation are required.

4.4.1.11 Invertebrates

In addition to the priority invertebrates listed in Section 4.3.1.12, records of medicinal leech *(Hirudo medicinalis)* were returned in the desk study. Medicinal leech is protected from killing and injuring under Schedule 5 of the WCA.

Suitable breeding habitat for priority invertebrates was found to be present on site in the form of grasslands, woodlands, wetlands and hedgerows.

4.4.1.12 Reptiles

The desk study returned records of grass snake *(Natrix Helvetica)*, all located to the south of the River Thames.

A grass snake was recorded 100m away from the proposed route, shown as RS1 in Appendix R. Suitable habitat was recorded on site in the form of unmanaged grassland, scrub borders and field margins. Additionally, a pile of grass cuttings was identified on site with the potential to support breeding reptiles, shown as TN2 in Appendix R.

4.4.1.13 Riparian Mammals

No records of otter were returned by TVERC or BMERC in the desk study. Records of water vole were identified by BMERC but none within the last 10 years. A single record of American mink *(Neovison vison)* from 2009 was returned in the desk study along the Jubilee River. Water vole are predated by American mink.

No evidence of water vole or otter was recorded during the riparian mammal surveys and otter are assessed as likely absent from the site. Suitable habitat for water vole was recorded within the ditches, rivers and other waterbodies. Dense vegetation along some waterbody banks made complete assessment difficult, however, signs of both species are usually prominent, so it is not seen as a significant limitation of the survey.

4.4.1.14 Aquatic Receptors

River Thames

Assessment of Jacobs data (2021) provides the following baseline characterisation of the macrophyte community; no Environment Agency (EA) data is available in the study area. The macrophyte community in the River Thames

within the proposed outfall site area (upstream and downstream) is typical of the large lowland non-tidal River Thames. Macrophyte communities are broadly ubiquitous to this habitat type; a wide and deep channel with slower flowing marginal areas. Macrophyte data indicates species diversity and abundance does not vary considerably throughout the study area. Jacobs (2021) data indicates minor deviation from reference conditions (undisturbed conditions) achieving Good WFD class. No species of conservation interest have been identified.

Freshwater macro-invertebrates in the study area have been monitored by the EA (2000-2019), and currently achieve Good WFD status. The macro-invertebrate communities in the River Thames consist of one typical to a large lowland river. Three invasive non-native species have been identified; the Demon shrimp *Dikerogammarus haemobaphes*, the amphipod *Chelicocorophium curvispinum* and the Zebra mussel *Dreissena polymorpha*. A number of species of conservation interest (Regionally notable or higher; Chadd and Extence, 2004) have been identified and are provided in Table 4.8.

Table 4.8: Species of conservation interest (Chadd and Extence, 2004 (revised scores provided by Chadd, 2021); Regionally notable or higher) in the River Thames.

Species	Common name	Conservation Interest	Watercourse
Dina lineata	Leech	Regionally notable	River Thames
Mystacides nigra	Caddisfly	Regionally notable	River Thames
Procloeon bifidum	Mayfly	Regionally notable	River Thames
Brachycentrus subnubilus	Caddisfly	Notable	River Thames
Ceraclea senilis	Caddisfly	Notable	River Thames
Haliplus laminatus	Caddisfly	Notable	River Thames
Kageronia fuscogrisea	Mayfly	Notable	River Thames
Oulimnius troglodytes	Beetle	Notable	River Thames
Psychomyia fragilis	Caddisfly	Notable	River Thames
Ephemera lineata	Mayfly	Rare (RDB3)	River Thames
Leptocerus lusitanicus	Caddisfly	Rare (RDB3)	River Thames
Macronychus quadrituberculatus	Beetle	Rare (RDB3)	River Thames
Nebrioporus depressus	Beetle	Rare (RDB3)	River Thames
Stenelmis canaliculate	Beetle	Vulnerable (RDB2)	River Thames

In the Thames (Cookham to Egham) waterbody, fish are currently unassessed under the WFD. EA monitoring data from the study area in the River Thames indicates a wide spatial spread of surveys upstream and downstream of the proposed outfall. A large proportion of this data includes surveys undertaken annually from early 2000s to 2019. The fish community is diverse and includes European eel (*Anguilla Anguilla*) a critically endangered species which receives protection under the Eels (England and Wales) Regulations (2009) and brown/sea trout (*Salmo trutta*), a Species of Principal Conservation Importance as listed in Section 41 of the NERC Act 2006. Atlantic salmon (*Salmo salar*) have also been recorded in the River Thames study area, and this species, alongside all coarse fish species, is protected under the Salmon and Freshwater Fisheries Act (1975) and under The Water Environment Regulations (England and Wales) 2017 (formally WFD (2000/60/EEC)). Atlantic Salmon are a Priority Species under Section 41 of the NERC Act 2006. Bullhead (*Cottus gobio*) and brook lamprey (*Lampetra planeri*) are protected Annex II of the European Union Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) (the Habitats Directive) and both species have been recorded at a number of sites in the Thames.

Roundmoor and Boveney Ditch

The current Slough STW outfall discharges into the Roundmoor and Boveney Ditch. The proposed option for a new outfall for future final effluent and all pre-treated storm flows to the River Thames will by-pass the Roundmoor and Boveney Ditch completely. Although some input of flow by the STW is to remain to the Ditch (approximately 1150l/s under normal operating conditions), it is pertinent to understand the baseline condition of this system.

Historic EA macrophyte and macro-invertebrate data precedes the Thames21 river restoration work in 2019. Jacobs surveyed macrophytes and macro-invertebrates in 2021 to characterise the current baseline condition of the community in the Roundmoor and Boveney Ditch, for which this assessment is based.

The macrophyte community is diverse and composed of a number of ubiquitous lowland species. Floating, linear and broad leaved emergent and submerged species are present. Water milfoil *Myriophyllum spicatum* (invasive species) is most prevalent in the Roundmoor Ditch, whilst in the Boveney Ditch the pondweed *Potamogeton natans* is most dominant (both species 50-75% cover). Alongside water milfoil *M. spicatum*, other invasive species present are water fern *Azolla filiculoides* and Canadian waterweed *Elodea canadensis*. The slow-flowing nature of the Roundmoor and Boveney Ditch provide ideal conditions for the rapid colonisation of the invasive species identified. Filamentous algae and a number of species of duckweed are present and indicative of a more pollution tolerant community. Both the Roundmoor and Boveney Ditch fail to achieve WFD Good status, which suggests there are environmental stressors on the community.

The macro-invertebrate community in the Roundmoor and Boveney Ditch is composed of a number of ubiquitous lowland species with a preference for slower flows, more tolerant of sedimented environments and poor water quality. Taxa identified include mayflies, snails, caddisflies, leeches, flatworms and water bugs. Using the WFD classification system for macro-invertebrates, this receptor achieves Moderate in the Boveney Ditch suggesting there is a deviation from undisturbed conditions and suffering from environmental stress. The Roundmoor Ditch could not be classified because the environmental parameters were at the extremes of the tolerances the RICT software can analyse.

Unlike macrophytes and macro-invertebrates which are relatively sedentary species, fish are highly mobile and able to perform localised migrations within the Roundmoor and Boveney Ditch and further afield to connecting watercourses, such as the Thames (assuming longitudinal connectivity is maintained). As such, it is considered the EA data suitable for assessment of the baseline community in the Ditch, also taking note of the community in the River Thames (downstream waterbody). Current WFD status of fish communities in the Roundmoor and Boveney Ditch waterbody is Good.

A number of fish species have been identified in the Roundmoor and Boveney Ditch including the European eel (*A. anguilla*), a critically endangered species which receives protection under the Eels (England and Wales) Regulations (2009) and brown/sea trout (*S. trutta*), a Species of Principal Conservation Importance as listed in Section 41 of the NERC Act 2006. Other species identified and typical of a lowland watercourse include 3-spined stickleback (*Gasterosteus aculeatus*), chub (*Leuciscus cephalus*) gudgeon (*Gobio gobio*), minnow (*Phoxinus phoxinus*), perch (*Perca fluviatilis*), pike (*Esox Lucius*), roach (*Rutilus rutilus*) and stone loach (*Barbatula barbatula*). Fish currently achieve WFD Good class suggesting the community shows minor deviation from reference (undisturbed) conditions.

The Cress Brook

The Cress Brook forms part of the Roundmoor and Boveney Ditch WFD waterbody (GB106039023540), forming a confluence with the Boveney Ditch downstream of the Roundmoor Ditch. The proposed pipeline route will cross the Cress Brook to reach the outfall destination on the River Thames. Tunnelling of the pipeline under the Cress

Brook is considered to have no direct pathway to effect. In addition, a temporary crossing of the Cress Brook is required to enable the haul road to be extended from Dorney Common to the River Thames.

Macro-invertebrate data is available from the Environment Agency (2006-2008) and indicates the community is typical of a lowland watercourse of this nature, comprised of macro-invertebrates with a preference for slower flows; snails, bivalves, water-bugs, beetles, and dragonflies. No species of conservation importance or interest (Local value or above) have been identified.

There is no historic EA fish data available for The Cress Brook. Fish species identified in the Roundmoor and Boveney Ditch (and the River Thames) have the potential to be present in the Cress Brook due to the longitudinal connectivity within the catchment.

There is no historic EA macrophyte or diatom data available for the Cress Brook. The temporary crossing is considered further in Section 4.4.2.

4.4.2 Assessment

4.4.2.1 Statutory Designated Sites

Due to the distance of separation and the nature and scale of the works, no negative impacts on Sutherland Grange LNR are anticipated.

The works lie within the SSSI IRZs of Bray Pennyroyal Field SSSI. Although the SSSI is located 2.4km to the west, it lies on the Thames floodplain. Nutrient rich discharge could negatively impact the SSSIs qualifying feature, pennyroyal *(Mentha pulegium).* There are no likely negative effects due to the flow direction being east, away from the designated site

4.4.2.2 Non-statutory Designated Sites

Works are proposed within Jubilee River and Dorney Wetlands LWS and Dorney Common and Cress Brook LWS. Due to the scale and temporary nature of the works, no long-term significant effects on these sites are perceived. No brown galingale was recorded within the works area so the sites qualifying feature will not be impacted.

4.4.2.3 Priority Habitat

The scheme will result in the minor, temporary loss of Deciduous Woodland priority habitat. The area lost will be allowed to naturally regenerate following the completion of the works and therefore there will be a no-net-loss in priority habitat. No-net-loss through natural regeneration will take longer than tree planting but is preferable where seeding from nearby trees is likely.

4.4.2.4 Notable Plants

No brown galingale was recorded within the scheme extents so there are no requirements for mitigation. Similarly, the population of yellow vetchling will not be affected as the habitat that supports it will be tunnelled under.

4.4.2.5 Invasive Plants

Invasive aquatic plant species have been identified and are listed in Section 4.4.1.14. No terrestrial invasive plant species were recorded during the site visit.

4.4.2.6 Badger

No active badger setts were recorded within the survey area and so there are no requirements for avoidance, mitigation or further survey.

4.4.2.7 Bats

One tree with low bat roost potential, T12, is likely to be felled as it is located at the Cress Brook crossing.

All trees where the outfall location is proposed have been assessed for bat potential. As stated in Section 4.4.1.7, four trees had potential to support roosting bats, but no roosts were identified in the recommended further surveys. There are therefore no likely effects on roosting bats with respect to the outfall location.

4.4.2.8 Birds

Vegetation clearance of suitable breeding bird habitat will be required along the proposed route and at the outfall location. This will include clearance of scrub, reedbeds and woodland. There is therefore a risk of breaching legislation relating to birds, nests and eggs in the absence of mitigation. Kingfisher was recorded along the River Thames but the banks where the outfall location is proposed are too shallow for nesting kingfisher.

4.4.2.9 Great Crested Newt

The results of the GCN eDNA surveys of the waterbodies located within 250m of the scheme were all negative for the species. Due to the negative results, GCN are considered to be likely absent from site and there are therefore no requirements for mitigation or further survey work with regards to the species.

4.4.2.10 Hazel Dormouse

Hazel dormouse is considered to be likely absent from site due to fragmented, and sub-optimal habitat present and a lack of connectivity in the wider landscape. No further survey work or mitigation is required with regard to hazel dormouse.

4.4.2.11 Invertebrates

The scheme will result in the temporary loss of habitat that is likely used by priority invertebrates. Records of medicinal leech are not connected to the site so there are no recommendations in relation to this species.

4.4.2.12 Reptiles

Vegetation clearance of suitable reptile habitat will be required to facilitate the works. This risks the illegal killing or injuring of common reptiles in the absence of avoidance or mitigation.

4.4.2.13 Riparian Mammals

Otter have been assessed as likely absent from site. Furthermore, a lack of water vole evidence over two targeted surveys, no records within the last ten years and possible presence of American mink suggest water vole are likely absent from site.

4.4.2.14 Aquatic Receptors

River Thames

The proposed outfall on the River Thames has the potential to disrupt riparian, bankside and marginal habitat as well as potential changes to water quality downstream of the discharge during construction and operation.

Habitat - Construction

Construction of the outfall will require a cofferdam to be installed, which will be in the localised area of the outfall. Connectivity of the River Thames will be maintained enabling fish passage; the River Thames at this location is approximately 50m wide. In addition, fish are sensitive to vibrations, and any piling methods associated with construction of the cofferdam will be specified during detailed design and a percussive piling assessment undertaken if required. Mitigation measures are provided in Section 4.4.3.12.

It is considered construction of a cofferdam and temporary loss of habitat is unlikely to significantly impact macro-invertebrate and macrophyte communities. There are no specialist species within this reach, and all typical of a lowland river system. The habitat is homogenous throughout the reach, and re-establishment and colonisation of species will be able to occur, through maintenance of channel connectivity.

Habitat - Operation

Modification of bankside habitat at the location of the outfall is permanent and unavoidable, by the very nature of the concrete structure. However, it is considered any loss of bankside vegetation can be compensated within the River Thames waterbody elsewhere. The bankside areas of the River Thames upstream and downstream of the proposed outfall generally have a complex and continuous presence, with some 'gaps' or 'patchy' areas; it is these areas which will be considered for planting/re-seeding to compensate for any riparian habitat loss as part of the Scheme.

At the location of the proposed outfall, and in the reaches upstream and downstream, the habitat is a homogenous glide comprising shallow marginal areas and deeper sections mid-channel. The banks of the River Thames are modified with complex vegetation that has naturalised the margins; evidence of hard revetments are visible at a number of locations. The proposed outfall will result in modification to bankside habitat, marginal shelf and river bed through replacement with concrete structures. However, it is considered although there will be loss of habitat, this habitat is not unique to the River Thames; the Thames has flow, substrate and marginal complexity homogeneity. In addition, the location of the outfall is proposed on a section of bank which is already heavily modified for use as a mooring/waiting quay for Boveney Lock. When the impact of bank/riparian/marginal habitat impact is considered in relation to the River Thames waterbody as an entirety, it is considered the impact on aquatic receptors negligible. Further detail regarding each biological receptor and loss of habitat is provided below.

The current macrophyte community is typical of a large lowland river system; there are no species of conservation importance or interest identified in the study area of the proposed outfall location. Any habitat changes (bank habitat, flow) of the proposed outfall are considered to be localised, small in comparison to the wider River Thames waterbody and therefore unlikely to have a significant impact on the macrophyte community within the River Thames. In addition, the proposed outfall location is currently modified for use as a waiting quay for Boveney Lock and macrophyte communities were absent (July 2021).

Macro-invertebrate communities present in the River Thames are typical of a large lowland system, and a number of macro-invertebrate species of conservation interest have been identified. Disruption of marginal and bankside areas during construction of the outfall may impact the lateral connectivity watercourse; macro-invertebrates utilise these slower flowing marginal areas and areas of detrital inputs. However, the location of the outfall is proposed on a section of bank which is already heavily modified for use as a mooring/waiting quay for Boveney Lock with limited lateral connectivity. It is considered any potential impact on the macro-invertebrate community in the River Thames is unlikely to be significant.

A number of coarse fish species are present in the River Thames, including the Species of Principal Importance Atlantic salmon (*S. salar*) and brown/sea trout (*S. trutta*), and species of conservation interest European eel (*A.anguilla*), bullhead (*C. gobio*) and brook lamprey (*L. planeri*). Impacts during the operational stages of the outfall on habitat are considered to have an unlikely impact on fish population habitat; the localised changes to the homogenous habitat and the mobile nature of fish will enable species to seek out ubiquitous habitat elsewhere.

During operation there is risk that fish may enter the outfall opening and swim up the pipeline. Fine screening has been removed from the design due to the risk of blockages during storm flows. A number of measures have been considered in the design of the outfall and pipeline to reduce any significant risk to fish populations.

The outfall opening is angled downstream and is below the waterline, at least 300mm above the river bed to reduce the likelihood of eels accessing the pipeline. Fish may enter the outfall and transit as far as the chamber (which is used to split the 1.4m pipe from the STW to two 1m pipes which carry the effluent to the outfall), approximately 10m-15m from the outfall. Fish are prevented further access from this chamber to the 1.4m pipe by a flap valve. In addition, fish will be prevented from isolation in this chamber, as a continuous flow will remain, enabling any fish species to swim out of the pipeline at any time.

Water Quality

Mitigation measures outlined in Section 4.4.3.12 can avoid and/or reduce any potential water quality impacts during the construction phase, such as run-off and pollution incidents. Changes to water quality will occur during the operation of the outfall and are considered below.

Macrophytes and phytobenthos (diatoms) are traditionally used as indicators of nutrient enrichment due to their sensitivities to phosphates. Under the Slough STW Quality AMP7 new permit, proposed phosphate levels in the final effluent will adhere to discharge permit limits agreed with the EA to protect the status of the River Thames and limit deterioration to agreed levels. The receiving waterbody, the River Thames, has a far greater discharge volume than the Roundmoor and Boveney Ditch where the current outfall is located. It is considered that any impact on the macrophyte community is unlikely to be significant.

It is well known that some macro-invertebrates are more sensitive to changes in water quality, specifically ammonia. The Slough STW Quality AMP7 new permit proposes to reduce the ammonia limits on the consent. The receiving waterbody, the River Thames, has a far greater discharge volume than the Roundmoor and Boveney Ditch where the current outfall is located. Therefore, it is considered any changes to water quality are unlikely to have a significant negative impact due to the treatment process improvements, the new permit reduction on ammonia limits and increase in dilution of the receiving watercourse.

The proposed new outfall will convey treated flow and pre-treated storm flow via a pipe directly from the STW. The frequency and intensity of untreated storm flows to the River Thames is not able to be predicted, however any impacts must be considered on the receiving watercourse. As discussed previously, the River Thames at the outfall location, and throughout much of its length is a wide and deep watercourse with a large discharge volume. Greater discharge capacity increases the ability of dilution from any receiving storm flows. It is considered any impacts would be temporary, and relatively localised, becoming more diluted further downstream.

Fish are mobile species and are likely to navigate away from areas/plumes of discharge to seek out preferred habitat. Macro-invertebrates are ubiquitous species and able to re-populate via downstream drift and through flight (for those with terrestrial adult stages). It is considered any storm flow impacts would be localised and temporary. Any impact on the macrophyte community would also be temporary and localised; although sedentary, maintenance of connectivity of the River Thames will allow downstream drift of re-seeding/propagules.

Flow dynamics and regime and any local fluvial processes (sedimentation being a factor in aquatic habitat) are unlikely to be affected by storm flows, as detailed in Section 5.4.1.2.

Roundmoor and Boveney Ditch

The macrophyte and macro-invertebrate communities are comprised of a number of species typical of poor water quality and are currently failing WFD status. Fish species achieve WFD Good status. The proposed outfall location on the River Thames is considered likely to result in positive changes to water quality in the Roundmoor and Boveney Ditch by reducing ammonia limits from 3mg/l to 1mg/l and removing the discharge of storm flows; improvements to water quality will be beneficial to all aquatic receptors in the watercourse.

The current STW outfall provides approximately 95% of the flow to the Roundmoor and Boveney Ditch. Upon operation of the outfall on the River Thames, a base-flow in the ditch will be maintained (approximately 1150 l/s, under normal operating conditions). Reduction in flow can cause changes to flow velocity, sedimentation, habitat (including wetted width) and potential longitudinal connectivity. Macro-invertebrates are commonly used to study changes to flow, due to their different sensitivities to flow. The current community is comprised of a number of species with a preference for slower flows and more tolerant of silt deposition, so some reduction in flow is unlikely to cause significant shifts in the community.

The Cress Brook

Any impacts on the aquatic communities of the Cress Brook will be during the construction phase of the pipeline; during the installation and use of the temporary bridge to allow vehicle access to the outfall site. It is considered there is no pathway to effect on aquatic biological receptors using the tunnelling method to lay the pipeline; the tunnel will be below the watercourse.

Fish species identified in the Roundmoor and Boveney Ditch (and the River Thames) have the potential to be present in the Cress Brook due to the longitudinal connectivity within the catchment. The temporary bridge required across Cress Brook will consider all design options, such as a clear-span bridge, to reduce environmental impact. Construction phase impacts would be temporary and localised. Section 4.4.3.12 details appropriate mitigation which is considered to reduce any significant impacts.

Any riparian, marginal and in-channel habitat disturbance during the temporary bridge use will be returned to its natural state, thereby reducing any impacts on macro-invertebrates and macrophytes. Macro-invertebrates are ubiquitous species and re-colonisation via downstream drift and flight (for those species with terrestrial life-stages) would occur. In addition, continued connectivity of the Cress Brook will allow re-colonisation and establishment of macrophyte communities. It is considered any significant impacts on these receptors unlikely.

4.4.3 Mitigation

4.4.3.1 Non-statutory Designated Sites

A CEMP will be prepared which will include specific details for works within Jubilee River and Dorney Wetlands LWS and Dorney Common and Cress Brook LWS. Additionally, the Local Planning Authority should be contacted regarding the works in these areas.

4.4.3.2 Priority Habitat

Should clearance of Deciduous Woodland and Reedbed priority habitat be unavoidable, the habitats should be allowed to naturally reinstate following the completion of works. It is recommended that these are monitored over time to ensure a no-net-loss of priority habitat.

4.4.3.3 Notable Plants

No brown galingale is present within the works area and the population of yellow vetchling will not be affected as it is being tunnelled under, so there are no requirements for mitigation with respect to notable plants.

4.4.3.4 Badger

No active badger setts were recorded within 30m of the proposed route or the outfall location, so there are no requirements for avoidance or mitigation. However, it is recommended that a pre-works check for badgers be undertaken prior to works commencing by the attending ECoW.

4.4.3.5 Bats

The tree with low potential near Cress Brook should be felled under a watching brief for bats. This should involve an inspection of the feature prior to felling. This should be done by an ecologist, or by an arborist being supervised by an ecologist.

Roosting bats were found to be likely absent from trees T13 – T16 so there are no requirements for mitigation with respect to these trees.

To avoid disturbance of commuting and foraging bats, illuminating the River Thames at night should be avoided. If it cannot be avoided, it should be hooded and directional.

4.4.3.6 Great Crested Newt

As per Section 4.3.3.5, HSI and eDNA should be repeated every two years to ensure GCN remain likely absent from site during construction.

4.4.3.7 Hazel Dormouse

No mitigation or further survey work is required with regards to hazel dormouse.

4.4.3.8 Invertebrates

Habitats should be allowed to naturally reinstate after the works have been completed, which will ensure the populations of priority invertebrate species are not negatively impacted by the works.

Medicinal leech are likely absent from site, so no mitigation is required.

4.4.3.9 Reptiles

All vegetation clearance should be undertaken during the reptile active season between March and October inclusive, when reptiles are less vulnerable to killing and injury. Where feasible, it is recommended that the clearance takes place between the end of September and the end of October to overlap with the end of the breeding bird season. Any vegetation clearance of unmanaged grassland, scrub borders or field margins during the active season for reptiles should be performed using a two-stage-cut supervised by a suitably experienced ecologist. The first cut should be to a minimum of 250mm, with the second cut down to ground level. Vegetation should then be maintained at ground-level throughout the entirety of the works.

4.4.3.10 Riparian Mammals

Otter are likely absent from site and there are therefore no requirements for mitigation. Water vole, too, are assessed as likely absent. However, there are historical records of water vole within the scheme extents, so it is recommended that the attending ECoW performs a check for burrows prior to and after vegetation clearance along Cress Brook for a distance of at least 30m either side of the works area.

4.4.3.11 Aquatic Receptors

A CEMP will be produced to detail the mitigation measures for the construction of the outfall on the River Thames and the temporary bridge across the Cress Brook, and to ensure overall environmental protection and management during the works. Effects to be mitigated and managed include potential for pollution incidents from construction plant, introduction and/or spread of invasive species and risk of riparian groundworks mobilising silt and/or silts that contain contaminants.

Best Practice Guidance (Environment Agency's former Pollution Prevention Guidelines (PPG 5: *Works and maintenance in or near water)* to be adhered to, to reduce the risk of contamination and/or spread of the watercourse arising through pollution incidents and invasive species from plant machinery and equipment.

An ECoW who is a suitably qualified ecologist will be present to ensure environmental management is adhered to throughout the construction phase.

Any in-channel works required at the site of the proposed outfall (River Thames) and construction of the temporary bridge will ensure maintenance of connectivity of the channel and works will be restricted to June-September to avoid the salmon migration season. Construction works undertaken in daylight hours to enable a large proportion of the 24-hour period for the movement of Atlantic salmon and other species. Any piling methods will be specified during detailed design and a percussive piling assessment if required.

Outfall design (including consultation with the EA):

- Will be considered to reduce modification of any existing natural bank of River Thames.
- Consider and abide by the Eels (England and Wales) Regulations 2009. The outfall will be constructed approximately 300mm off the river bed to reduce the likelihood of eels entering the outfall structure.
- Designed to reduce the likelihood of all fish entering the outfall/pipeline:
    - A flap valve will be fitted to the 1.4m pipe at the connection to the chamber, to prevent fish access further up the pipeline.
    - A continuous flow through the chamber will any prevent isolation of fish; a connection to the River Thames will remain.

The design of the temporary bridge across the Cress Brook will consider all options to reduce the environmental impact, such as a clear-span design.

The existing Slough STW outfall provides 95% of flow in the Roundmoor and Boveney Ditch. The proposed outfall on the River Thames will not result in a reduction of flow in the Ditch – a base-flow will remain. However, any reduction in this base-flow in the Ditch that is considered will need to re-evaluate the potential impacts on ecological communities.

4.4.4 Opportunities

Below are a number of potential enhancement opportunities which can be implemented during and following the works.

- Improvement to water quality in the Roundmoor and Boveney Ditch upon operation of the new outfall to the River Thames. The existing Slough STW discharges any storm flows exceeding the storm tank capacity to the

adjacent land treatment area. Flooding at Eton Wick, including untreated storm flow from the land treatment area as a result of the Ditch exceeding channel capacity will be avoided. The pre-treated storm flows will be directed along the new pipeline route to the River Thames outfall.

- Any vegetation cleared during the works could be kept as brash, log or grass cutting piles to provide refuges for protected species such as reptiles.
- The banks of waterbodies could be reprofiled to make them more suitable for brown galingale, kingfisher and water vole.
- Bird and bat boxes could be installed on buildings or trees, provided no future work is scheduled on them.
- The invasive aquatic plants could be legally removed and disposed of, to stop their spread in the wild. This will also encourage the natural recolonisation of native aquatic species.

4.5 Summary

Potential constraints relating to designated sites, priority habitat, protected species, priority species and invasive species have been identified according to best practice guidelines. It is assessed that potential significant construction effects on protected sites, habitats and species can be effectively mitigated through the implementation of appropriate and proportionate mitigation measures and the application of construction management best practices, providing the mitigation recommendations outlined in this report and included within a CEMP are adhered to.

It is considered any short term negative impacts during construction and operation are unlikely to significantly impact the aquatic communities in the River Thames upon implementation of mitigation measures outlined in Section 4.4.3.12.

Improvements to water quality in the Roundmoor and Boveney Ditch upon operation of the proposed new outfall and maintenance of a base-flow flow is considered unlikely to cause significant negative impacts on the aquatic communities, with the potential to have positive effects.

Construction of the bridge across the Cress Brook will be temporary and localised and consideration of suitable design to reduce environmental impacts (such as clear-span bridge) is unlikely to cause significant negative impacts on the aquatic communities. It is considered the tunnelling method under the Cress Brook is unlikely to have a significant impact on the aquatic community as there is no pathway to impact.

TWUL has a performance commitment that on all projects where there is permanent habitat loss, a net gain in biodiversity must be achieved as a result of the project. Consultation will be undertaken with TWUL to ensure mitigation, compensation and enhancement measures are aligned to Thames Water Biodiversity Strategy and proposed management for the site. A preliminary assessment has been undertaken to demonstrate that the site (and site owned land) can achieve 10% net gain. Outline areas for reinstatement, replacement and enhancement have been identified and are shown on the Landscape and Biodiversity Enhancement Plan.

Table 4.9: Summary of the assessment of ecology.

Assessment of Ecology Effects	Significance of Effects	Mitigation Measures
During construction: *No designated sites or priority habitats will be negatively affected during construction.* *The scheme will result in the minor, temporary loss of Deciduous Woodland priority habitat at the Cress Brook temporary crossing.* *Protected species surveys identified a badger footprint on the STW site and Schedule 1 and priority bird species were seen or heard on the STW site and along the route of the outfall. No other signs have been found on the STW site and along the route of the outfall. Some trees with potential bat roost features were identified, of which one tree with low potential is likely to be felled.* *The proposed outfall on the River Thames has the potential to disrupt riparian, bankside and marginal habitat.*	*No significant environmental effects are expected from terrestrial and aquatic ecology during the construction phase.*	*A CEMP will be prepared for works within Jubilee River and Dorney Wetlands LWS and Dorney Common and Cress Brook LWS. Additionally, the LPA will be contacted regarding the works in these areas (see details in Section 4.3.3 and 4.4.3).* *A CEMP will be prepared to detail the mitigation measures for the construction of the outfall on the River Thames, temporary bridge across the Cress Brook, and to ensure overall environmental protection and management during the works (see details in Section 4.4.3.11).* *TWUL has a performance commitment that on all projects where there is permanent habitat loss, a net gain in biodiversity must be achieved as a result of the project. Outline areas for reinstatement (including the Deciduous Woodland at the Cress Brook crossing), replacement and enhancement have been identified and are shown on the Landscape and Biodiversity Enhancement Plan.*
During operation: *No designated sites, priority habitats or protected species will be affected during operation.* *A beneficial impact of the scheme relates to improvements to water quality in the Roundmoor and Boveney Ditch upon operation of the proposed new outfall and maintenance of a base-flow.*	*No significant environmental effects are expected from terrestrial and aquatic ecology during the operation phase. Beneficial impacts are anticipated due to improved water quality in the Roundmoor and Boveney Ditch.*	*No mitigation measures recommended for operational phase.* *TWUL has a performance commitment that on all projects where there is permanent habitat loss, a net gain in biodiversity must be achieved as a result of the project. Outline areas for reinstatement, replacement and enhancement have been identified and are shown on the Landscape and Biodiversity Enhancement Plan.*

5. Flood Risk and Water Environment

5.1 Information Sources

Readily available background information:

- Environment Agency's Flood Mapping online tool (https://flood-map-for-planning.service.gov.uk/);
- MAGIC mapping service (https://magic.defra.gov.uk/magicmap.aspx);
- Water Environment (Water Framework Directive) (England and Wales) Regulations (WER) 2017 baseline data from both catchment data explorer (Environment Agency, 2021b);
- Slough STW SERV Flooding Plan; and,
- Slough Borough Council Strategic Flood Risk Assessment Level 1 (March 2021).

Reports developed specifically to inform Sough STW outfall relocation assessment:

- Slough Sewage Treatment Works Outfall Relocation: Ecological Desk-based Assessment (JBA Consulting, 2020);
- Roundmoor Stream Site Investigation & Options Report Proposal, E14476 Version 1, December 2020, Cain Bio-Engineering;
  Proposal by Cain Bio-Engineering (CBE) for Thames Water to investigate potential improvements to mitigate flooding issues on the Roundmoor Ditch and Boveney Ditch. CBE propose to undertake desktop searches, visual assessments, topographic survey, hydraulic modelling including hydrological analysis of low flows and flood flows, option design/appraisal, detailed design, and stakeholder liaison. Although the document does not specify the options considered, it hints at improvements to conveyance along the Roundmoor Ditch/Boveney Ditch, as well as measures to encourage flow through the Cole Norton Stream and Common Brook, flowing east towards the Thames.
- Slough STW Outfall Relocation: Water Quality Impact Assessment (JBA Consulting, 2020); Report of water quality modelling undertaken to assess the potential impact of outfall relocation options on water quality, and associated water quality permitting requirements.
- Slough Sewage Treatment Works Outfall Relocation: Proposed flow gauging, Jubilee River JBA Consulting 2020);
  JBA proposal for flow monitoring at several locations on the Jubilee River on one day to identify losses to the geology. Associated with the option of an STW outfall to the Jubilee River.

Drawings:

- Slough Mech Sketch Proposed Site Layout - RevP07.pdf – Proposed Site Schematic Plan
- Slough STW SERV Services Plan .pdf – Existing condition services plan with apparently incomplete surface water drainage system

5.2 Policy

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

Annex 3 of the National Planning Policy Framework (https://www.gov.uk/government/publications/national-planning-policy-framework--2, updated July 2021).

5.3 STW upgrade

5.3.1 Geomorphology

5.3.1.1 Baseline

Catchment Overview

The STW upgrade is likely to impact one watercourse, Roundmoor ditch, which has its source by a series of drainage channels south of Slough (NGR: SU91998076). From its source, the channel flows typically south east, passing beneath the M4, B3026 and Jubilee River. Downstream of Jubilee River, Roundmoor ditch then flows south before draining in Boveney Ditch at Eton Wick (NGR: SU94187839).

Upstream of Jubilee River, Roundmoor Ditch exhibits a largely straightened channel, whereby some sinuous channel lengths suggest the presence of geomorphological processes. The channel here is largely obscured by the dense vegetated riparian zone, comprised of deciduous trees and shrubs. Downstream of Jubilee River, the watercourse remains straight, exhibiting some sinuosity upstream of its confluence with Cress Brook. However, given the monocultural nature of the riparian zone (largely short grass), erosion is extensive along both banks. No depositional features are visible along the channel, whilst flow is uniform and featureless throughout the watercourse. Historical mapping suggests the watercourse was continuous from the earliest available map (1887) up until the construction of Jubilee River.

Water Environment (Water Framework Directive (WFD)) Regulations (England and Wales) 2017 information and water bodies

Under the requirements of the WER regulations, any new development within or adjacent to a water body requires an assessment of its potential impacts to that water body. The WER regulations maintain that the quality of the water body should not deteriorate as a consequence of the development.

One WER water body has been identified along adjacent to the STW: Thames (Cookham to Egham) and Roundmoor Ditch and Boveney Ditch. Table 5.1 provides a summary of the characteristics of each WER water body.

Table 5.1: WER Water body characteristics and Current Status (Environment Agency, 2020).

Water body name	Roundmoor Ditch and Boveney Ditch
Water body ID	GB106039023540
NGR	SU9293478514
Designation	Not designated artificial or heavily modified
Length (km)	8.78
Catchment area (km^2)	18.32
Ecological status	Poor
Biological quality element	
Fish	Good
Invertebrates	Moderate

Macrophytes and Phytobenthos combined	Poor
Physico-chemical quality elements	
Acid neutralising capacity	High
Ammonia (Phys-Chem)	High
Dissolved Oxygen	High
Phosphate	Moderate
Temperature	High
pH	High
Hydromorphological supporting elements	
Hydrological regime	Supports good
Supporting elements (surface water)	
Mitigation measures assessment	Not assessed
Specific pollutants	High
Chemical	Fail

5.3.1.2 Assessment

Construction

A review of available information from open-source data sources and photographs of the watercourses from previous surveys suggest that updates to the STW structure could lead to fine sediment entering Roundmoor Ditch via silt-laden runoff. This could lead to smothering of local bed substrate material as sediment is deposited.

Operation

The presence of the STW will not lead to a significant increase in impermeable surfaces, thus not altering surface water drainage and reducing the lag time between rainfall events and peak discharge. The increase in discharge at the existing outfall could be a result, in part, to such an upgrade. However, this could lead to localised scour resulting from changes in local flow dynamics and peak discharges.

5.3.1.3 Mitigation

Prior to construction activities a CEMP will be written to provide the specific measures to mitigate impacts of construction activities on local watercourses. This would include the management of silt-laden runoff, riparian vegetation removal, pollutants, and construction drainage.

The upgrade of the STW would likely alter local drainage of Roundmoor drain and Jubilee River. This could alter local flow regimes and hydraulics, causing change to geomorphological processes such as erosion and deposition.

Therefore, a detailed drainage programme would be required to mitigate any potential impacts associated with the upgraded STW.

5.3.1.4 Opportunities

The upgrade to the STW would be unlikely to lead to any significant opportunities to the local geomorphology. However, in terms of WER compliance, the proposed reductions in pollutants from the effluent discharge could lead to a betterment in the physico-chemical and chemical quality elements. This in turn could also improve conditions for biological quality elements within the WER waterbody. However, it should be noted that this may not provide enough betterment to increase the overall status of the WER water body. Therefore, an assessment would be required to evaluate the impacts associated with the upgrade.

5.3.2 Flood Risk

5.3.2.1 Baseline

The assessment of flood risk has been derived from the Flood Risk Assessment (FRA) included in Appendix X. The FRA should be read in conjunction with this section, of which provides a summary of the assessment included within that report.

The Environment Agency Flood Map shows that the proposed works within the STW site are in Flood Zone 1, except the outfall pumping station manhole at the STW which is in Flood Zone 2.

5.3.2.2 Assessment

5.3.2.2.1 Fluvial Flooding

The proposed works within Slough STW site are in Flood Zone 1. The Environment Agency modelling presented in Appendix X confirms this and indicates the proposed works within Slough STW site will be outside of Flood Zone 3 for the scheme design life (2085), based on a consideration of the 100 year flood event with +35% peak river flow climate change allowance. The Slough STW site is on higher ground levels than the adjacent Roundmoor Ditch floodplain (rather than benefitting from raised flood defences).

5.3.2.2.2 Surface water flood risk

The Environment Agency Risk of Flooding from Surface Water (RoFSW) flood map indicates there is potential for localised accumulation of surface water runoff within the Slough STW site. However, the modelling used to derive the RoFSW flood map is broadscale and does not account for local details such as local site drainage features.

Slough Borough Council Strategic Flood Risk Assessment Level 1 (March 2021) identifies that the Slough STW site is not in a Critical Drainage Area.

Surface water runoff from the Slough STW site areas is collected up by a site drainage system. Gullies within the site discharge to pumping stations on the site which discharge flow to the inlet of the STW. The drainage design return period is not known. Runoff from exceedance flow events would either be retained on the site or run off. The topography of the site tips towards the south, such that exceedance flows would flow overland to the storm grass plots.

The proposed upgrade will not generate major areas of new hardstanding. Tanks will be being constructed in existing grassed areas of the site. There will be minor elements of new site roads to access new elements (e.g. Outfall pumping station). This adds approximately 449m^2 of hardstanding to the site which will be offset by removal of a redundant structure within the site and returning its footprint to grass (511m^2). The net impact of the

proposed development will be to reduce impermeable area within the Slough STW site, and therefore to reduce runoff generated from within the site.

5.3.2.2.3 Groundwater flood risk

For the proposed structures within the Slough STW site, the additional new structures are a small additional percentage of the overall buried foundation structures within the site, again should not impede any groundwater flow as they will be in mainly a granular material.

As works within the Slough STW site and along the outfall route involve below ground excavation, the management of groundwater flood risk during construction will need to be considered.

5.3.2.3 Mitigation

The flood risk mitigation measures to be incorporated into the CEMP will include:

- Where possible, remove existing redundant hard standing before creating new areas of hard standing, such that the overall total hard standing area Is not increased during construction;
- contractor to sign up to Environment Agency flood warnings and specify triggers and actions (in response to receipt of a flood warning) in a construction flood management plan;
- locate construction compound(s) in area(s) with lowest feasible flood risk (ideally Flood Zone 1);
- apply appropriate water quality controls to construction compound runoff; and,
- agree with Environment Agency triggers to cease discharging into the Jubilee River e.g. based on Environment Agency flood warnings and/or observed river levels.

5.3.2.4 Opportunities

Storm flows from Slough STW have historically impacted the local area, with storm flows from Slough STW in Roundmoor Ditch contributing to flooding of residential gardens in Eton Wick.

Slough Borough Council Strategic Flood Risk Assessment Level 1 (March 2021) notes that: "*There is a finite capacity of the foul water sewers in the Slough Borough and there is also a constraint on the wastewater treatment capacity at Slough STW in that, the receiving watercourse - the Roundmoor and Boveney Ditch are already a flood risk and have no capacity for additional discharge.*"

Flood risk associated with Slough STW storm flows, and the benefits the proposed works will provide at Eton Wick, are discussed in Section 5.4.2.

5.4 Route and outfall

5.4.1 Geomorphology

5.4.1.1 Baseline

Catchment Overview

The proposed works are situated in the River Thames catchment whereby the main channel has its source (NGR: ST98589879) approximately 1.3km north of the parish of Kemble and 5km south west of the town of Cirencester.

From there, the River Thames typically flows in a westerly direction, through the settlements of Oxford, Reading, Slough (location of the proposed works) and London, before draining into the English Channel via the Thames Estuary. Based on the Flood Estimation Handbook (CEH, 2021) the catchment area of the River Thames is 9938km^2.

Predominately exhibiting a sinuous planform, with short lengths of straightening, the River Thames flows in a typically west direction. From its source, the watercourse flows through the large settlements of Oxford, Reading, Slough (including the location of the proposed works) and London. In London, downstream of Twickenham, the watercourse forms part of the Thames Estuary, flowing as a tidal river. From there, the watercourse drains into the English Channel at Canvey island and Southend-on-Sea (NGR: TQ79048113).

Numerous drainage channels (both artificial and natural, and of various sizes and potential discharges) feed the River Thames throughout its catchment. Notable tributaries include: The River Windrush, the River Cherwell, the River Ock and the River Wey.

Contemporary Channel Characteristics

The study area consists of not only the River Thames, but also three additional watercourses, all of which drain into the River Thames as tributaries. These are detailed in the Table 5.2.

Table 5.2: Baseline Information of watercourse within the study area.

Watercourse name	Description
River Thames	Originating near to the settlements of Kemble and Cirencester (see 'Catchment Overview'). The River Thames is a meandering watercourse comprising numerous vegetated islands along the reach. Some of these islands are bridged by large weirs, whilst crossings also bridge these islands to adjacent banks. The planform remains largely unchanged since the earliest known historical maps (1887). Between 1987 and the present day, an additional channel has been excavated and used to convey flows.
Jubilee River	Acting as an artificial secondary channel to the Thames, Jubilee River has its source approximately 2.5km west of Slough (NGR: SU 90492 82940). An artificial watercourse largely exhibiting a sinuous planform with some straightened lengths. Erosion is visible along the north bank of the channel, where bank failure is visible. Such bank failures appear to have provided the channel with sediment for the formation of mid-channel bars, visible on aerial imagery. The watercourse is crossed by several road bridges, including the A4, M4 and the A355. Furthermore, the watercourse consists of three weirs and numerous foot crossings. Historical mapping is unavailable due to the recent development of the watercourse (since 1987).
Cress Brook	Cress Brook has its source approximately 500m north of the settlement of Boveney. From its source it flows west for approximately 2km before draining into the River Thames approximately 400m south of Eton Wick (NGR: SU97937797). The watercourse exhibits a sinuous planform, cross by numerous footbridges and lined by short grasses making up the adjacent pastoral and residential land use. The lack of complex riparian vegetation has exposed the watercourse to erosion,

Watercourse name	Description
	which is visible in patches along both banks. No depositional features are present, whilst flow is uniform and featureless. Historical mapping suggests little has changed in terms of channel form, however increased urbanised land sue encroaches upon the channel from 1949.
Roundmoor Ditch	Roundmoor Ditch has its source by a series of drainage channels south of Slough (NGR: SU91998076). From its source, the channel flows typically south east, passing beneath the M4, B3026 and Jubilee River. Downstream of Jubilee River, Roundmoor ditch then flows south before draining in Cress Brook at Eton Wick (NGR: SU94187839). Upstream of Jubilee River, Roundmoor Ditch exhibits a largely straightened channel, whereby some sinuous channel lengths suggest the presence of geomorphological processes. The channel here is largely obscured by the dense vegetated riparian zone, comprised of deciduous trees and shrubs. Downstream of Jubilee River, the watercourse remains straight, exhibiting some sinuosity upstream of its confluence with Cress Brook. However, given the monocultural nature of the riparian zone (largely short grass), erosion is extensive along both banks. No depositional features are visible along the channel, whilst flow is uniform and featureless throughout the watercourse. Historical mapping suggests the watercourse was continuous from the earliest available map (1887) up until the construction of Jubilee River. From then, the watercourse passes under the watercourse, however it is unclear as to how.

Water Environment (Water Framework Directive (WFD)) Regulations (England and Wales) 2017 information and water bodies

Under the requirements of the WER regulations, any new development within or adjacent to a water body requires an assessment of its potential impacts to that water body. The WER regulations maintain that the quality of the water body should not deteriorate as a consequence of the development.

Two WER water bodies have been identified along the proposed route: River Thames (Cookham to Egham) and Roundmoor Ditch and Boveney Ditch. Table 5.3 provides a summary of the characteristics of the River Thames with the details of Roundmoor Ditch and Boveney Ditch already provided in Table 5.1..

Table 5.3: WER Water body characteristics and Current Status (Environment Agency, 2020).

Water body name	River Thames (Cookham to Egham)
Water body ID	GB106039023231
NGR	TQ0099272440
Designation	Heavily modified
Length (km)	30.06
Catchment area (km^2)	65.88
Ecological status	Moderate
Biological quality element	
Fish	Not assessed
Invertebrates	Good
Macrophytes and Phytobenthos combined	Not assessed
Physico-chemical quality elements	
Acid neutralising capacity	High
Ammonia (Phys-Chem)	High
Dissolved Oxygen	Dissolved oxygen
Phosphate	Moderate
Temperature	High
pH	High
Hydromorphological supporting elements	
Hydrological regime	Not assessed
Supporting elements (surface water)	
Mitigation measures assessment	Moderate or less
Specific pollutants	High
Chemical	Fail

5.4.1.2 Assessment

Construction

A review of available information from open-source data sources and photographs of the watercourses from previous surveys suggest that the following construction impacts could take place:

- No impacts are anticipated on the hydromorphology of the Jubilee River as a result of the pipe-jack/tunnelling that has been proposed.
- The pipeline route being pipe-jacked beneath Cress Brook is considered to have no adverse impacts likely, on the geomorphology of Cress Brook.
- A haul road proposed along Cress Brook would be placed on top of soil. This could reduce infiltration rates of surface waters into the surrounding strata. Consequently, such impacts could lead to alterations in surface water flow paths and lead to localised scour of the banks at Cress Brook, where runnels could form. This could lead to the mobilisation of fine sediment adjacent to the watercourse. Which, if conveyed via silt-laden runoff, could enter the watercourse and smother local bed substrate material. The removal of riparian vegetation could also expose bank material to localised scour as well.
- A bailey bridge or similar to allow the haul road to cross the channel could lead to fine sediment to enter the channel and smother localised bed substrate material during its construction. However, this would be mitigated by ensuring the abutments of the structure are located away from the bank face of Cress Brook and would only be temporary.
- The construction of the new outfall at the River Thames could lead to the release of fine sediment as a result of bank excavations. However, given the artificial nature of the banks, at the location of the outfall, fine sediment would be of a negligible quantity and any subsequent bank destabilisation would be unlikely.
- Construction drainage would be discharged into any of the three watercourses along the route (Roundmoor Ditch, Cress Brook or the River Thames). This could lead to localised changes in flow dynamics and regime depending on where they are discharged from, as well as causing localised scour.

Operation

Operational impacts are largely associated with the outfall structure at the River Thames and discharge of flows from both the new and existing outfalls into the River Thames and Roundmoor Ditch respectively. These are as follows:

- The discharge of effluent to Roundmoor Ditch has been proposed at 1150l/s (1.15m^3/s). This differs to the estimated existing discharge during dry conditions, which equate to approximately 739l/s (0.74m^3/s) (JBA, 2020). Consequently, this could lead to bed and bank material susceptible to scour. Given the increase in discharge, discharge could also lead to the onset of potential channel instabilities during dry flow conditions.
- The presence of the new outfall would be unlikely to cause a significant impact to the watercourse. The current design depicts a structure which is set back into the channel and aligned at a 45° angle. Therefore, impacts to local flow dynamics are unlikely, whilst the risk of flows stilling, which are generally associated with outfalls angled perpendicular to the direction of natural flow, are also unlikely.
- Given the artificial nature of the bank where the outfall has been proposed, any risk of outflanking by erosion are unlikely.
- The River Thames would receive an approximate normal operational effluent of approximately 400l/s (0.4m^3/s), whilst pre-treated storm flows are designed to rise to 1150l/s (1.15m^3/s). As flows along the River Thames, as per the Thames at Royal Windsor Park gauging station (Station Id: 39072) (NRFA, 2021), are on average 58.53 m^3/s, with a Q95 flow of 14.8 m^3/s, such discharge would be unlikely to cause any significant change to the flow dynamics and regime and any local fluvial processes.

5.4.1.3 Mitigation

Prior to construction activities a CEMP will be written to provide details of the specific measures to mitigate impacts of construction activities on local watercourses. This would include the management of silt-laden runoff, riparian vegetation removal, pollutants, and construction drainage.

Environmental Permits would be applied for relevant activities such as discharges with appropriate risk assessments and methodologies approved.

5.4.1.4 Opportunities

The new outfall would be unlikely to provide any opportunity to improve the geomorphological or WER conditions given the localised footprint. However, the STW upgrade would lead to the new outfalls continuously discharging improved effluent flows into watercourses. Thus, providing a betterment in terms of WER physico-chemical and chemical quality elements.

5.4.2 Flood Risk

5.4.2.1 Baseline

The FRA (Appendix X) should be read in conjunction with this section, of which provides a summary of the assessment included within that report.

The proposed new pipe route crosses Flood Zones 2 and 3 (including areas of defended Flood Zone 3). The proposed outfall route is all below ground level except for the manholes, which will be finished no higher than existing ground levels. The proposed manholes include:

- Reinforced concrete (RC) shaft north of Roundmoor Ditch (chainage approximately 130m) located in Flood Zone 3;
- RC shaft between Jubilee River and Common Road (chainage approximately 525m) located in defended Flood Zone 3;
- Manhole north of Common Road (chainage approximately 750m) located in defended Flood Zone 3; and,
- Cover for the chamber to split the 1.4m diameter pipe into two 1m diameter pipes near to the River Thames path (chainage approximately 1735m).

The proposed discharge, into the River Thames downstream of Boveney Lock, is within Flood Zone 3.

The Environment Agency Flood Map shows fluvial flood defences on both sides of the Jubilee River, and no River Thames flood defences, or other watercourse flood defences, in the vicinity of the proposed outfall route.

5.4.2.2 Assessment

5.4.2.2.1 Fluvial Flooding

5.4.2.2.1.1 Fluvial Flood Risk to the proposed works

The proposed outfall route crosses the Roundmoor Ditch and River Thames floodplains, and will be entirely underground except for 4 No. manholes listed in Section 5.4.2.1 and the discharge outfall structure in the River Thames bank (pipe with flapped outfall and concrete head wall).

The proposed manholes will be finished no higher than existing ground levels and designed such that they will not be adversely impacted if inundated by flooding. Any additional covers identified during the detailed design phase will also be kept to existing ground levels.

The proposed discharge outfall structure is designed to function during River Thames flood conditions, and so will not be adversely impacted by River Thames flooding.

The proposed outfall will be pumped and designed to discharge into the River Thames during River Thames flood conditions up to the 50 year return period flood level in 2085 (i.e. with +35% peak river flow climate change allowance). For higher River Thames conditions, the outfall will become flood locked and Slough STW storm flows will be stored in on-site storm tanks, which have a two hour storm flow capacity. If the storm tanks become full, pre-treated storm flow will be diverted to the existing land treatment area adjacent to Roundmoor Ditch, which ultimately drains into the River Thames via the Roundmoor Ditch. Hence there will be no adverse impact to the proposed works within the Slough STW site, or to the proposed new outfall route, if the proposed new outfall route becomes flood locked due to high River Thames flood levels.

5.4.2.2.1.2 Impact of the proposed works on fluvial flood risk elsewhere

The existing Slough STW discharges treated flow into the Roundmoor Ditch upstream of Manor Farm weir and discharges any storm flows exceeding the storm tank capacity to the adjacent land treatment area. The land treatment area also drains into the Roundmoor Ditch, which drains towards the River Thames, passing the western edge of Eton Wick. There has been historic flooding affecting residential back gardens in Eton Wick (winter of 2013/14), including untreated storm flow form the land treatment area, as a result of flow in the Roundmoor Ditch exceeding channel capacity.

The proposed works include a new outfall route that will convey treated flow and pre-treated storm flow through a pipe directly into the River Thames downstream of Boveney Lock. The outfall will convey the pre-treated storm flow that would otherwise be sent to the land treatment area (i.e. if the storm tanks become full), plus up to 400 l/s of treated flow, such that the Roundmoor Ditch still receives treated flow (required to avoid significant environmental impacts to Roundmoor Ditch, as a large proportion of its flow is currently from Slough STW).

The proposed new outfall will therefore convey a maximum flow of 1520 l/s to the River Thames. During storm conditions with full storm tanks, this equates to the peak flow to the works (2500 l/s) treated and pre-treated storm flow components, minus 980l/s of treated flow which will be discharged into the Roundmoor Ditch.

The proposed new outfall is designed to be able to discharge at its full rate for River Thames flood levels up to the 50 year return period flood in 2085. If there were storm flows exceeding the storm tank capacity during a higher River Thames level, the discharge of pre-treated storm flows would revert to the current arrangement (discharge into the land treatment area).

5.4.2.2.1.3 Impact on River Thames Flood Risk

The proposed outfall will discharge into the River Thames downstream of Boveney Lock, approximately 400m upstream of the existing Roundmoor Ditch inflow to the River Thames. Total flows and volumes from Slough STW will be the same for the pre- and post-development cases, which is limited by upstream pumping capacity of approximately 2500 l/s.

Without flood locking of the proposed new outfall

The post-development arrangement discharges up to 1520 l/s (1.5 cumecs) into the River Thames approximately 400m upstream of the Roundmoor Ditch inflow to the River Thames, whereas for the pre-development

arrangement all Slough STW flow drains to the River Thames through the Roundmoor Ditch. This means flow in the River Thames downstream of Boveney Lock will be increased by approximately 1.5 cumecs for approximately 400m. The impact locally of this additional 1.5 cumecs on River Thames flood levels is expected to be insignificant, as in-channel flood flows in the River Thames at this location are much higher (e.g. 2 and 30 year return period peak flow in channel of 187 cumecs and 250 cumecs respectively), and the River Thames floodplain is flat and wide at this location such that the impact on flood level would be insignificant.

Whilst the total volume of flow from Slough STW into the River Thames is the same for the pre- and post-development cases, there is a slightly less attenuation for the post-development case, as a lower proportion of flow is routed through the Roundmoor Ditch and/or land treatment area compared to the pre-development case. The impact of this slightly lower attenuation on River Thames flood risk is expected to be insignificant, as in-channel flood flows in the River Thames at this location are much higher than River Thames inflows from the Slough STW (e.g. 2 and 30 year return period peak flow in channel of 187 cumecs and 250 cumecs respectively), and the River Thames floodplain is flat and wide at this location such that the impact on flood level would be insignificant.

With flood locking of the proposed new outfall

For both the pre-development and post-development with flood locking cases, all Slough STW flow into the River Thames is through the Roundmoor Ditch and/or land treatment area. There is a slightly higher degree of attenuation for the post-development case as a higher proportion of the total flow is diverted to the land treatment area. As above, the impact of this slightly higher attenuation on River Thames flood risk is expected to be insignificant, as in-channel flood flows in the River Thames at this location are much higher than River Thames inflows from the Slough STW (e.g. 2 and 30 year return period peak flow in channel of 187 cumecs and 250 cumecs respectively), and the River Thames floodplain is flat and wide at this location such that the impact on flood level would be insignificant.

5.4.2.2.1.4 Impact on Roundmoor Ditch flood risk

Without flood locking of the proposed new outfall

The proposed new outfall will reduce flood risk from Roundmoor Ditch, including at Eton Wick, as for the post development case there is less flow discharged to Roundmoor Ditch than for the pre-development case, and, unlike the pre-development case, for the post development case there is no pre-treated storm flow discharged to the land treatment area (which drains into Roundmoor Ditch). This reduction in Roundmoor Ditch and land treatment area flows will contribute to a reduction in flood risk at Eton Wick.

With flood locking of the proposed new outfall

For both the pre-development and post-development with flood locking cases, all Slough STW flow into the Roundmoor Ditch is either directly discharged into the Roundmoor Ditch or into the land treatment area. There is a slightly higher degree of attenuation for the post-development case as a higher proportion of the total flow is diverted to the land treatment area. This higher degree of attenuation of the post-development case (with flood locking) will provide a slight benefit at Eton Wick in terms of reduced peak flows. In addition, for the post-development case a higher proportion of flow in the Roundmoor Ditch will be treated flow rather than peak final effluent and pre-treated storm flow.

5.4.2.2.1.5 Displacement of floodplain storage

The proposed outfall route manholes will not result in displaced floodplain storage as they will be finished no higher than existing ground levels.

The proposed discharge structure in the River Thames will be designed to have no net displacement of floodplain storage.

5.4.2.2.2 Surface water flood risk

The proposed new outfall alignment will be returned to its current state after construction and so the proposed outfall route will not require any surface water drainage system and will not impact surface water flood risk elsewhere.

5.4.2.2.3 Groundwater flood risk

Slough Borough Council Strategic Flood Risk Assessment Level 1 (March 2021) reproduces the British Geological Survey Susceptibility to Groundwater Flooding map, which shows that the Slough STW site and the proposed outfall route are within an area with "potential for groundwater flooding to occur at surface".

The Slough STW scheme ground information available at present, indicates that the geological sequence within the Slough STW site and along the proposed outfall route comprises the following; Alluvium to a depth of approximately 6m.bgl, over the London Clay Formation, over the Reading Beds. The basic borehole log descriptions available, describe the alluvium as Clay, Sand and Gravel. This also applies to the majority of the Slough STW site, but here borehole data indicates the base of the alluvium could be as deep as 7m.bgl. The exception of this, the eastern part of the Slough STW site is underlain by Shepperton Gravels, described as Gravel with Clay and Sand. However, none of the descriptions on the borehole logs indicate the gravel, sand or fines (silt/clay) contents as a percentage of the strata.

The proposed outfall pipe will be in a trench approximately 3m to 3.5m deep, therefore will be assumed to be within the alluvial material. The proposed structures within the Slough STW site will have foundation to a maximum depth of 6m.bgl. Again, this is likely to be within the alluvial material and/or Shepperton Gravels or may just be in the top of the London Clay Formation. Groundwater within the Slough STW site and along the proposed outfall route have historically been recorded between 1m to 3m.bgl within the alluvial deposits.

The deeper access shafts and the trenchless crossings of the Jubilee River / wetland areas will be at a depth of approximately 15m.bgl, these should be in the London Clay Formation. The access shafts and trenchless crossing of the Eton Wick Road B3026 and adjacent utilities, will be at a depth pf approximately 5m.bgl and should be within the alluvial deposits. The exact depths, composition and permeability of the alluvium, Shepperton Gravels and London Clay, along with the depth to groundwater in all strata will be confirmed following specific ground investigations.

It is assumed that the groundwater flow is south towards the River Thames, the near surface strata (alluvium) should have low to medium permeability, with the Shepperton Gravels having high permeability. The trenches will be filled with a granular material with no impermeable barriers / membranes included. Therefore, any horizontal structure along the route (pipe and trench) should not impede any natural groundwater flow, due to the nature of its construction and the surrounding natural strata.

5.4.2.3 Mitigation

The flood risk mitigation measures to be incorporated into the CEMP include:

- where possible, remove existing redundant hard standing before creating new areas of hard standing, such that the overall total hard standing area Is not increased during construction;
- agree with the Environment Agency constraints on how cut and back-fill works can be undertaken e.g. maximum permitted length of bunded excavated material in Flood Zone 3 adjacent to trench before

back-filling, temporary storage of stripped topsoil outside of Flood Zone 3, programme works in Flood Zone 3 to avoid the "flood season";

- contractor to sign up to Environment Agency flood warnings and specify triggers and actions (in response to receipt of a flood warning) in a construction flood management plan;
- locate construction compound(s) in area(s) with lowest feasible flood risk (ideally Flood Zone 1);
- apply appropriate water quality controls to construction compound runoff; and,
- agree with Environment Agency triggers to cease discharging into the Jubilee River e.g. based on Environment Agency flood warnings and/or observed river levels.

5.4.2.4 Opportunities

The proposed works are considered to provide a benefit to Eton Wick in terms of reduced flood risk from the Roundmoor Ditch.

5.5 Summary

5.5.1 Geomorphology

A review of publicly available sources and some additional reports identified that the proposed scheme could impact four watercourses in total. These watercourses are largely drainage ditches with largely straightened planforms, with the exception of the River Thames which exhibits a meandering and anastomosing planform. All watercourses appear to be extensively modified.

Construction impacts are largely associated with the extensive riparian vegetation clearance. Furthermore, the upgrades to the STW, clearance of riparian vegetation and the construction of a bailey bridge could lead to fine sediment release smothering local bed substrate material, once deposited.

Operational impacts are largely associated with the discharge of effluent flow from the existing outfall at Roundmoor Ditch and the River Thames. The former could result in scour of the bed and banks and channel instabilities as a result of the increase in discharge. Discharge from the new outfall at the River Thames could lead to localised changes in flow dynamics. However, given the negligible increase in flow, relative to existing conditions along the watercourse and the design of the structure, impacts are likely to remain localised and minimal.

5.5.2 Flood Risk

The proposed works are considered to pass the Sequential Test. The Exception Test is not required as the proposed works are classified as Less Vulnerable (proposed works within Slough STW site) and Water Compatible (proposed new outfall route).

Flood risk to the proposed works is considered low. The proposed works within Slough STW are in Flood Zone 1, except for a proposed new outfall pumping station manhole in Flood Zone 2. Whilst the proposed new outfall route crosses Flood Zone 3 it will be underground, and its operation would not be impacted by flooding. Other sources of flood risk to the proposed works are not considered significant.

The potential for the proposed works to impact flood risk elsewhere is considered to be most significant for fluvial flood risk. The proposed works are considered to provide a benefit to Eton Wick in terms of reduced flood risk from the Roundmoor Ditch and impacts on River Thames flood risk are considered insignificant. The proposed works will not adversely impact flood risk elsewhere for other flood risk sources.

The proposed works will not increase flood risk for Slough STW staff. The proposed works will not result in increased staffing levels and Thames Water will continue to manage flood risk through its emergency plan and procedures.

Table 5.3: Summary of the assessment of flood risk and water environment.

Assessment of Flood Risk and Water Environment Effects	Significance of Effects	Mitigation Measures
During construction: *The STW site is not within an area of flood risk (Flood Zone 1). The pipe and outfall are located in Flood Zone 2 and 3.* *Construction impacts are largely associated with localised scour of channel bed and banks, riparian vegetation clearance, and potential fine sediment release. These will all be managed via implementation of construction best practice.*	*No significant environmental effects are expected from flood risk and water environment during the construction phase.*	*Prior to construction activities an Environmental Management Plan (EMP) will be written to provide the specific measures to mitigate impacts of construction activities on local watercourses. This would include the management of dewatering, silt-laden runoff, riparian vegetation removal, pollutants, and construction drainage.* *Environmental Permits would be applied for relevant activities such as discharges with appropriate risk assessments and methodologies approved.* *The EMP will be provided to the contractor to incorporate into the CEMP.*
During operation: *The STW site is not located in an area of flood risk (Flood Zone 1). The pipe and outfall are located in Flood Zone 2 and 3.* *The proposed development of the STW site will not generate major areas of new hardstanding. Any hardstanding areas that are no longer required once construction has been completed will be returned to their original state and thus surface water run-off will be reduced.* *The additional new structures within the STW site should not impede any groundwater flow.* *The proposed new outfall will reduce flood risk from Roundmoor Ditch, including at Eton Wick and Dorney Common.* *The quality of the water that will be discharged will be improved which will have a beneficial impact on the environment.*	*No significant environmental effects are expected from flood risk and water environment during the operation phase.* *Beneficial impacts are anticipated due to reduced flood risk from Roundmoor Ditch and improved water quality discharge.*	*No mitigation measures recommended for operational phase. Residual risks and their management are included in Appendix X.*

6. Geology and Soils

6.1 Information Sources

The following sources of information have been used to undertake this screening opinion assessment:

- Groundsure Enviro + Geo Insight Report Ref. Slough STW;
- BGS GeoIndex Online map viewer;
- Historical Ground Investigation on behalf of TW: Slough STW Sewage Lagoons BH1 to BH29, 1c/5 and 1c/6;
- Ground Investigation: GG241 Slough STW;
- Ground Investigation: GG1847 Slough STW Filter Tank Conversions; and
- Ground Investigation: 7K4D Slough STW Effluent Project.

6.2 Policy

The relevant policies which have been used are:

- Regulation 5(2)(c) of The Infrastructure Planning Environmental Impact Assessment Regulations 2017 (commonly referred to as the EIA Regulations)
- The Environmental Permitting (England and Wales) Regulations 2016
- The Planning Act 2008
- NPPF (Ministry of Housing, Communities and Local Government, 2019)
- NPSNN (Department for Transport, 2014)

6.3 STW upgrade

6.3.1 Baseline

A review of available information has identified a number of potential sources of contamination associated with the STW, including the potential presence of made ground, runoff from the M4 motorway, and a fuel station 250m to the north-east. However, it is considered more likely that potential contamination would be associated with the site's current and historical use as a sewage treatment works, rather than off-site sources.

The available borehole logs that have been identified from historical investigations are only located on small areas within the existing STW site. The available data does not include any contamination / chemical testing as an attempt to quantify potential contamination.

6.3.2 Assessment

A Conceptual Model / Contamination Risk Assessment was undertaken for the STW as part of the Jacobs Geotechnical and Geoenvironmental Desk Study. This is presented in Appendix Y. This presents an assessment of the potential contamination risks which could be associated with the site and the proposed works.

6.3.3 Mitigation

A Soil Management Plan, following guidance within Ministry of Agriculture, Fisheries and Food (MAFF) Good Practice Guide for Handling Soils (2000) and Defra Construction Code of Practice for the Sustainable Use of Soils

on Construction Sites (2009) will be developed for the topsoil and subsoil strip which will be required to install the temporary construction compound. The land will be reinstated following the construction phase.

A CEMP will be developed for the construction works to outline mitigation measures in accordance with environmental commitments. The CEMP will include measures for the storage and handling of soils, unforeseen contamination, materials and waste, and waste management.

No significant effect on geology is currently anticipated, and as such no mitigation has been considered at this time.

6.3.4 Opportunities

Enhancement measures relating to soils may include beneficial reuse of soils within the Scheme, such as in landscaping areas or by providing surplus soils for reuse on other sites. Abandoned lagoons could be reclaimed with surplus soil from the excavation works associated with the Scheme.

Waste would be minimised as appropriate and proportionate by identifying opportunities for the reuse of soil and materials within the Scheme.

If contaminated land is encountered, testing of the suspected contaminated material would enable the development of a remediation strategy to remediate the contaminated land and provide net gain to the scheme and surrounding environment.

The Scheme would result in the current land treatment area being used less frequently. This would reduce the potential risk of contamination to groundwater and surface water.

6.4 Route and outfall

6.4.1 Baseline

A review of available information has identified limited potential sources of contamination associated with the proposed route, including potential made ground associated with the construction of the B3026, allotment gardens adjacent to the proposed route and an historical landfill 110m to the west.

A limited number of borehole logs have been identified from historical investigations. The available data does not include contamination / chemical testing as an attempt to quantify any potential contamination.

The route is underlain by Grade 1 'excellent' agricultural soils in the north, Grade 3a 'good quality' agricultural soils in the centre of the route, and Grade 2 'very good quality' agricultural soils at its southern extent, which is relevant to both tunnelling (laydown areas and haul road) and open cut (temporary or permanent loss/degradation of soil) options.

6.4.2 Assessment

A Conceptual Model / Contamination Risk Assessment was undertaken for the proposed route as part of the Jacobs Geotechnical and Geoenvironmental Desk Study. This is presented in Appendix Y. This presents an assessment of the potential contamination risks which could be associated with the route and the proposed works.

There is potential to cause damage to high grade agricultural soils if mitigation measures are not incorporated into the proposed construction works.

6.4.3 Mitigation

For both tunnelling (laydown areas and haul road) and open cut (potential loss or degradation of soil) options, a Soil Management Plan, following guidance within Ministry of Agriculture, Fisheries and Food (MAFF) Good Practice Guide for Handling Soils (2000) and Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009) will be developed for the topsoil and subsoil strip which will be required. The topsoil and subsoil removed during construction work shall be replaced, where possible, to avoid permanent loss/sterilisation of Best and Most Versatile (BMV) agricultural land. It is envisioned that the only areas where topsoil and subsoil shall be permanently lost are those areas where manhole covers will be required, and at the locality of the outfall pipe. No permanent access roads or compounds will be required along the outfall route.

For both tunnelling and open cut options, a CEMP will be developed for the construction works to outline mitigation measures in accordance with environmental commitments. The CEMP will include measures for the storage and handling of soils, unforeseen contamination, materials and waste, and waste management.

For both tunnelling and open cut options, no significant effect on geology is currently anticipated, and as such no mitigation has been considered at this time.

6.4.4 Opportunities

For both tunnelling and open cut options, waste would be minimised as appropriate and proportionate by identifying opportunities for the reuse of soil and materials within the Scheme.

Enhancement measures relating to soils may include beneficial reuse of soils within the Scheme, such as in landscaping areas or by providing surplus soils for reuse on other sites. It is anticipated that in order to promote sustainable reuse of soil and other geological arisings within the Scheme, a Materials Management Plan would be prepared which would detail the proposed reuse of arisings around the site. It is anticipated that this would follow the protocols within the CL:AIRE Definition of Waste guidance to ensure that excavated materials are reused appropriately and sustainably.

If contaminated land is encountered, testing of the suspected contaminated material would enable the development of a remediation strategy to remediate the contaminated land and provide net gain to the scheme and surrounding environment.

6.5 Summary

A review of publicly available information and historical ground investigation information in the project area has been undertaken. The findings of the review identified uncertainty around the geological conditions at both the STW and proposed outfall route, as well as uncertainty of the chemical condition of the ground and potential contamination which may be encountered. It is considered likely that the key contamination risk within the STW is from made ground and its historical and current operation, rather than offsite sources. Along the outfall route, three potential sources of contamination have been identified within the Conceptual Model.

The construction phase of the proposed works within the STW and along the outfall route are not expected to result in significant adverse impacts to identified receptors (agricultural soil, surface water, groundwater, construction and maintenance workers and local residents) based on the implementation of mitigation measures and best practice in construction to sever potential contaminant pathways during the works and protect soil resources.

The operational phase is not expected to result in potential pollutant linkages, and therefore no adverse impacts are anticipated from the operation of the proposed scheme.

Table 6.1: Summary of the assessment of geology and soils.

Assessment of Geology and Soils Effects	Significance of Effects	Mitigation Measures
During construction: *The proposed works within the STW and along the outfall route are not expected to result in significant adverse impacts to identified receptors (agricultural soil, surface water, groundwater, construction and maintenance workers and local residents) based on the implementation of mitigation measures and best practice in construction to sever potential contaminant pathways during the works and protect soil resources.* *There is potential to cause damage to high grade agricultural soils if mitigation measures are not incorporated into the proposed construction works.*	*Given the existing site use and the best practice mitigation measures proposed, the construction activities are not expected to result in significant adverse impacts on sensitive receptors with regards to ground contamination.* *No significant environmental effects are expected from geology and soils during the construction phase.*	*A Soil Management Plan will be developed for the topsoil and subsoil strip which will be required to install the temporary construction compound. The land will be reinstated following the construction phase.* *A CEMP will be developed for the construction works to outline mitigation measures in accordance with environmental commitments. The CEMP will include measures for the storage and handling of soils, unforeseen contamination, materials and waste, and waste management.*
During operation: *No adverse impacts are anticipated from the operation of the scheme as it is not expected to result in potential pollutant linkages.*	*No significant environmental effects are expected from geology and soils during the operation phase.*	*No mitigation measures recommended for operational phase.* *Any adverse operational effects from ground contamination will be prevented by industry standard control measures as is currently practised at the STW.*

7. Heritage and Archaeology

7.1 Information Sources

The following sources of information have been utilised for this study:

- A cultural heritage desk-based assessment produced specifically for the scheme (see Appendix Z)
- A cultural heritage baseline study, produced for the 2021 options appraisal
- The Historic England Archive (HEA) and National Heritage List for England (NHLE) for designated cultural heritage assets, both statutory and non-statutory
- Buckinghamshire and Berkshire Historic Environment Records (HER) for information on non-designated cultural heritage assets and previous archaeological interventions
- Online local authority sources such as interactive planning portals for Conservation Area information
- Buckinghamshire and Berkshire Historic Landscape Characterisation (HLC) projects
- An existing historic environment baseline study (Jacobs 2021a)
- Historic mapping (Ordnance Survey and Tithe Maps) and aerial imagery available online and from purchased datasets
- Local historical publications
- Geotechnical ground investigation data
- Topographic imagery

7.2 Policy

- Ancient Monuments and Archaeological Areas Act 1979
- Planning (Listed Buildings and Conservation Areas) Act 1990
- Enterprise and Regulatory Reform Act 2013
- National Planning Policy Framework (NPPF) (2021) with accompanying Planning Policy Guidance (PPG)
- South Buckinghamshire District Council Development Plan (1999 Adopted Local Plan, with 2011 Adopted Core Strategy): Core Policy 8 Built and Historic Environment
- Slough Borough Council Core Strategy (2008) saved Local Plan Policy EN17 Locally Listed Buildings and Core Policy 9 Natural and Built Environment
- Royal Borough of Windsor and Maidenhead (RBWM) Local Plan (2003) Policies LB2 (listed buildings and their setting); ARH1, 2, 3 and 4 (guidance for archaeological remains) and CA1 and 2 (Conservation Areas) – taken into consideration due to proximity.

7.3 STW upgrade

7.3.1 Baseline

There are no statutory or non-statutory designations within the Slough STW site boundary.

There are no Conservation Areas, Registered Battlefields or World Heritage Sites in the wider 1km study area, which has been utilised to provide context for studying the setting effects of the scheme.

A scheduled monument, Cippenham Court abuts the STW boundary at Wood Lane to the north east of the STW plant. This is an area of public open space with extant earthworks. These represent the remains of a medieval moated site from a manor dating to the 13th century.

The Huntercombe Manor Grade II Registered Park and Garden (NHLE 1000602) lies approximately 700m north west of the STW.

In the area of the designated park and garden lie the Grade I listed Huntercombe Manor and Burnham Abbey. A Grade II* farmhouse (Bell Farm farmhouse) lies on the east side of Eton Wick. There are 64 listed buildings within the 1km study area. These all have a high asset value.

There are three Archaeological Notification Areas approximately 1km to the west of the proposed outfall (0580000000:1, 0580000000:2 and 0217900000). These represent concentrated areas of known buried archaeology either side of the Jubilee River, which have a very high potential for surviving remains. They have been identified primarily from cropmark interpretation. The first two listed are areas of likely prehistoric settlement, with the third of unknown date.

The STW sits in a relatively highly sensitive archaeological environment. The area of 20th century development projects immediately to the north of the STW resulted in the discovery of a multi-period archaeological landscape, within which the prehistoric and Romano-British periods were particularly well represented.

7.3.2 Assessment

The STW Upgrade will not physically affect the status of any heritage designation, aside from locally designated areas of high archaeological potential (non-statutory designations). Given the scale of the design proposals, negative impacts are unlikely to designated historic structures and designed landscapes. The proposed STW structures are of insufficient height and profile in the local landscape to have any additional visual bearing on protected assets above those that already exist.

The highest potential for issues arising from the STW upgrade relate to buried remains. The STW lies within the Thames gravels in terms of geology. These are proven foci for prehistoric and historic human activity. Archaeological remains have been found within the STW during previous phases of construction. The new assets will all be situated on previously disturbed areas of the STW site, therefore, the survival of further remains is considered to be unlikely.

7.3.3 Mitigation

There are not likely to be any mitigation measures required for designated assets in the study area during the construction or operational phases of the STW upgrade.

Given the likely extent of ground disturbance within the STW boundary, the need for archaeological mitigation would likely be determined by the survival, or otherwise, of historic soil profiles which is not thought to be likely due to previous disturbance.

7.3.4 Opportunities

The opportunities identified from the scheme are focussed on generating information from the archaeological and geoarchaeological investigation and mitigation work. Archaeological and environmental research frameworks stipulate questions that all interventions should address.

If extensive significant buried remains are found, there might be an opportunity to provide information online via TWUL website with a summary of the findings.

7.4 Route and outfall

7.4.1 Baseline

There are no statutory or non-statutory designations along the Proposed Outfall Route to Boveney Lock.

There are no Registered Battlefields or World Heritage Sites in the wider 1km study area, which has been utilised to provide context for studying the setting effects of the scheme.

There are two conservation areas within the 1km study area, which lie near the southern extents of the scheme by the River Thames. These are Boveney and Clewer Village conservation areas. The former lies in the Buckinghamshire Council area adjacent to Dorney Lake, with the latter in the Royal Borough of Windsor and Maidenhead, abutting the south bank of the River Thames just under 1km from the proposed outfall into the river.

The proposed outfall route crosses through two Archaeological Notification Areas (0434500000 and 0569600000, Figure 2) in the arable field in between Eton Wick and the River Thames. Analysis of aerial images has identified the former as a grouping of potentially Bronze Age and Iron Age features, most of which relate to ring ditches and field systems (MBC11499, MBC11500, MBC11501 and MBC11502). These are represented by cropmarks. The latter represents an area of activity dating to the Mesolithic period. The working area around the outfall encompasses most of the designated area, part of which contains areas of hardstanding. These Notification Areas have been attributed a high asset value.

There are known archaeological remains on Dorney Common adjacent to the outfall route. One of these is the site of a possible Bronze Age barrow, which is assigned a medium value.

The potential for unknown archaeology and palaeoenvironmental remains are high along most of the outfall route, as stated above. Ground investigation and archaeological intervention in the wider area suggest quarternary deposits lie underneath the route. These are crucial in understanding past environments and human activity since the Pleistocene. In the buried environment are features such as relict palaeochannels which, along with peaty deposits interleaved with Holocene alluvium, shed light on past environments.

7.4.2 Assessment

The outfall route will not physically affect any statutory designation. Impacts would be to the setting of such assets, primarily during construction. The areas of open cut trench would be the main source of impact. It is therefore possible that those designations which have a visual relationship with the outfall route might be affected on a temporary basis. This would be relevant to some of the listed buildings and conservation areas around Dorney Common.

In terms of non-designated archaeological remains, the route passes through two areas of very high potential. The quantity of archaeological remains is unknown, but the Archaeological Notification Areas south of the Cress Brook and Eton Wick likely represent areas of human settlement from the prehistoric periods.

It is likely that the outfall pipeline route will also cut through former landscapes from the Pleistocene period which may lie buried at depth below the present ground surface. Such evidence may lie beneath alluvial Holocene deposits. Past environments can be recreated from the analysis of organic remains and dated using modern scientific techniques. The outfall structure will be situated on previously disturbed areas of the quay, therefore, the survival of further remains is considered to be unlikely in this location.

7.4.3 Mitigation

The area in between the STW and the Jubilee River has been subject to archaeological watching brief in the past (ERM 236). The present outfall into the Roundmoor Ditch was subject to archaeological monitoring which recorded archaeological remains; a palaeochannel (MRM 15772) Neolithic/ Bronze Age flint (MRM 15773) and a Post Medieval drainage ditch (MRM 15771). Consultation with Berkshire Archaeology, who provide archaeological planning advice for Slough Borough Council, have requested a watching brief on the pipeline easement strip, pipe trench excavation and shaft excavation in the section of the outfall from the STW to the Jubilee River.

The Buckinghamshire Council archaeological advisory service provides archaeological planning advice for the area. Consultation established the need to implement a suite of archaeological investigation pre-construction. The advisory service recommended geophysical survey followed by intrusive trial trench investigation to ascertain the level of archaeological risk. The results would inform the need for and scope of a robust programme of mitigation. In order to de-risk the project, these phases of investigation will need to be carried out at the earliest opportunity pre-construction in line with detailed design to leave sufficient time for the formulation of an appropriate mitigation strategy which will be incorporated within the CEMP.

Pre-construction archaeological trial trenching would be essential in determining the presence, extent and significance of archaeological remains in the working area of the outfall. The results of the investigation will inform the need for and scope of archaeological mitigation. Only intrusive investigation can achieve this. South of the Jubilee River, the known archaeological remains may need quantifying with intrusive investigation techniques.

Mitigation will have to comprise preservation by record which in this case would mean the excavation of archaeological remains at the outset of enabling works, or beforehand, if possible.

All archaeological fieldwork and reporting will have to be carried out to a method statement agreed by the LPAs archaeological advisory services in advance of fieldwork implementation. The scope of mitigation will depend on the results of pre-construction non-intrusive and intrusive investigation.

The presence of significant archaeology and application of the mitigation measures will not affect the viability of the scheme or the proposed outfall route or outfall structure.

7.4.4 Opportunities

The opportunities identified from the scheme are focussed on generating information from the archaeological and geoarchaeological investigation and mitigation work. There are archaeological and environmental research frameworks which outline a series of research questions that all interventions should address.

Significant buried remains present an opportunity to erect information boards in the vicinity, with a summary of the findings.

7.5 Summary

The STW upgrade, pipeline, and outfall will not physically affect any statutory designations. The primary impacts to setting are during the construction period, and effects will only be temporary.

The highest potential for issues arising from the STW upgrade relate to buried remains. The survival of remains at the STW site depends on the extent to which the proposed development areas within the STW have been disturbed by previous phases of development. Mitigation measures will be implemented with the aim to prevent risk to assets.

In terms of non-designated archaeological remains, the pipeline route passes through two areas of relatively very high potential for remains, however, the quantity of archaeological remains is unknown. The archaeology within the working area of the outfall is therefore going to be at risk from being erased or damaged. It should be noted that the outfall structure at the river is located on previously disturbed ground at the end of the quay for the lock, therefore reducing potential risk to and of encountering assets. Following implementation of mitigation measures outlined in section 7.4.3, the residual impact of the route on these remains would be negligible.

Consultation with the LPA archaeological advisory services has been carried out to understand the scope of archaeological intervention required.

The STW, pipe and outfall lie in a sensitive archaeological and palaeoenvironmental environment. The pre-construction intrusive investigation required is likely to be extensive taking into consideration the size of the site, and involve both archaeological geophysical survey and trial trenching to retrieve sufficient samples for deposit modelling and environmental analysis which can be undertaken pre-construction.

The potential impact to heritage and archaeology assets is, therefore, seen to be insignificant, following implementation of mitigation measures as outlined below which will be incorporated in the CEMP.

Table 7.1: Summary of the assessment of heritage and archaeology.

Assessment of Heritage and Archaeology Effects	Significance of Effects	Mitigation Measures
During construction: *The STW upgrade, pipeline and outfall will not physically affect the status of any statutory designations.* *The primary impacts to setting are during the construction period, and effects will only be temporary.* *In terms of non-designated archaeological remains, following implementation of mitigation measures the residual impact of the route would be negligible. The outfall structure is located on previously disturbed ground, reducing potential risk to archaeological assets.*	*No significant environmental effects are expected to heritage and archaeology during the construction phase.*	*Given the likely extent of ground disturbance within the STW boundary, the need for archaeological mitigation would likely be determined by the survival, or otherwise, of historic soil profiles which is not thought to be likely due to previous disturbance.* *Implementation of pre-construction archaeological investigation, which would inform the need for and provide the scope of a robust programme of mitigation. These phases of investigation will be carried out at the earliest opportunity to leave sufficient time for the formulation of an appropriate mitigation strategy which will be incorporated within the CEMP.*
During operation: *Given the scale of the design proposals, changes to setting from the proposed upgrade within the STW boundary are negligible.*	*No significant environmental effects are expected to heritage and archaeology during the operation phase.*	*No mitigation measures recommended for operational phase.*

8. Landscape and Visual

8.1 Information Sources

The following background information has been reviewed.

- Landscape Character Assessments:
    - National Landscape Character Assessment
    - Local Landscape Character Assessments (where available)
- The National Heritage List for England – Registered parks and gardens
- MAGIC mapping service https://magic.defra.gov.uk/home.htm -to identify the following:
    - Landscape and other designations (Statutory and Non- Statutory)
    - Publicly accessible land, including Commons, Village Greens etc. (NB Not landscape designations)
- Conservation Areas – reviewed via local authority websites.
- Public Rights of Way (PRoW) - Footpaths (FP), Bridleways (BW).
- National and local recreational routes - National Trails and National Cycleway Network (NCN).
- Woodland Trust Ancient Tree Inventory – No ancient trees were identified in vicinity of proposed development.
- Google Earth – Air Photo Interpretation (API) to understand spatial relationships /identify potential constraints.
- Street View – To understand spatial relationships/identify potential constraints.

Study areas have been adopted of up to1km from the Slough STW boundary and the proposed outfall route, for landscape and related designations (statutory and non-statutory) and for visual purposes; locally extended up to 2km for visual purposes from any elevated viewpoints within designated landscapes or other sensitive viewpoints; and a maximum of 2km for landscape character purposes.

8.2 Policy

Relevant landscape policies are included in the following Development Plans:

- Waste Local Plan for Berkshire (1998) (Saved Policies) (covers Slough Borough and the Royal Borough of Windsor and Maidenhead)
- Slough Local Development Framework Core Strategy Development Plan Document 2006-2026 (2008)
- Slough Local Plan (2004) (Saved Policies)
- Royal Borough of Windsor and Maidenhead Local Plan (1999, updated 2003 and 2011)
- Central and Eastern Berkshire Joint Minerals and Waste Plan (2021) Submission Version (draft plan)
- Royal Borough of Windsor and Maidenhead Borough Local Plan 2013-2033 (2018) Submission Version (draft plan)
- Buckinghamshire Minerals and Waste Local Plan 2016-2036 (2019)
- South Bucks Local Development Framework Core Strategy Development Plan Document (2011)
    - South Bucks Local Plan (1999, Consolidated 2011)
    - Eton and Eton Wick Neighbourhood Plan 2016-2036 (2018) (Formally Made Version)

Policies applicable to the London Area Green Belt have not been reviewed and are covered in 1.2.1.

Policy - General

- Each local authority has adopted environmental planning policies that include conservation and enhancement of the landscape resource which would apply to all developments.
- In Buckinghamshire and Royal Borough of Windsor and Maidenhead (RBWM), further policies have been adopted relating to the River Thames and it's setting as follows:
    - Buckinghamshire Council: Local Plan Landscape Policy L4 (River Thames Setting), which seeks to prevent *'development which would have an adverse impact on the special character, landscape or amenity of the River Thames'*.
    - RBWM: Local Plan Policy N2 (Setting of the Thames), which seeks to prevent *'development which would adversely affect the character and setting of the river'*. RBWM are in the advanced stages of updating their local plan, but the new plan retains a policy (SP4: River Thames Corridor) that, amongst other provisions, seeks to protect the setting of the Thames. (NB Policy applicable south of River Thames only.)
- In Slough a further policy CG2 (Linear Park) has been adopted relating to the linear park along the Jubilee River where '*Development proposals which would prejudice the route or detract from users' enjoyment will not be permitted. Improved access to the Linear Park, and landscape enhancement measures, will be sought from any development proposals adjacent to the route.'*

Policy - Constraints

- The northern section of the outfall route will cross the linear park in Slough.
- To the south of Eton Wick the outfall route will cross land covered by local planning policy L4 relating to the setting and amenity of the River Thames. This constraint also applies to the outfall.

Overview – Landscape and Visual Assessment

For the purposes of this EIA Screening Opinion a preliminary Landscape and Visual Assessment (LVA) has been undertaken. The aim is to identify the key landscape and visual issues and the resulting potential for significant effects. Whilst it is necessary to identify the range of effects likely to be experienced by receptors, those effects that are potentially significant and most relevant to decision making processes are highlighted based on professional judgement and with reference to the guidance outlined below.

The approach adopted is proportionate and in accordance with the Guidelines for Landscape and Visual Impact Assessment 3rd Edition (GLVIA3) published in 2013 by the Landscape Institute and the Institute of Environmental Management & Assessment. Associated photography for reporting purposes has been undertaken in accordance with Technical Guidance Note 06/19 (September 2019), "Visual Representation of Development Proposals" published by the Landscape Institute.

A zone of theoretical visibility (ZTV) has not been generated, but desk study has identified potential landscape and visual receptors and publicly available viewpoints for the latter. A field survey was undertaken on 29 July 2021 to assess the likely effects of the proposals on both landscape and visual receptors. Viewpoints were verified and their locations adjusted in the field as appropriate.

The potential effects on landscape and visual receptors are considered for both the construction and operational phases, (the latter at two time periods; at completion – Year 1, and at Year 15). Most construction phase effects will be temporary only, however permanent removal of existing landscape features e.g. trees, will also cause effects during the operational phase. The magnitude of such effects will in part be dependent upon their location and proposed mitigation.

Visual effects during the construction phase will be limited from some receptors by screening vegetation that is predominantly deciduous and whose screening value may be reduced during the winter period when leaves are not present. Whilst the field assessment was undertaken during the summertime the assessment of visual effects considers the worst-case scenario of the winter months.

The assessment of potential effects on landscape and visual receptors has been informed by the outcome of an arboricultural constraints report (ACR) – see Appendix AA.

In Appendix BB landscape and visual receptors are shown on Figures BB.1 and BB.2 respectively. Photographs from selected viewpoints are shown in Appendix CC accompanied by a table summarising all viewpoints and a plan of the locations of viewpoints is shown. Appendix DD summarises the potential constraints and their sensitivities and the potential for effects during both construction and operational phases.

An Outline Landscape and Biodiversity Enhancement Plan has also been produced for the purposes of this scheme, which has been presented in Appendix W.

8.3 STW Upgrade

8.3.1 Baseline

Designations

No landscape designations apply within the STW and due to lack of proximity and visual connection no landscape related designations within the 1km study area will be affected by the STW Upgrade.

Landscape Character Receptors

The STW lies within National Character Area NCA115 – Thames Valley (NE379) but no landscape character assessment has been published for Slough Borough Council.

Landscape Receptors

At the location where both existing and proposed pipelines exit the STW there is no mature vegetation on the STW southern boundary. The boundary is marked by ageing metal fences. Within the development area of the STW upgrade there is recent planting of native species on an area of raised ground adjacent to an established area of unmanaged tall hedgerow/scrub (ACR G1 Cat C3) within and along the STW southern boundary. The planting was provided to screen the new gas bag development granted Planning Permission under reference P/04788/018. Whilst the hedgerow/scrub provides some setting and lower-level screening from external views, the recent planting does not yet contribute to the landscape of the STW or its environs and has no screening value.

Visual Receptors

Any loss of mature vegetation on the southern boundary and within the STW (if applicable) would potentially affect views towards the STW from the following external viewpoints where available:

- Wood Lane
- Residential properties at Wood Lane
- Bridleway running south from Wood Lane
- Informal path on north side of Jubilee River
- Bridleway/NCN Route 61 along south side of Jubilee River

8.3.2 Assessment

The potential effects of the proposed STW Upgrade have been assessed by site appraisal within the STW and from Viewpoints 1 - 8, from which there is either nil (Viewpoints 1 and 2) or only limited visibility of the sites of the STW Upgrade. The proposed new infrastructure is low in stature and bulk and is overall comparable to existing installations in visual terms. The assessment has considered effects likely to arise in both the construction and operational phases, see below and Appendix DD.

In view of the small area involved and the low profile of the proposed infrastructure within an existing developed STW, it is considered that there will be no material effect on local landscape fabric, structure or character during either the construction or operational phases.

Construction Phase Effects

The area of recent planting will be lost. The area of hedgerow/scrub will also be removed. *Landscape effect - Negligible.*

Construction phase activity including cranes will potentially be visible from very limited locations along NCN Route 61 and the informal path on the north side of the Jubilee River (Viewpoints 4, 4A and 7). STW Upgrade construction works will be seen in combination with the pipeline installation work between the STW and the northern RC Shaft that will be installed immediately north of the Jubilee River close to the Manor Farm Weir. The STW Upgrade will be in the background of views seen across or blocked by foreground construction activity for the RC shaft. *Visual effect - Minor Adverse.*

Operational Phase Effects

Replacement planting (where consistent with operational access and depth of cover over new infrastructure) will locally strengthen the southern boundary and improve landscape character and structure by increasing visual separation of the STW. *Landscape effect – Minor adverse at Year 1; Minor Beneficial at Year 15.*

The proposed new infrastructure is unremarkable, low in stature and bulk, and is overall comparable to existing installations in visual terms. There is a lack of proximity of the available public viewpoints and the landscape mitigation will be planted as small saplings. *Visual effect - Neutral or Negligible at Year 1; Minor Beneficial at Year 15.*

8.3.3 Mitigation

Potential for mitigation of the landscape and visual effects of the STW Upgrade can be summarised as follows:

- Removal of trees and hedgerows with stems exceeding 75mm in diameter at 1.5m from ground level should be avoided or minimised.
- Construction works and temporary facilities should be located greater than 15m from the root protection area (RPA) of retained trees and hedgerows, or as directed by an arboriculturist.
- Mitigation planting should be provided for visual setting / screening of new installations as follows:
    - Breaks in the linear vegetation on the STW southern boundary should be planted with hedgerows and trees consistent with operational access and depth of cover over new infrastructure.
    - The area of recent planting should be reinstated and ideally at raised levels as previously within areas identified in the Outline Landscape and Biodiversity Enhancement Plan. See Outline Landscape and Biodiversity Enhancement Plan in Appendix W for potential locations.
    - Compensatory planting in nearby locations within the STW should be provided where direct replacement of lost vegetation is not possible.
    - All new planting should be of locally occurring indigenous species.

- The height and bulk of new permanent above ground installations, including supporting infrastructure such as fencing and access facilities, should be minimised to reduce visual effects and clutter.
- Colours and reflectivity of new above ground installations should be selected to reduce visual effects.

8.3.4 Opportunities

The provision of an on-site planting scheme of locally occurring indigenous trees and shrubs to provide visual mitigation of new installations would also have associated biodiversity benefits and may also increase screening and setting of other STW infrastructure.

Opportunities may also exist for extension of the on-site planting elsewhere within the STW that would further assist in visual mitigation of the wider STW and provide additional biodiversity benefits.

Subject to landowner agreements there are opportunities to provide off site planting on land to the south of the STW to mitigate the STW Upgrade and to improve the setting and screening of the STW within the wider landscape.

8.4 Route and outfall

8.4.1 Baseline

Designations

No landscape designations apply within the 1km study area, and due to lack of proximity and visual connection no landscape related designations within the 1km study area will be affected by the outfall route.

Landscape Character Receptors

The route and outfall lie within National Character Area NCA115 – Thames Valley (NE379).

The outfall route passes through two local authority areas – Slough Borough Council where no landscape character assessment has been published, and Buckinghamshire Council for which a landscape character assessment has been undertaken which identified landscape character area LCA 26.2 Dorney Floodplain which includes Dorney Common.

The landscape character in the vicinity of the route and outfall is consistent with published assessments. At a local level the route passes through several distinct areas of character that can be summarised as follows and are discussed further in Section 8.4.2.

- Jubilee River Corridor – all land north of Dorney Common which includes the Jubilee River and associated land set out for recreational, biodiversity and amenity purposes. The area includes raised ground between the Jubilee River and Dorney Common that is extensively planted both internally and on its boundaries. There is a high degree of visual enclosure. Several informal paths exist in addition to PRoW.
- Dorney Common – LCA 26.2 to the north of Cress Brook comprising the wide flat and open expanse of the Dorney Common agricultural grassland that is crossed by Common Road.
- Setting of River Thames – LCA26.2 to the south lying between Cress Brook and the River Thames comprising a single large flat and open field in arable use and mature tree belts marking the south side of the Cress Brook and the north bank of the River Thames. Within the latter two national level recreational routes running parallel to the river. The south bank of the river is well treed in this locality which also includes the lock and cottage at Boveney Lock.

Landscape Receptors

The outfall route will affect mature vegetation as follows:

- Jubilee River Corridor – boundary vegetation (ACR G2 Cat C2) and scrub to the north of the Jubilee River removed to accommodate pipeline and RC Shaft construction.
- Dorney Common – none.
- Setting of River Thames – local felling within the mature deciduous tree belts to the south of Cress Brook (ACR G18 – Cat B2) and on the north bank of the River Thames (ACR G30 – Cat B2, T28 – Cat B2, T29 – Cat B3, G27 – Cat C2) to accommodate pipeline and outfall construction.

The outfall route will also affect the Dorney Common grassland which is a distinct local landscape feature grazed short by farm animals and geese and will cross agricultural land in arable use to the south of the Cress Brook.

Visual Receptors

There are numerous visual receptors which have been grouped into five categories:

- Users of well-established informal paths along the north bank of the Jubilee River;
- Recreational users of Dorney Common (unrestricted public access by walkers and riders);
- Users of public rights of way including NCN Routes 4 and 61 and the Thames Path National Trail;
- Occupiers of residential properties at Eton Wick, Dorney and Boveney adjacent to Dorney Common, and the cottage at Boveney Lock; and,
- Users of the River Thames waterway.

8.4.2 Assessment

The potential effects of the outfall route and outfall have been assessed by site appraisal including from all viewpoints except for Viewpoints 1 and 2. The assessment has considered effects likely to arise in both the construction and operational phases, see below and Appendix DD.

During the construction period it is understood that:

- The pipeline will be installed by progressive cut/install/cover.
- The temporary land take for construction, access and materials storage will be as per the red line boundary.
- All access and storage etc. for works north of the Jubilee River will be via the STW which will limit the area of disturbance to the outfall route.
- Principal location for contractor compounds and materials storage for works south of the Jubilee River will be on Dorney Common with access taken from Common Road.
- Access for the outfall will be as above plus restricted use of the private road from Boveney to Boveney Lock, and local storage in vicinity of the outfall.
- Following construction, the affected areas will be returned to the existing ground levels and the existing ground cover and uses reinstated with the exception of very limited new paving required for maintenance access purposes.

Construction Phase Effects

Landscape Character Receptors

In view of the small area involved within the much more extensive landscape character areas identified at national and district levels, it is considered that there will be no material effect on landscape character at these levels during either the construction or operational phases. Effects on local character are described below in relation to the three areas identified above.

Jubilee River Corridor – Construction of the outfall route and the northern RC Shaft will temporarily affect a very localised area only to the north of the Jubilee River that is not prominent in the local landscape. Loss of boundary vegetation and scrub will be incidental only. *Effect – Minor Adverse*

LCA26.2 North - Dorney Common - The construction of the outfall route and the southern RC Shaft will temporarily affect the landscape character due to loss of integrity and openness of the Dorney Common grasslands. It should be noted that this effect will only occur during the construction phase, for a short-term duration. *Effect – Major Adverse (Significant) (short term)*

LCA26.2 South - Setting of River Thames – Construction activity for the outfall route will temporarily affect the integrity and openness of the arable field. However, arable areas are regularly disturbed by cultivation activities and resumption of arable use and existing appearances can be expected to be rapid following reinstatement. *Effect – Minor Adverse*

Landscape Receptors

Construction phase effects on the Dorney Common grasslands will not be limited to the physical effects upon the directly affected areas (including access routes and storage compounds etc.), as access limitations, necessary to provide for safe operations, may locally limit the unrestricted grazing regime. This may cause some areas adjoining the construction to be temporarily unmanaged and the grass sward to grow longer (depending upon season). Reinstatement to grassland will also require measures to exclude cattle until the restored areas are sufficiently recovered to reintroduce grazing. *Effect – Moderate Adverse (Significant) (short term)*

Temporary effects on landscape receptors elsewhere will be restricted to tree removals in the three locations described above. The arboricultural study has identified that trees to be removed are not individually of high intrinsic value, however the removal of trees within the two tree belts will have local effects on the integrity of these landscape features as follows.

Boundary vegetation and scrub to the north of the Jubilee River – Low stature hedge remnants and scrub of limited landscape value will be removed. *Effect - Negligible*

The tree belt on the south side of Cress Brook – The belt is technically beyond Dorney Common; however the feature is important in defining and 'containing' the open areas to the north and south conveying a strong sense of landscape structure. Overall, the belt is thin with some small gaps and visual porosity evident when trees are bare. However, during the winter months the tree belt on the north side of the River Thames is seen through/behind the belt along Cress Brook bolstering its value in defining the visual horizon and containment of the Common. Whilst the intrinsic value of individual trees lost may be low, their removal will at worst case scenario cause a small gap in the belt very locally impairing the integrity of this feature in defining landscape boundaries. However, the location is close to the corner of the Common and to the urban edge of Eton Wick which will assist in reducing landscape effects until replanting becomes established. *Effect – Minor Adverse*

*Tree belt on north bank of River Thames – T*he outfall route will make use of a locally thin section of the belt to minimise loss of mature vegetation and integrity of the feature. The belt is locally thin in the vicinity of the lock and the outfall route will avoid the stronger section of belt to the east. *Effect – Minor Adverse*

Visual Receptors

The level of temporary effects at visual receptors will vary with distance from construction activity and intervening screening factors and can be summarised as follows in the five categories identified above.

Informal paths north of Jubilee River – (Viewpoints 3, 4, and 4A) Mature scrub, overgrown hedgerows, and trees on either side of the path to the east and west of the outfall route provide effective screening limiting available views

to the construction areas to two short sections only in the vicinity of the weir. The principal visual interest in this location is the river and weir. To the north there are filtered views to higher parts of the STW infrastructure. *Effect – Minor Adverse*

Dorney Common – (Viewpoints 9, 10, 11, 12, 13, 13A, 14 and 24) There is unrestricted access across all parts of the Common and some clearly defined unsurfaced paths around the perimeter and elsewhere linking to the various access points. Access is seasonally limited locally by the damp conditions prevailing in the northeast corner close to the southern RC Shaft location. The Common is extensive in area and hence effects upon views will vary in relation to proximity. Some unobstructed views to the construction works will be across distances in excess of 1km. *Effect – Negligible to Major Adverse (Significant) (short term)*

PRoW – The visibility and magnitude of effects of the construction works will be variable determined by proximity, screening factors and diversions where applicable. PRoW with views available to the outfall route are as follows:

- Bridleway/NCN Route 61 - (Viewpoints 5, 6, 6A and 7) There are limited locations only where open views are available across the Jubilee River to the location of the north RC Shaft where construction may be seen above retained vegetation. *Effect - Minor Adverse*
- Footpath in Slough – (Viewpoint 8) A long view is available northwards from higher ground across the outfall route including north RC Shaft towards the Slough STW. *Effect - Negligible*
- FP DOR/3/1 - (Viewpoints 15 and 16) The footpath is crossed by the outfall route which will also be visible crossing the wide arable field to the outfall. *Effect – Minor Adverse*
- NCN Route 4 (BW DOR/2/2 and BW DOR/2/3) - (Viewpoints 18, 20 and 21) Approaching the crossing point from either direction there will be glimpsed views or occasional wider views northwards to the outfall route. which then crosses NCN Route 4 close to the outfall. *Effect - Minor Adverse to Moderate Adverse (Significant)*
- Thames Path National Trail (FP DOR/18/1) - (Viewpoints 19, 22 and 23) The Trail is crossed by the outfall route immediately adjacent to the outfall and some limited tree removals. The approach from the east is enclosed within the riverside tree belt with only a very limited forward view. Approach from the west (from Boveney Lock) is more open permitting views to low key waterside infrastructure and the outfall location. The principal visual interest in this location is the river and lock. *Effect – Negligible to Moderate Adverse (Significant)*
- FP DOR/4/1 & FP DOR/4/2 - (Viewpoint 17) These footpaths follow the margins of the arable field affording wide views across the field to the outfall route. *Effect Negligible to Minor Adverse*

Residential Properties – Properties with visibility of the outfall route are restricted to:

- Eton Wick - (Viewpoints 10, 11, 13, 13A and 16) There are numerous two-story properties facing westwards and southwards towards the outfall route crossing Dorney Common and the agricultural field to the south respectively. Effects will be variable depending upon proximity to the outfall route and to ancillary activities e.g. southern RC Shaft, compounds etc. *Effect - Minor Adverse, Moderate Adverse (Significant) and Major Adverse (Significant)*
- Dorney and Boveney – (Viewpoint 24) properties on the edge of the Common with long views towards the outfall route across Dorney Common. *Effect – Minor Adverse*
- Residential property on island at Boveney Lock – (Viewpoint 23) Partially screened views will be available to the outfall construction. *Effect - Minor Adverse*

River Thames Waterway – The outfall construction will be clearly visible to waterway users over a very short but busy stretch of the river to the east of Boveney Lock. In this location craft bound upriver congregate and temporarily moor to await access to the lock which will potentially increase awareness of the works. *Effect – Minor Adverse*

Operational Phase Effects

Landscape Character Receptors

The existing structure, overall configuration and appearance of the landscape will be returned to existing and with minimal change to landscape fabric. *Landscape Character - Neutral at Years 1 and 15.*

Landscape Receptors

Loss of existing vegetation is limited and where consistent with operational access and depth of cover over new infrastructure, the trees removed to facilitate construction will be directly replaced, and/or compensatory planting provided nearby (subject to landowner agreement), with the objective of reinstating to the existing situation and to lessen effects of breaks in the two tree belts. *Landscape - Neutral or Minor Adverse at Year 1; Neutral at Year 15.*

Visual Receptors

On completion visible infrastructure along the outfall route will be limited to ground level access covers. The modest outfall structure will be at circa existing bankside ground levels and clearly visible from only the immediate vicinity on both land (Thames Path National Trail and to lesser extent NCN Route 4) and on the waterway, and not prominent from any viewpoint, including from the Boveney Lock or the residential cottage on the lock island. The structure will become part of the built scene and local infrastructure adjacent to the Boveney Lock. *Visual – Neutral or Minor Adverse at Year 1; Neutral or Negligible at Year 15.*

The loss of trees per se will not constitute a material change in any view. *Visual – Neutral or Minor Adverse at Year 1; Nil at Year 15.*

8.4.3 Mitigation

Potential mitigation of the landscape and visual effects of the route and outfall can be summarised as follows:

- The construction period should be minimised.
- The temporary land take for construction purposes should be minimised and optimised where appropriate.
- The height and bulk of temporary facilities should be minimised during the construction period.
- Temporary screening of construction works should be provided from most sensitive viewpoints, e.g. using soil bunding and/or fencing.
- Removal of trees and hedgerows with stems exceeding 75mm in diameter at 1.5m from ground level should be avoided or minimised.
- Construction and temporary facilities should be located greater than 15m from the root protection area (RPA) of retained trees and hedgerows, or as directed by an arboriculturist with appropriate root protection in place.
- Ground levels should be returned to existing, and the land returned to current land uses. Sufficient depth of cover over infrastructure should be provided to support the land use.
- Walls, fencing and metalled surfaces should be reinstated to the previous specification using recovered or identical materials.
- Reinstatement of grassland areas should reflect the existing purpose and using grass (and herb species as appropriate) to replicate the existing sward composition(s).
- All areas of arable land affected will be fully reinstated to the previous condition and purpose.
- Subject to agreement with the landowners, mitigation planting should be provided for visual setting / screening of new installations as follows:
    - Breaks in the linear vegetation belts planted with trees and understorey species. (Where consistent with operational access and depth of cover over new infrastructure.)

  - Compensatory planting in nearby locations where direct replacement of lost vegetation is not possible.
  - All new planting should be of locally occurring indigenous species.
- The height and bulk of new permanent above ground installations, including supporting infrastructure such as fencing and access facilities, should be minimised to reduce visual effects.
- Colours and reflectivity of new above ground installations should be selected to reduce visual effects.
- The design of new above ground installations should be sympathetic to the rural surroundings and local vernacular, and where possible co-located with existing infrastructure.
- The outfall and headwall design should be low key and of least possible height, width and depth, and will avoid any local increase in the height of the riverbank. The outfall should be co-located with existing bankside installations.

8.4.4 Opportunities

Mitigation planting as outlined above would have associated biodiversity benefits. Mitigation planting may also be designed and located to make modest positive contributions in the delivery of the following:

- Local planning policies relating to the River Thames and its setting, and to the linear park - see above.
- NCA115 - Environmental Opportunities SE01, SE03 and SE04.
- LCA26.2 - Strategy/Vision and Landscape Guidelines. The visitor experience of users of the Thames Path National Trail, NCN4 and NCN61, and the River Thames waterway.

8.5 Summary

A study to identify the potential effects of the proposals upon landscape and visual receptors has been undertaken informed by review of publicly available information and a site appraisal.

Construction Phase

The construction phase both within the STW and along the outfall route is expected to result in very localised effects on landscape character and landscape receptors with permanent effects limited to the removal of scrub and recent planting within the STW, and small numbers of mature trees along the outfall route. These landscape character and landscape effects are considered likely to be *significant adverse* at Dorney Common only, and this will only be during the construction phase for a short duration. Whilst visual effects from some residential properties at Eton Wick will be significant adverse during the construction phase, the duration of the works will be short and no significant adverse effects will arise during the operational phase. Therefore, it is considered that a Residential Visual Amenity Assessment will not be appropriate as the effects on residential visual amenity are not considered to be significant.

Temporary effects upon visual receptors during the construction phase will be short in duration and will vary with distances between the construction activities and the receptors. Disturbance will be greatest and longest in the vicinity of the RC Shafts and the outfall to the River Thames which are considered likely to cause *significant adverse* effects for the following visual receptors only:

- Where close to the construction – Dorney Common (walkers and riders), NCN Route 4 and Thames Path National Trail
- Residential properties at Eton Wick with views across Dorney Common, towards the southern RC Shaft and towards construction compounds and the crossing of Common Road.

Operational Phase

Ongoing restoration of disturbed areas to original uses can be expected to continue during the first year of the operational phase. During this period ongoing local degrading of the landscape character noted above will remain temporary and will not cause significant adverse effects.

During the operational phase the new infrastructure within the STW will be low level and of low visibility in the wider landscape and no significant visual effects will arise. Incidence of new infrastructure within the landscape outside of the STW will be restricted to access covers at ground level along the outfall route which will not lead to significant adverse effects at any location.

The outfall to the River Thames will comprise a very modest low-level, partly submerged construction immediately adjacent to existing bankside infrastructure and accompanied by a small area of additional hard surfacing for access and maintenance purposes. It is acknowledged that the location is visually sensitive and that special policies apply seeking to prevent *'development which would have an adverse impact on the special character, landscape or amenity of the River Thames'*. However, it is considered that the adverse visual effects of the new installation will not be significant either at Year 1 or Year 15, and that the special character, landscape and amenity of the River Thames will be maintained consistent with local policies L4 (Buckinghamshire) and N2 (RBWM).

Landscape and visual significant adverse effects are anticipated to occur only temporarily during the construction phase and no significant adverse effects are anticipated during the operational phase. It is considered that the scheme will cause no significant environmental impacts, and scope for mitigation has been identified to minimise the effects of the construction and operational phases upon landscape and visual receptors.

Table 8.1: Summary of the assessment of landscape and visual.

Assessment of Landscape and Visual Effects	Significance of Effects	Mitigation Measures
During construction: *Very localised effects on landscape character and landscape receptors with permanent effects are limited to the removal of scrub and recent planting within the STW, and temporary effect associated with removal of small numbers of mature trees along the outfall route at the Cress Brook temporary crossing. Landscape character and landscape effects are considered likely to be significant adverse at Dorney Common only, and this will only be during the construction phase for a short duration. The effects on residential visual amenity are not significant.* *Temporary effects upon visual receptors during the construction phase will be short in duration and will vary with distances between the construction activities and the receptors.*	*No significant permanent environmental effects are expected from landscape and visual impacts during the construction phase.*	*A CEMP will be implemented that will include mitigation measures identified in Section 8.3.3 and 8.4.3, for example: construction works and temporary facilities should be located greater than 15m from the root protection area of retained trees and hedgerows; breaks in the linear vegetation on the STW southern boundary should be planted with hedgerows and trees consistent with operational access and depth of cover over new infrastructure; and, compensatory planting in nearby locations within the STW should be provided where direct replacement of lost vegetation is not possible. The Outline Landscape and Biodiversity Enhancement Plan also outlines mitigation opportunities (see Appendix W).*
During operation: *Ongoing restoration of disturbed areas to original uses can be expected to continue during the first year of the operational phase. During this period ongoing local degrading of the landscape character will remain temporary and will not cause significant adverse effects.* *During the operational phase the new infrastructure within the STW will be low level and of low visibility in the wider landscape and no significant visual effects will arise. Incidence of new infrastructure within the landscape outside of the STW will be restricted to access covers at ground level along the outfall route which will not lead to significant adverse effects at any location.* *It is considered that the adverse visual effects of the new outfall installation will not be significant.*	*No significant environmental effects are expected from landscape and visual impacts during the operation phase.*	*Ongoing mitigation measures to be outlined in the CEMP and Outline Landscape and Biodiversity Enhancement Plan (Appendix W).*

9. Noise and Vibration

9.1 Information Sources

The following background information has been reviewed:

- Slough STW Relocation of Outfall to River Thames Presentation 26.05.2020 and subsequent updated indicative outfall routes.
- DEFRA England noise map viewer.
- OS mapping.

9.2 Policy

The relevant legislation for this noise and vibration assessment is set out in Table 9.1.

Table 9.1: Noise and Vibration Key Legislation and Policy.

Applicable Legislation / Policy	Description
Environmental Protection Act 1990 Part III	Part III defines statutory nuisance and provides the principal controls over it for local authorities. Under the Act, local authorities have a duty to inspect their areas to detect nuisances and, when satisfied that a statutory nuisance exists or is likely to occur or recur, to serve an abatement notice on the responsible party. They also have a duty to investigate any complaint made by a person living within their area. Though businesses have a defence of '*best practicable means*', failure to comply with a valid notice is a criminal offence.
Control of Pollution Act 1974	This Act contains powers for local authorities to deal with noise and vibration from construction and demolition sites.
National Planning Policy Framework (NPPF) 2019	This sets out the government's planning policies for England and how these are expected to be applied. For what constitutes a significant adverse impact, the NPPF refers to the *Noise Policy Statement for England*.
Noise Policy Statement for England 2010	This provides explanation of the term '*significant adverse impact*' from the NPPF. The document also defines the meanings of the terms No Observed Effect Level (NOEL), Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL).
Planning Practice Guidance – Noise	This provides additional guidance to the NPPF and sets out how planning can manage potential noise impacts in new development. It advises that planning authorities should take account of the acoustic environment and in doing so consider: ▪ Whether or not a significant adverse effect is occurring or likely to occur ▪ Whether or not an adverse effect is occurring or likely to occur ▪ Whether or not a good standard of amenity can be achieved.

Applicable Legislation / Policy	Description
	Planning Practice Guidance - Noise states that these potential effects should be evaluated by comparison with the SOAEL and the LOAEL for the given situation.

The guidance relevant to the assessment of noise and vibration is presented in Table 9.2.

Table 9.2: Noise and Vibration Key Guidance.

Applicable Legislation / Policy	Description
British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound	BS 4142 describes methods for rating and assessing sound of an industrial or commercial nature. It enables the effects on people nearby to be assessed and the associated risks to be minimised.
British Standard 5228-1:2009+ A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise	This code of practice provides guidance on the assessment and control of noise on construction sites, along with guidance on acceptable noise levels.
British Standard 5228-2:2009+ A1:2014 Code of practice for noise and vibration control on construction and open sites. Vibration	This code of practice provides guidance on the assessment and control of vibration on construction sites, along with guidance on acceptable vibration levels.

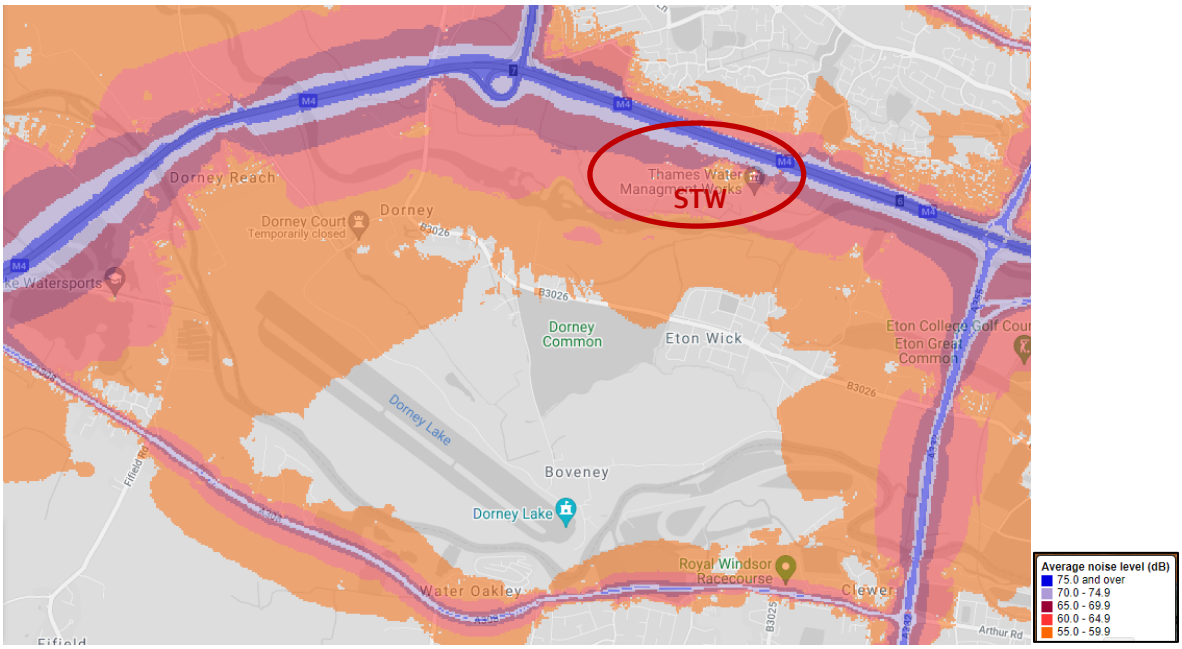
9.3 STW upgrade

9.3.1 Baseline

Surveys of the ambient environmental sound levels of the site and outfall route have not been undertaken at this early stage. In the absence of ambient environmental sound survey data the strategic noise mapping data provided by Defra produced under the Environmental Noise (England) Regulations, 2006, has been considered. The strategic noise maps are required to be produced every five years. They must be produced for agglomerations with a population of more than 100,000 people; for major roads with more than 3,000,000 vehicle passages per year, and for major railways with more than 30,000 train movements per year.

As the STW is alongside the busy M4, the strategic noise maps for roads have been reviewed. Figure 9.1 indicates the $L_{Aeq,16h}$ dB across the site and outfall route for the modelled year of 2017.

Figure 9.1: Defra Strategic Noise Map of $L_{Aeq,16h}$ dB.



It can be seen that at the location of the STW the baseline sound environment is likely to be dominated by road traffic noise from the M4, with baseline noise levels in the range 60 to 74.9 dB.

The closest noise sensitive receptors to the proposed upgrade works within the STW are close to the eastern boundary of the STW, at a distance of approximately 300m from the location of the works and would be subject to similar levels of noise as the STW.

9.3.2 Assessment

The onsite works will include the modification of existing structures and provision of several new structures within the current operational STW site. There would be other activities taking place across the STW, but the construction of these structures is likely to involve the longest periods of time and generate the highest levels of noise. The proposed new structures include the following key elements, indicated with approximate distances to closest residential properties;

- Two new FST tanks (210m)
- New liquor return pump (120m) and drainage pipework
- New ASP lane (240m)
- Reuse of disused existing Humus tank as storage tank (350m)
- New transfer pumping station (350m)
- New centrate sump and pumping tank (560m)

Construction noise

The details regarding the likely construction program, methods and plant to be used are included in Section 1 and Appendix H. Given the type of works that are required, it is anticipated that the construction works would occur during daytime working hours, with no need for night-time or weekend working. It is anticipated that the construction activities would typically involve some earthworks, some demolition/modification of existing structures, and concreting and building construction. It is not thought that piling would be needed apart for the installation of sheet piles to aid in excavation to foundation levels.

The assessment of noise from construction works would normally be undertaken within a study area of 300m or less, as at distances of greater than 300m construction noise levels are usually below prevailing ambient noise levels. The new liquor returns pump and associated pipework and new FST tanks would be within 300m of the closest noise sensitive receptors on Wood Lane to the east of the STW, and so some noise from construction activities is likely to be audible at these receptors.

As there are existing high levels of baseline ambient noise in the area of the STW and the residential dwellings on Wood Lane from road traffic using the M4, it is considered unlikely that there would be any adverse impact during the construction phase at the closest noise sensitive receptors.

Vibration from construction activities can result in annoyance at sensitive receptors that are located within 100m of vibration generating activities, such as piling or compaction. As the closest sensitive receptors are located in excess of 100m from any of the construction works within the STW there would be no adverse impacts from vibration.

Given the busy nature of the roads in the area it is not anticipated that the addition of the required construction traffic would cause a significant effect.

Operational Noise

The operation of the new structures are likely to be similar to those operations already on site. Given high baseline noise levels around the STW, and the intervening distance to the closest noise sensitive receptors of over 100m, it is considered unlikely that there would be any noticeable increase in operational noise from the STW at residential receptors on Wood Lane. Therefore, significant operational noise impacts are not anticipated.

9.3.3 Mitigation

Embedded mitigation is inherent to the design; good practice measures are standard industry methods and approaches used to manage commonly occurring environmental effects.

Embedded mitigation includes the use of up to date operational plant within the STW, which is likely to be the quietest available plant.

All construction activity will be managed in accordance with BS 5228-1, which requires that noise control measures should be adopted. The contractor will implement a management plan to control noise and vibration during the construction phase. The management plan would include general procedural measures that represent examples of best practice on construction sites, examples of which include the following:

- Programming and phasing the works over a number of stages to restrict impacts within any one area to the minimum time.

- Keeping local residents and property owners fully informed about the nature and timing of the works via such means as newsletters or individual contact, where appropriate.

- Having a representative available on site during working hours to answer queries or address any concerns expressed.
- Careful selection of equipment, for example any compressors brought to site will be super-silenced or sound reduced models fitted with acoustic enclosures or any pneumatic tools will be fitted with silencers or mufflers, wherever practicable.
- All plant and equipment will be properly maintained and operated in accordance with manufacturers' recommendations and in such a manner as to avoid causing excessive noise.
- Equipment will be shut down when not in use for a period longer than 5 minutes.
- Provision of temporary noise barriers.

If the contractor requires to undertake any of the works outside of normal working hours (8am – 6pm, Monday – Friday and 8am – 1pm on Saturdays) they should consider applying for prior consent under Section 61 of the Control of Pollution Act 1974. In addition, a baseline noise survey may be required to support this.

9.3.4 Opportunities

The use of new and up to date construction plant and equipment may present opportunities to replace older and potentially nosier plant and equipment.

9.4 Route and outfall

9.4.1 Baseline

The strategic noise mapping data provided by Defra and reproduced in Figure 9.1 indicates that the route of the outfall passes through an area where road traffic noise levels are likely to below 55 dB $L_{Aeq,16h}$, with the exception of the section between the STW and the northern boundary of Dorney Common where road traffic noise levels are in the range 55 to 60 dB $L_{Aeq,16h}$.

There are noise sensitive receptors located within the settlement of Eton Wick within a distance of about 75m to the proposed outfall route where it passes to the west and south-west of the settlement. Apart from receptors within Eton Wick, the outfall does not pass within 300m of any other noise sensitive receptors.

9.4.2 Assessment

The outfall route and changes to the outfall will include installing the outfall pipe across Dorney Common to the west of the settlement of Eton Wick and across agricultural fields between Dorney Common and the River Thames to the proposed river outfall structure. The outfall route will cross beneath Jubilee River, the B3026 and Cress Brook.

Construction noise

The construction phase will include open cut trenching from the STW to the Jubilee River, where a shaft will be dug on northern side of Jubilee River to enable tunnelling. A tunnel will traverse under the river to the south of the wetland area in Dorney Common. From here there will be further open cut trenching to B3026 road where a tunnel will be constructed underneath the gas main and road. From the south side of the B3026 there will be further open cut works to the outfall structure, with an additional tunnel section under the Cress Brook. It is likely that a cofferdam will be needed at the outfall into the River Thames while concreting and other installation works are undertaken to create a dry working area.

Given the type of works that are required, it is anticipated that the construction works would occur during daytime working hours, with no need for night-time or weekend working. Given the linear nature of the route, works would be traversing along the route, and would not be expected to be in a given location for a prolonged period of time, except for when the works associated for the outfall at the River Thames.

BS 5228-1 provides a framework for the assessment effects, which includes methods for deriving threshold levels for significant impacts. The standard provides a range of possible thresholds for a potential significant effect, the lowest of which is 65 dB $L_{Aeq,T}$ for quiet areas during a standard working day. There is a temporal scope element, which suggests that an impact is only a significant effect if the threshold level is met or exceeded for one month or more.

The closest receptors to the works are within about 75m of the outfall route where is passes Eton Wick to the west and south. Noise from construction activities is likely to be audible at the closest noise sensitive receptors at Eton Wick. The noisiest potential activity would be the works associated with the tunnelling under Cress Brook. These works would involve the use of excavators, dumpers and equipment for the tunnelling, which would typically result in a noise level of around 65 dB $L_{Aeq,T}$ at the closest sensitive receptors.

Most construction activities are expected to be below the lowest available daytime construction noise threshold of 65 dB $L_{Aeq,T}$ at residential dwellings within Eton Wick. The highest construction noise levels associated with activities such as piling are anticipated to occur for short periods of time, typically of less than one month. Moreover, as the construction activities and associated noise will be moving along the route of the outfall, it is anticipated that the highest construction noise levels would be audible periods of less than one month at individual residential dwellings, with decreased construction noise levels before and after this period. It is therefore anticipated that there would not be a significant construction noise impact from the constructing of the outfall.

There is likely to be a temporary construction compound near to the crossing of the B3026, with a satellite compound near the outfall into the River Thames. A compound alongside the B3026 would be placed as far away from Eton Wick as possible, and noise control measures implemented as required. The compound could be orientated such that temporary welfare cabins would be placed on the side of the compound closest to receptors to act as a screen from on-site activities. The outfall is in excess of 300m from any noise sensitive receptor, there would therefore be no adverse noise impacts. Given the busy nature of the roads in the area it is not anticipated that the addition of the required construction traffic would cause a significant effect.

Vibration from construction activities can result in annoyance at sensitive receptors that are located within 100m of vibration generating activities, such as piling or compaction. Piling may need to be undertaken within 100m of residential dwellings in the settlement of Eton Wick at a distance of more than 75m, where building damage is unlikely.

Operational Noise

The operation of the outfall once complete would not be noise generating. Any pumps that may be required along the outfall route would be for temporary maintenance purposes and designed and installed to avoid any annoyance in accordance with the methodologies provided within British Standard 4142. The discharge of the outfall into the River Thames would be underwater and therefore not generate noise. Significant noise impacts are therefore not anticipated.

9.4.3 Mitigation

All construction activity will be managed in accordance with BS 5228-1, which requires that noise control measures should be adopted. The contractor will implement a management plan to control noise and vibration during the

construction phase. The management plan would include general procedural measures that represent examples of best practice on construction sites, examples of which include the following:

- Programming and phasing the works over a number of stages to restrict impacts within any one area to the minimum time.
- Keeping local residents and property owners fully informed about the nature and timing of the works via such means as newsletters or individual contact, where appropriate.
- Having a representative available on site during working hours to answer queries or address any concerns expressed.
- Careful selection of equipment, for example any compressors brought to site will be super-silenced or sound reduced models fitted with acoustic enclosures or any pneumatic tools will be fitted with silencers or mufflers, wherever practicable.
- All plant and equipment will be properly maintained and operated in accordance with manufacturers' recommendations and in such a manner as to avoid causing excessive noise.
- Equipment will be shut down when not in use for a period longer than 5 minutes.
- Provision of temporary noise barriers.

9.4.4 Opportunities

There are considered to be no opportunities for enhancement of noise and vibration along the outfall route.

9.5 Summary

A review using aerial photography and publicly available information regarding existing ambient noise levels in the project area has been undertaken. The area around the STW is dominated by road traffic noise from the M4. With increased distance from the M4 ambient noise levels are expected to reduce.

The construction phase of the proposed works within the STW and along the outfall route are not expected to result in adverse impacts at receptors due to the large distances between works and the closest noise sensitive receptors in most locations. Where the proposed outfall route passes within about 75m of Eton Wick the duration of the works to install the outfall would be short. In addition, the contractor would implement a management plan and use best practice measures to manage noise and vibration emission during the works, which will include the adoption of noise control measures. It is considered that there would be no significant effects from noise and vibration from construction activities.

The operational phase is not expected to increase existing noise from the STW at the closest noise sensitive receptors, and the outfall itself would not be noise generating. Therefore, no adverse impacts are anticipated from the operation of the proposed scheme.

Table 9.3: Summary of the assessment of noise and vibration.

Assessment of Noise and Vibration Effects	Significance of Effects	Mitigation Measures
During construction: *It is considered unlikely that there would be any adverse impact during the construction phase of the STW upgrade, pipeline and outfall at the closest noise sensitive receptors.* *There would be no adverse impacts from vibration during the STW upgrade. Vibration from construction activities along the pipeline may result in very limited annoyance to sensitive receptors.* *Given the busy nature of the roads in the area it is not anticipated that the addition of the required construction traffic would cause a significant effect.*	*No significant environmental effects are expected from noise and vibration during the construction phase.*	*Embedded mitigation includes the use of plant no older than five years within the STW, which is likely to be the quietest available plant.* *All construction activity will be managed in accordance with BS 5228-1, which requires that noise control measures should be adopted. The contractor will implement a management plan to control noise and vibration during the construction phase. The management plan would include general procedural measures that represent examples of best practice on construction sites (see Section 9.3.3 and 9.4.3 for details).*
During operation: *It is considered unlikely that there would be any noticeable increase in operational noise from the STW at residential receptors on Wood Lane, therefore, significant operational noise impacts are not anticipated.* *The operation of the outfall once complete would not be noise generating. The discharge of the outfall into the River Thames would be underwater and therefore not generate noise. Significant noise impacts are therefore not anticipated.*	*No significant environmental effects are expected from noise and vibration during the operation phase.*	*No mitigation measures recommended for operational phase.*

10. Population and Human Health

10.1 Overview

The EIA Regulations 2017 require the identification, description, and assessment of the direct and indirect significant effects of the scheme on 'population and human health' (Section 4, Paragraph 2a). National Highways (Formerly Highways England) (2020) define population as "all individuals located in a particular location (this can be local, regional or at a national scale)". The World Health Organization (WHO) (2019) define human health "as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". Based on these definitions and considerations, this section will determine the potential temporary and permanent effects during construction and operation of the proposed scheme on identified surrounding receptors for the following socio-economic topics:

- Human Health;
- Employment and Economy; and,
- Land-use and Accessibility.

The consideration of some of these topics will require contributions from other environmental topics, particularly those which may give rise to potential significant effects on communities. The combination of these effects contribute to a broader picture of how local people, businesses, and community resources may respond to the proposed scheme.

TWUL is a statutory water and sewerage undertaker, responsible for the abstraction, treatment and supply of clean, safe drinking water and treatment of sewage. TWUL is seeking to improve Slough STW's existing treatment facilities and provide a new discharge point for the effluent and in doing so reducing the STW's impact on the environment and benefit to the wider community and their customers. Slough STW is one of TWUL's larger STWs. The scheme will reduce the STW's impact on the environment by resolving existing compliance risks, including storm environmental permit breaches; effluent compliance breach; FST hydraulically overloaded; effluent compliance risks (ammonia and solids); and, environmental permit breach. The scheme will also contribute to a reduction in flooding via the Roundmoor Ditch, and a significant reduction in effluent to this and other ditches in the area.

In resolving these issues, the scheme will also have a positive impact on population and human health, leading to improvement rather than detriment. From an economic perspective, TWUL will be spending money to implement the scheme, however, this is fully funded through investment provided in AMP7 and will ultimately lead to a betterment for the environment, population and human health.

10.1.1 Guidance

Due to the lack of externally established guidance for this topic area, which is relevant to the proposed scheme, professional judgement is considered appropriate to focus on the direct and indirect methods by which the proposed scheme could affect the health and wellbeing of local communities, through impacts on the availability, accessibility and amenity of residential properties, community and recreational facilities and through impacts on the local economy, and hence the availability and accessibility of employment opportunities. The assessment will be conducted with regard to, so far as relevant, the following guidance:

- National Highways (formerly Highways England), Design Manual for Roads and Bridges (DMRB) LA 112 Population and Human Health (hereafter 'DMRB LA 112'). Although developed specifically for highways projects, DMRB is often considered a best practice assessment guidance to be adopted in the absence of development specific guidance, particularly for linear infrastructure projects;

- Homes and Communities Agency, Additionality Guide;
- IAIA, Human Health: Ensuring a high level of protection; and,
- IEMA, Health in Environmental Impact Assessment: A Primer for a Proportionate Approach.

10.1.2 Study area

Professional judgement has been applied in identifying a suitable study area for the reporting of environmental conditions relevant to population and human health as set out within paragraph 3.23 of LA 112. Where possible, data has been presented for a study area comprising the two LPA areas that the proposed scheme intersects. Where this is not relevant, a study area extending to 500m either side of the working corridor has been used which further includes the adjacent LPA of the Royal Borough of Windsor and Maidenhead.

10.1.3 Information sources

The following sources of information have been used to undertake this screening opinion assessment:

- Local authority local development plans, both adopted and emerging and neighbourhood plans (these provide information on housing allocations and development plans and any information on local greenspace);
- Web based data sources including population statistics from the Office of National Statistics (ONS);
- Information on Public Rights of Way (PRoW) provided by the local authorities;
- National Cycle Network; and,
- Local authority health profiles (Public Health England).

10.2 Policy

Environmental Protection Act (1990). Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents.

Equality Act (2010). Available at: https://www.legislation.gov.uk/ukpga/2010/15/pdfs/ukpga_20100015_en.pdf.

National Planning Policy Framework (2021). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf.

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017/571). Available at: https://www.legislation.gov.uk/uksi/2017/571/contents/made.

10.3 STW upgrade, route, and outfall

10.3.1 Human Health

The assessment of human health for the purposes of this scheme has utilised guidance provided by the IAIA (2020), who recommend using a screening checklist tool of questions related to determinants of health to help identify where there is potential for interactions between a project and its environment. The tool has been adapted for the purposes of this assessment to outline the potential relevance to the scheme and whether it is likely to

result in a significant impact, which is presented in Appendix EE. The determination of whether the scheme would result in particular significant impacts considered the following questions:

- Will the health of the population, and of sections of the population (particularly vulnerable groups), be affected?
- Will the effect be influential to the achievement of key health priorities set for the affected population (e.g. in relation to obesity)?

The assessment outlined in Appendix EE indicates the determinants of health most likely to apply to the scheme are associated with:

- Land-use change (Question 1, 8, 10 and 11);
- Use, storage, transport, handling or production of substances or materials (Question 2);
- Noise and vibration (Question 4);
- Risk of accidents or disasters (Question 6 and 16); and,
- Locality to potential receptors (Question 12 and 13).

It has been determined through use of this tool that the determinants of health outlined above have potential relevance to the scheme, but that the scheme will not have a significant impact on human health via these determinants due to the implementation of health and safety standards, construction best practice, and other processes and measures, including mitigation, outlined in Appendix EE and throughout this report.

The primary determinant that has the potential for adverse impact effects upon sensitive individuals and communities is locality of the scheme to potential receptors. This will primarily be during the construction phase as a result of elevated noise and/or dust. These effects are addressed in Section 2 and 9, respectively.

10.3.2 Employment and Economy

The scheme will influence employment in the short term, specifically during the construction phase, as local resources may be utilised. This may bring short term benefits to the local economy of areas such as Eton Wick or Slough. This is not envisaged to carry through to the operational phase, as the STW will not require an increase in staff to maintain the pump, pipeline, or outfall.

During the construction phase, there will be temporary disruption to agricultural land holdings and accessibility, which may affect the local economy and employment. This will be short term utilising minimal land take for construction boundaries and gradual take of land as the pipeline is laid, which will be followed by reinstatement of land. The short-term loss of field crop growth may have an impact on employment, as lower crop yield may require smaller workforces.

Through stakeholder engagement, local groups will be engaged to introduce the scheme and to understand the impacts it may have on the local area. This may provide added benefit in understanding welfare requirements or unforeseen impacts that were not previously considered. Community meetings will also help to understand the concerns of the local community and allow residents to prepare for any disruption. A stakeholder management strategy and plan will be utilised.

10.3.3 Land-use and Accessibility

The assessment of land-use and accessibility considers the effects on the receptors outlined in Table 10.1, which is detailed in the following sub-sections. Through option alignment and design, some significant land-use impacts have already been avoided, such as existing housing, see Section 1.8. The pipe and outfall have been designed to avoid settlements to reduce the risk of disruption to property and land use. The residential areas within the study area include south Slough, Eton Wick, and east Dorney.

There are multiple PRoW used by walkers, cyclists and horse-riders (WCH) and open spaces within the study area, these are covered in Section 8.

The proposed location of the outfall structure is located at the end of the Boveney Lock quay, which is utilised by recreational river users as a sanitary station and temporary mooring. The River Thames in this area is generally used for hire boats, tour boats, and other recreational river boat uses. The Environment Agency also utilise this area for various purposes, such as navigation and monitoring. This stretch of the River Thames and associated riverbank is also known to become busy during events that occur in Windsor.

Table 10.1: Land-use and accessibility receptors (adapted from DMRB LA 112).

Element	Description of receptors	Receptors
Private property and housing	Location and number of properties at risk of demolition or from which land will be required/access affected by the project	Residential properties
	Location of residential development land and number of units (i.e. proposed number of dwellings) that will be affected by a project	Local Development Plans for housing
Community land and assets	Location of community land (e.g. common land, village greens, open green space, allotments, sports pitches) and the amount of land which will be required / access affected by a project	Common land, open green space
	Location of community assets (e.g. village halls, healthcare facilities, education facilities, religious facilities) and number of assets from which land will be required / access affected by a project	Care homes, educational facilities, healthcare facilities, hospitals, post offices, libraries, religious facilities, community hall/centres
Development land and businesses	Location and number of businesses (and associated jobs) at risk or from which land will be required / access affected by a project	Commercial properties, development land, transport hubs, shopping centres
	Location of land allocated for development by local authorities and the number of future jobs that will be affected by a project	Local Development Plans for land

Element	Description of receptors	Receptors
Agricultural land holdings	Type, location and number of agricultural holdings at risk of demolition or from which land will be required / access affected by a project	Farms, agricultural land holdings
Walkers, cyclists and horse-riders	Type, location and extent of WCH provision (e.g. public rights of way (PRoW)) within the study area	PRoW, national trails, Sustrans national cycle network

10.3.3.1 Private property and housing

The scheme will not require the demolition of existing residential properties or the use of land that is owned by these properties.

The B3026 Common Road will be utilised by construction traffic for access to a temporary site compound and haul roads, as well as Wood Lane for access to the STW and Lock Path for access to the outfall. These requirements have the potential to effect access for local residents, although it should not directly block or prevent access to properties and the effects will only be temporary.

The scheme will not affect local development plans for housing based on the South Bucks Area Proposals Map and the Slough Borough Proposals Map (adopted Nov 2010). The closest residential development land is north of the M4, over 118m from the STW.

10.3.3.2 Community land and assets

The scheme will require temporary land take and associated changes in accessibility / severance during the construction phase across Dorney Common, which is common land and open green space. The impact of this will be temporary and the land will be reinstated to be utilised for its previous purposes, as well as measures implemented to minimise impact during construction. A community liaison plan or engagement plan following TWULs policies and procedures would be developed to help manage communications with the local community around any construction activities.

The following community assets have been identified within 500m of the scheme:

- Western house Academy primary school north of the M4 in Slough;
- Dr P McCabe The Village Medical Centre general practitioner north of the M4 in Slough;
- Dr JG O'Donnell Farnham Road Practice general practitioner north-east of Wood Lane in Slough;
- Eton Wick Post Office east of Dorney Common;
- Eton Wick Library east of Dorney Common;
- Cippenham Community Centre north of the M4 in Slough;
- Weekes Drive Community Hall north-east of Wood Lane in Slough; and,
- Eton Wick Village Hall east of Dorney Common.

There are no care homes, hospitals, or religious facilities located within 500m of the scheme. There are notable potential community assets beyond the 500m buffer that are likely to be situated along the scheme transport routes.

The impact on these assets will be temporary, and primarily related to movement of construction traffic. A traffic management plan would be developed at a suitable stage of the project, which would help to control construction traffic and minimise / manage disruption, for example, avoidance of HGV movements during school drop-off and pick-up times, as well as management of construction traffic routes to avoid sensitive receptors.

10.3.3.3 Development land and businesses

The scheme will not require land currently utilised for commercial properties, transport hubs or shopping centres. The scheme will also not disrupt allocated development land as the closest is north of the M4, over 118m from the STW.

Construction traffic's access to the works area has the potential to impact businesses, however, this will be minimised through use of a traffic management plan. Jobs associated with these businesses should not be at risk due to the scheme, nor should future jobs proposed as part of development land.

10.3.3.4 Agricultural land holdings

There is potential for temporary adverse impact effects on agricultural land holdings as a result of land take and associated changes in accessibility / severance during the construction phase of the proposed scheme. The pipeline route will cross one agricultural holding used for arable purposes before reaching the River Thames and proposed outfall. The land is situated south of Dorney Common and will be accessed via a haul road that crosses the Cress Brook. The land will be reinstated post-completion of works, and there is no envisaged long-term impact.

However, there is potential for permanent adverse effects on some agricultural land holdings as a result of the permanent land take for above ground assets, such as manholes for maintenance. The scheme will utilise best design practice to limit the number of required manholes to two, and these will be situated either side on the peripheries of the field.

10.3.3.5 Walkers, cyclists and horse-riders

The scheme will affect PRoW used by walkers, cyclists and horse-riders (WCH), which are outlined in Section 8. Transient users of various WCH routes which intersect the proposed pipeline working corridor may experience short-lived disturbance as a result of temporary closures / diversions to facilitate the construction of the proposed scheme. Any such impacts effects are addressed in Section 8. All PRoW will be re-connected after construction and diversions will be temporarily implemented during construction, where required. As the contractor moves through the construction phasing, they will look to relinquish PRoW diversions as soon as possible.

The PRoW alongside Boveney Lock and the quay is also utilised by the public during events that are held in Windsor. It is unknown when these events occur, but they will be programmed into the construction of the outfall where possible.

10.4 Summary

There is the potential for impacts on human health as a result of noise and dust generated during the construction phase. These impacts are considered in more detail in Sections 2 and 9 and are not deemed to be significant.

There is also the potential for localised economic effects where the construction of the proposed scheme results in a loss of revenue for land and business owners. For example, impacts upon the local agricultural industry as a result of temporary disruptions to operations (lower crop yields and therefore smaller workforces required). However, this is balanced by the potential positive impacts effects on the local economy as a result of the proposed scheme, both directly through job creation during the construction phase and indirectly as a result of the workforce using local facilities such as accommodation, shops and restaurants and is therefore unlikely to be significant in a regional context.

Construction phase impacts identified are generally associated with the temporary land take of the proposed scheme and the potential for access restrictions / severance during the construction phase.

It is considered unlikely that any of these potential effects will be significant, given their short-term nature. Overall, the operation of the proposed scheme represents a positive effect for local people, communities and human health as it increases the resilience of the treatment facility along with the ditch system and surrounding environment.

11. Major Accidents and Disasters

11.1 Overview

The EIA Regulations 2017 require a 'description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters' (Schedule 4, Paragraph 8). The Institute of Environmental Management and Assessment (IEMA) (2020) refer to a major accident as an event that threatens immediate or delayed serious environmental effects to human health, welfare and/or the environment and requires the use of resources beyond those of the client or its appointed representatives to manage. IEMA (2020) refer to a disaster as a man-made/external hazard or a natural hazard with the potential to cause an event or situation that meets the definition of a major accident.

IEMA published an EIA primer on major accidents and disasters (2020), which states that during "screening it should be sufficient to identify if a development has a vulnerability to major accidents and/or disasters and to consider whether a development could lead to a significant effect". The primer outlines three high-level questions to consider during the screening stage:

- Is the development a source of hazard itself that could result in a major accident and/or disaster occurring?
- Does the development interact with any sources of external hazards that may make it vulnerable to a major accident and/or disaster?
- If an external major accident and/or disaster occurred, would the existence of the development increase the risk of a significant effect to an environmental receptor occurring?

Based on this guidance, an initial assessment has been undertaken to identify the schemes vulnerability to major accident and disaster events, which is provided in Appendix FF. The assessment has taken into consideration the environmental baseline outlined in sections 2-10, as well as considering any design, resilience, and mitigation measures required to alleviate the vulnerability of the major accident or disaster on the scheme. The events are based on those identified in the UK National Risk Register (HM Government 2020) and the International Federation of Red Cross and Red Crescent Societies' types of disasters. The events most likely to apply to the scheme are discussed further in Section 11.3.1, as well as the likelihood of the scheme to increase vulnerability elsewhere.

11.2 Policy

Council Directive 2012/18/EU of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC. Available at: https://www.legislation.gov.uk/eudr/2012/18/contents.

The Construction (Design and Management) Regulations 2015 (SI 2015/51). Available at: https://www.legislation.gov.uk/uksi/2015/51/pdfs/uksi_20150051_en.pdf.

The Control of Major Accident Hazards Regulations 2015 (SI 2015/483). Available at: https://www.legislation.gov.uk/uksi/2015/483/contents/made.

The Pipeline Safety Regulations 1996 (SI 1996/825). Available at: https://www.legislation.gov.uk/uksi/1996/825/introduction/made.

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017/571). Available at: https://www.legislation.gov.uk/uksi/2017/571/contents/made.

11.3 STW upgrade, route, and outfall

11.3.1 Vulnerability to major accidents and disasters

The assessment outlined in Appendix FF indicates the events most likely to apply to the scheme are associated with:

- Inland flooding / hydrological scour from rivers / flood defence failure (to be reported in the Flood Risk and Water Environment section);
- Landslides / mass movement / ground hazards / aggressive ground conditions / mobilization of contamination / unexploded ordnance / mining (to be reported in the Geology and Soils section); and,
- Animal strikes / low temperatures / heavy snow / roadside structure failure / building fire/failure / critical infrastructure failure / utilities failure / attack on people (bomb, chemical, vehicle) / rioting and protest / traffic accidents (mitigation has been provided in Appendix FF).

Through the implementation of design, construction, and safety best practice and protocols, the likelihood of these events occurring has been limited, thereby, serious environmental effects to human health, welfare and/or the environment have also been limited. It should also be noted that the design of the pipeline will comply with the Pipelines Safety Regulations 1996, which requires the management of potential hazards to reduce accidents and disaster risk to an acceptable level.

11.3.2 Potential to lead to significant effects

The potential for the scheme to lead to significant effects has been determined utilising the assessment of vulnerability to events presented in Appendix FF and consideration of the environmental baseline outlined in sections 2-10.

The greatest potential vulnerability of the scheme relates to flooding. The STW upgrade enters areas of Flood Zone 3 and 2, and the route and outfall are primarily within Flood Zone 3. The pipeline route also crosses the Jubilee River and several ditches before reaching its outfall on the River Thames. Identified receptors with the potential to be impacted by flooding in this area include people, property, and water resources. The scheme's works area does benefit from flood defences, however, as outlined in Appendix FF and Section 5, failure of these defences may exacerbate flooding. The potential for flooding during construction of the scheme to lead to significant effects will be mitigated by best practices and safety protocols. The potential for pipeline faults or failures and subsequent contribution to potential flooding has been mitigated by design standards (see Flood Risk and Water Environment Section 5).

The potential for the scheme to lead to significant effects through critical infrastructure / utilities failure has also been considered. The pipeline is to cross a gas main and high-voltage cable located on Dorney Common, north of the B3026. Identified receptors with the potential to be impacted by infrastructure / utilities failure in this area include people, property, and infrastructure. The potential for failure of gas and electricity utilities during construction of the pipeline will be mitigated by the design and construction best practices (preliminary assessment of impact of construction activities on utilities will be undertaken and further assessment will be undertaken at detailed design with specific machine parameters) and safety protocols to prevent significant effects to human health. The risks to the gas main and high voltage cable have been further reduced by tunnelling, which will take the pipe deeper beneath them than would be using open cut methods and also means they are not exposed.

Alongside these measures, coordination and consultation with utility owners will assist in preventing faults and failures. The potential for pipeline faults or failures and subsequent impact on utilities infrastructure has been mitigated by design standards, such as BS EN 14161 and the Civil Engineering Specification for the Water Industry

(CESWI) to reinforce the application of good-practice and the identification of the use of ductile iron pipe to BS 8010 Section 2.1 for robustness.

The likelihood of the scheme to increase vulnerability elsewhere has been determined to be low.

11.4 Summary

A review of the environmental baseline information and the assessment of major accidents and disasters has determined that the risks of any event occurring will be managed to be as low as reasonably practicable, given the processes and measures that are in place as part of the scheme. Therefore, effects related to the risk of major accidents and / or disasters are not considered to be significant.

It should also be noted that the use of the scheme's construction design and management (CDM) risk register, will contribute to ongoing review and assessment of the potential for major accidents and disasters. Compliance with the CDM and other design standards will help to manage any future risks to be as low as reasonably practicable.

12. Traffic and Transport

12.1 Overview

The traffic and transport assessment will consider construction and operation impacts and mitigation. The construction assessment considers the phasing of works (that includes a high-level construction schedule), routing of construction traffic, access to the works, and vehicle movements. The operation assessment considers the traffic levels post-completion of works. The assessment considers the users of the transport network and receptors in locality of the proposed works that may be impacted by traffic movements.

12.2 Construction

12.2.1 Phasing of the Works

The construction works can be divided into two geographic locations. The first is the Slough STW to the north of the Jubilee River, the second is the outfall pipe run to the south of the Jubilee River. The exact sequence of works will be determined by the contractor once appointed however, for the purposes of assessment it is assumed that both areas of the project will be undertaken concurrently. This approach will result in completion of the works in the most realistic duration. To facilitate permitting and management of the works, traffic and transport plans will need to be developed as the project matures and close coordination with local authorities should be continued to ensure that proposals are realistic and do not impact on identified project stakeholders or receptors.

To provide a basis for the Environmental Impact Assessment screening report a high-level construction schedule has been produced based on the proposed design. This programme can be seen in Appendix H and is supported by construction phasing shown in Appendix I. The following report sections provide the narrative to these two documents to inform assessment.

12.2.1.1 Slough STW Works

The main temporary construction site offices and welfare will be established at the existing STW operational site. The first task shown on the schedule is to establish this compound and mobilise labour and construction plant needed to undertake the works. The STW will act as a centralised material storage location and whilst a 'just in time' delivery strategy would be adopted by the contractor, to minimise storage and double handling, there may be bulk materials such as pipes, fittings, and aggregates that may need to be delivered and stored at the STW shortly after mobilisation.

The largest construction activity on the STW upgrade schedule is the construction of two new 35m diameter FST structures. To excavate the 4m to formation level ~120m of sheet pile retaining wall will need to be installed. Open cut is not considered an option in this area due to proximity of boundary fencing, high ground water, and poor ground conditions. The sheet piles would most likely be installed by a tracked leader rig. The large item of plant would be mobilised to the STW site via low-loader, the sheet piles would be transported to site on flatbed articulated HDVs. Prior to excavation a dewatering system would need to be installed this could be undertaken by a series of perimeter well points or designed deep well pumps. This system will need to be designed once detailed GI is undertaken for the project but needs to take account of flow rates, contamination, and siltation. A contractor would need to manage the dewatering activities in compliance with the environmental permits for discharge and if necessary abstraction and may need to utilise silt busters, temporary attenuation ponds, or chemical treatment prior to discharge.

To counteract buoyancy the FST structures will rely upon tension piles in addition to the self-weight of the concrete. The use of piles avoids the need to have a 2.1m thick foundation slab. A 500mm thick base slab is sufficient when working with tension piles. The superstructure of the FST structures is Pre-Cast Concrete. These segments would

be brought to site on articulated flatbed HDVs the units will be lifted into position by a mobile crane. These tanks have been shown ~8months of construction.

Part way through construction of the FST structures the new ASP lane construction commences. This is relatively conventional construction; however it is near to the STW utilities corridor, and ground water is expected during the foundation excavation phase. This will require the contractor to have both a robust utilities management plan and dewatering strategy in place. Following on from construction of the ASP lane the schedule shows the ASP distribution chamber being constructed. This element of the works needs to be undertaken online and ASP lane 4 to be drained. This activity needs detailed planning and coordination with the STW operations team to ensure that the reduction in plant throughput is managed.

The conversion of the disused humus tank to a liquor tank, construction of the new pumphouse, and installation of new piping is shown over the second half of the programme. Commissioning of the new ASP lane is considered to take ~6 months due to the complexity of integrating new and old infrastructure.

12.2.1.2 Outfall Pipe Run

The outfall pipe run is a 1.75km linear element of the project that consists of both 1.4m diameter ductile iron and 1.5m diameter concrete pipe sections. The pipe run starts at the STW outlet chamber, Ch000, to the north of the Jubilee River and ends at the outfall structure, Ch1753, on the River Thames. The current design for the pipe run utilises two pipe laying techniques, pipe jacking and open cut with trench box, to traverse the natural and manmade features along the pipe route. It is likely that a contractor would utilise two specialist sub-contractors to undertake each of the construction techniques. To minimise mobilisation of additional construction plant, materials, and labour it is also likely that each of these specialist subcontractors would only undertake one work location at a time and move in a linier sequence from the STW to the River Thames. These assumptions have driven production of the high-level schedule.

Whilst the main site office and welfare is located within the STW boundary a contractor would need to establish satellite compounds closer to the workface. The schedule shows that the first month is used to establish two satellite compounds off the B3026, and adjacent to the outfall location. To gain access off the B3026 a temporary vehicle access point, compliant to Traffic Safety Measures and Signs for Road Works and Temporary Situations: Chapter 8 would be required. To gain access to the outfall location steel trackway (or similar appropriate temporary haul road installation) would be temporarily installed across Dorney Common and adjacent farmland. A temporary access bridge would also need to be installed across the Cress Brook to facilitate plant and material deliveries to the outfall location.

The first and longest pipe jack on the project is under the Jubilee River this will require a shaft to be constructed on either side of the river to launch and receive the pipe jack cutter head. The shafts are relatively deep and would be installed sequentially by a shaft installation gang. Once the shaft gang have completed the Jubilee River shafts, they will move on to construct shafts for the B3026 pipe jack, and Cress Brook pipe jack.

The schedule shows that the pipe jacking activity, undertaken by a pipe jacking gang, follows directly on from construction of the Jubilee River shafts. Once the Jubilee River pipe jack is complete the pipe jacking gang will move onto the B3026 pipe jack, and then the Cress Brook pipe jack. This sequential working pattern limits the plant and labour needed to undertake the works and smooths out the number of vehicle movements out of the site as tunnel spoil is only extracted from one location at a time. The thee pipe jack sections are shown on the schedule to take ~8 months.

The B3026 pipe jack traverses the high-pressure gas main and high voltage electric cable that crosses the pipe run to the adjacent to the B3026. Whilst the selection of a pipe jack construction method reduces the risk associated with working around each of these utilities, it does not eliminate the risk. The asset owners may require pre and

post work condition surveys utilising Ground Penetrating Radar (GPR) and geotechnical monitoring of the ground during pipe jacking. They may also require surface protection to be installed in areas where construction plant crosses the utilities.

The open cut pipe installation would require advanced works to install a designed system of well points. This will reduce the ground water level along the pipe alignment to below pipe invert level. This preparatory works is essential for a contractor to install the pipeline safely and efficiently. Due to the relatively poor ground, which consists of sand and gravels, a heavy-duty trench box will be needed to keep the trench open and allow pipe lengths to be installed one at a time. This trenching method is relatively slow, and a conservative output rate has been used in the schedule. The spoil that is excavated from within the trench box will be stored to the side of the pipe run and will be used as selected backfill. At this stage of the project, it is assumed that two thirds of the excavated material can be reused, the other third will be removed from site by six or eight wheel tipper trucks. Given the length of pipe to be installed using this method and the complex working conditions a period of ~13 months has been shown on the schedule for this activity.

The outfall construction is shown on the schedule as being constructed during the summer months when river levels and flow rates are at their lowest. The outfall structure itself will require a water excluding temporary works structure such as a sheet pile cofferdam. Other lighter weight alternatives, such as a portadam or bladder dam, are available, however further site investigation is needed to inform suitability of these solutions. A sheet pile cofferdam will require the use of a land-based crane to drive sheet piles. A contractor may also choose to utilise floating plant for either working method or safety reasons. Once a dry working environment has been created the riverbed and bank will be excavated to formation and pre-cast concrete headwall sections installed. The outfall structure is shown on the schedule as taking a period of ~8 months.

At the end of the construction schedule a short commissioning period of ~3 months is shown for valves, penstocks, and pump testing.

12.2.2 Routing of Construction Traffic

Construction traffic will be required to access two locations on the scheme; the STW and satellite compounds off the B3026. There will also be a requirement for construction traffic to move between the STW and satellite compounds off the B3026. This generates three routing options for the project.

1. From the M4 to the STW
2. From the M4 to the B3026
3. From the STW to the B3026

The routing options have been highlighted in Appendix J. The routes are generally the most direct too and from the M4, utilising main roads that are already used by STW operations staff and other HDVs. All routes take account of the identified project stakeholders and receptor, as well as avoid the major centres of Eton Wick and Eton. Both settlements have residential populations and road networks with tight turns which is not conducive to articulated HGV movements.

12.2.3 Access to the Works

Access to the STW for construction is not considered any different than STW for operation. TWUL routinely receive articulated HGVs to the site and the recent M4 widening scheme has improved the approach overbridge and immediate access road.

The satellite compounds off the B3026 will require a bell-mouth entrance that is compliant with local authority standards. The level difference for road to ground level will need to be ramped down by ~1 metre. Turning circle and swept path analysis should be considered as the design matures to ensure that HDVs and site vehicles can turn around within the site compound. Traffic control would be required for plant and vehicle movements during the period of pipe jacking and open cut pipe installation.

Indicative access arrangements off the B3026, including Temporary Traffic Management, have been highlighted in Appendix K.

12.2.4 Vehicle Movements

Based on the current proposed development a material take-off of both permanent and temporary construction material has been carried out. Based on the proposed working methods an assessment of the of number, and type, of construction plant that a may be required to undertake the works has been completed. These material volumes and equipment numbers have been converted to standard HDV vehicle movements that comply with the Road Traffic Act 1991. A summary of these total vehicle movements can be seen in Appendix K.

The following sections of the report break the vehicle movements down by location and material type and will inform the EIA screening assessment.

12.2.4.1 Temporary works

There will be a number of construction plant and equipment deliveries at the start of the project consisting of; site welfare cabins, generators, trench boxes, excavators, cranes, and earthmoving equipment. These same items of construction plant will have to be removed from the site on completion of the works. The construction plant will be mobilised and demobilised from site using articulated HGVs with a low loader trailer. This will allow the items of heavy equipment to track on and off, of the delivery vehicle. The exact number of low loader movements will be for the contractor to determine however for the purposes of assessment ~25 deliveries have been assumed for the purposes of assessment.

The largest volume of the temporary works material will be for constructing the haul road along the length of the outfall pipe trenches, as well as setting up areas for the main welfare and satellite welfare. To prevent damage to Dorney Common and surrounding fields it is assumed that a contractor would utilise a steel trackway system or similar. These are delivered using a HIAB lorry and trailer combination. To deliver the ~1750m length of access road ~100 of these HIAB lorry and trailer combinations would be required, the same number would be required at the end of construction to remove the trackway.

As previously mentioned, open cut is not the preferred construction method for the two 35m diameter FST tanks, largely due to the 4m depth of the bases. Therefore, it is assumed that a contractor would install a temporary steel sheet pile retaining wall using a tracked leader piling rig, around each of the FST structures before main construction can commence. The sheet piles would be delivered to site on ~15 flatbed articulated HGVs along with the additional sheet piles for the outfall headwall and coffer dam.

Once the vertical shafts are constructed on the outfall route, it is expected that the contractor will look to bring a specialist pipe jacking contractor to site to construct the tunnel sections. These are the outfall sections under the Jubilee River, the B3026 and the Cress Brook. It expected that the specialist pipe jacking contractor will require ~5 flatbed articulated HDVs to transport their Tunnel Boring Machine (TBM), jacks, thrust ring and control equipment

12.2.4.2 STW

There are three significant new structures at the STW; the two 35m diameter FSTs and the 64m by 16m ASP lane. The formation level for the tanks and ASP lane, are 5.2m and 4.45m below existing ground respectfully. Removal of this volume of overburden translates to a significant number of vehicle movements off site. There is an opportunity to reuse some suitable material onsite to landscape areas of the site. However, if all material were to be removed from site this would be ~1,350 tipper lorry movements for all three structures. The new structures will require ready mix concrete deliveries during construction. To counteract the effects of buoyancy caused by high ground water the foundation slabs of the structures are ~2.1m thick. This requirement increases the concrete volumes for the project and converts to ~500 concrete wagons for all structures, over the construction period.

To assist in the EIA screening assessment the calculated vehicle movements have been overlaid on the 24-month construction schedule, see Appendix K. This allows the assessment to consider the likely traffic movements during each of the project phases which is more realistic than assessment of total vehicle movements in isolation. The STW construction vehicle movements have been shown as separate from the rest of the project as they will utilise the M4 to STW routing as shown in section 12.2.3 above.

12.2.4.3 Outfall Pipe

The largest volume of material to be removed for the construction site along the outfall pipe will be from the trenching work. It has been assumed in the material take-off that two thirds of the excavated material can be used as selected trench reinstatement material and therefore does not need to be removed from site. This leaves the remaining one third of arisings to be removed from site including the excavated material from the shafts which converts to ~370 tipper lorries. There will also be pipe bedding and pipe surround material that needs to be imported to site this is calculated as ~215 tipper lorries. The pipe material that has been selected for use on the project is ductile iron this is available in 3m and 6m lengths. It is assumed that a contractor would bring in 6m lengths of pipe to minimise the number of joints in the pipe run. The relatively large, 1.4m diameter, pipe would mean only a small number of pipe lengths could be transported at any time on a standard articulated flatbed lorry. When taking this into consideration ~150 lorries would be required to transport the pipe sections to site.

To facilitate construction of the outfall it is assumed that the contractor will install a temporary sheet piled cofferdam. These sheet piles, along with supporting piling equipment, will require ~6 flatbed articulated HGVs for the delivery and subsequent collection.

The proposed ductile iron pipe sections for the 1.75km pipe run are 1.4m in diameter, and 6m long. It is calculated that there will be a requirement for ~150 lorries to deliver these sections to site.

To assist in the EIA screening assessment the calculated vehicle movements have been overlaid on the 24-month construction schedule, see Appendix K.**Error! Reference source not found.**This allows the assessment to consider the likely traffic movements during each of the project phases which is more realistic than assessment of total vehicle movements in isolation. The outfall construction vehicle movements have been shown as separate from the rest of the project as they will utilise the M4 to B3026 routing as shown in section 12.2.3 above.

12.2.4.4 Opportunities

The construction works have been phased to smooth out vehicle movements across the construction period. As the project matures and the construction methods are refined the volume of temporary materials could be reviewed.

The design of the tanks and structures is based on a worst-case assessment of ground conditions, following a ground investigation survey the foundation design could be refined to reduce the volume of excavation and

concrete required for construction. This design development could reduce the number of vehicle movements to and from the site.

12.3 Operation

Operation of the outfall, pipeline, and supporting infrastructure is not understood to require an increase in number of trips for day-to-day operation. Based on the future sludge vehicle movement predictions, it is indicated that there would be a 4% decrease in vehicle movements per day up until the scheme design horizon (see Table 12.1), with further decreases beyond this time. The number of operations personnel on the STW is not understood to increase and the increase in the number of chemical deliveries will be negligible due to the upgrade scheme, therefore, traffic movements will be no greater than current levels during operation.

Table 12.1: Summary of Sludge Vehicle Movements.

	Existing (m3/day)	Future (m3/day)	Existing Vehicle Movements (number/day)	Future Vehicle Movements (number/day)
Sludge Imports	257	238	9	8
Sludge Cake Exports	103	110	3	4

Routine maintenance of the outfall, pipeline, and supporting infrastructure may require infrequent trips. These would be small scale and intermittent, therefore, also not considered to significantly impact traffic movements during operation.

Table 12.2: Summary of the assessment of traffic and transport.

Assessment of Traffic and transport Effects	Significance of Effects	Mitigation Measures
During construction: *The construction assessment considers the phasing of works (that includes a high-level construction schedule), routing of construction traffic, access to the works, and vehicle movements.* *All routes take account of the identified project stakeholders and receptor, as well as avoiding the major centres of Eton Wick and Eton.*	*No significant environmental effects are expected from traffic and transport during the construction phase.*	*Construction traffic will be required to use identified preferred routing options and traffic management. All routes take account of the identified project stakeholders and receptors, as well as avoiding the major centres of Eton Wick and Eton.*
During operation: *Traffic movements are not considered to increase compared against current levels during operation.* *Future sludge vehicle movement projections indicate that there would be a 4% decrease in vehicle movements per day up until the scheme design horizon and decrease further beyond.* *Routine maintenance is not considered to significantly impact traffic movements during operation.*	*No significant environmental effects are expected from traffic and transport during the operation phase.*	*No mitigation measures recommended for operational phase.*

13. Cumulative Effects

13.1 Overview

The EIA Regulations 2017 require the consideration of the characteristics of development with regard to "cumulation with other existing development and/or approved development" (Schedule 3, Paragraph 1b), and consideration of the types and characteristics of the potential impact with regard to "the cumulation of the impact with the impact of other existing and/or approved development" (Schedule 3, Paragraph 3g) as part of screening for Schedule 2 development.

Both combined and cumulative effects occur when a receptor (or group of receptors) is subject to more than one effect over time, which are generally additive or interactive in nature. Combined effects arise from the interaction of more than one of the environmental topics of the project, pertaining to the EIA Regulations 2017 Schedule 3, Paragraph 3g. Cumulative effects arise from the interaction of effects of the scheme with the effects of others, pertaining to the EIA Regulations 2017 Schedule 3, Paragraph 1b.

The methodology for both combined and cumulative effects is presented in Appendix GG.

It should be noted that there may be fluctuations in vehicle movements for general maintenance activities on the STW site in accordance with TWUL duties as a Statutory Undertaker, however, these are not currently defined and are therefore not considered further in this section.

13.2 Policy

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017/571). Available at: https://www.legislation.gov.uk/uksi/2017/571/contents/made.

13.3 Combined Effects

The assessments contained in Sections 2 to 10 describe specific impacts on individual receptors in terms of a range of environmental topics. In many instances, the range of potential impacts on receptors are addressed within each topic-specific section.

For example, in Section 4, the ecology assessment considers the potential for multiple effects on habitats and species from changes in water quality, vibration, and direct impacts from land-take. Similarly, in Section 10, the human health assessment considers the potential for multiple effects from changes in air quality, noise, vibration, risk of accidents and disasters, severance of access, and direct impacts from land-take.

There are also key receptors, principally local residents, and users of open spaces and agricultural land, with the potential to experience combined effects within the study areas for the scheme as identified in Table 13.1.

Table 13.1: Potential combined effects.

Affected receptors	Summary description of combined effects	Topics with shared receptors
Residents in close proximity to the scheme	There would be combined minor effects on residents at properties in the vicinity of the project (typically within 500 m) during construction and operation due to: • a worsening of human health as a result of emissions (negligible); • changes in views (significant adverse during construction, neutral during operation); and, • disruption to or loss of access/severance (low).	Air quality (Section 2) Landscape and visual (Section 8) Population and human health (Section 10)
Users of community facilities, public open space, and public rights of way	There would be combined minor effects on users of community facilities, public open spaces and public rights of way in the vicinity of the project during construction and operation due to: • a worsening of human health as a result of emissions (negligible); • changes in views (significant adverse during construction, neutral during operation); and, • disruption to or loss of access/severance (low).	Air quality (Section 2) Landscape and visual (Section 8) Population and human health (Section 10)
Agricultural land holdings	There would be combined minor effects on agricultural landholdings in the vicinity of the project during construction and operation due to: • degradation of soil quality (low); • disruption to local economy and employment (low); and, • disruption to or loss of access/severance (adverse during construction, neutral during operation).	Geology and soils (Section 6) Population and human health (Section 10)

These effects, whilst considered individually within each specific topic section, also have the potential to interact and combine, thus increasing the potential significance of such effects, both alone and in combination. Overall, the combined effects are considered minor, and through mitigation identified in the individual specific topic sections the effects can be minimised. It should also be noted that many of the effects are associated with the temporary construction impacts and will not be realised following completion and during operation.

13.4 Cumulative Effects

The long list of identified other projects is presented in Appendix HH. The long list totalled ten other projects that were individually subjected to Step 2 of the cumulative effects assessment, of which one other project was included in the short list. The identified short list of other projects is presented in Table 13.2.

Table 13.2: short list of other projects.

Application Reference	Applicant Name	Description of Development	Approval Status	Allocation Policy	Local Plan	Tier	Type of Development
TR010019	M4 Junctions 3 to 12 Smart Motorway	Works to upgrade the M4 Motorway to a Smart Motorway between Junctions 3 to 12	Application permitted	N/A	N/A	2	Infrastructure – Transport

The other project relates to the upgrade of sections of the M4 Motorway to a Smart Motorway. The other project's scheme boundary will intersect with the Slough STW upgrade scheme boundary along the STW's northern boundary near the M4, near and in areas along the STW's eastern boundary (specifically the Wood Lane overbridge), and near and in areas along the STW's western boundary (specifically the Oldway Lane overbridge). The study area for the other project stretches 250m to the northern half of Eton Wick, ending before the B3026. The majority of M4 upgrade works are to be located within the existing highways boundary, meaning that no crossover between the proposed STW upgrade and the M4 upgrades are envisaged. The M4 upgrade works will not affect the outfall and associated pipeline.

Utilising information provided via The Planning Inspectorate's National Infrastructure Planning project search function, which included pre-application scoping report and application Environmental Statement, it has been possible to assess the cumulative effect of the other project with the Slough STW scheme. Based on the construction programme for the M4 upgrades, commissioning for the other project should be completed by Spring 2022. This means that there will be a considerable gap between the completion of the other project and the mobilisation of the Slough STW scheme. Due to this gap, baseline information for both schemes, proposed mitigation measures, and the nature of both schemes, construction and operation are predicted not to lead to overall significant cumulative effects. A summary of cumulative effects is provided below:

- Air quality – no construction cumulative effects, and no significant operational cumulative effects;
- Ecology – no construction cumulative effects, and following implementation of mitigation, operational cumulative effects will be neutral;
- Flood risk and water environment – no construction cumulative effects, and no significant operational cumulative effects;
- Geology and soils – no construction cumulative effects, and no significant operational cumulative effects;
- Heritage and archaeology – no construction cumulative effects, and no operational cumulative effects;
- Landscape and visual – no construction cumulative effects, and no significant operational cumulative effects;
- Noise and vibration – no construction cumulative effects, and no significant operational cumulative effects;
- Population and human health – no construction cumulative effects, and neutral operational cumulative effects; and,
- Traffic and transport – no construction cumulative effects, and negligible operational cumulative effects.

14. Summary and Conclusions

14.1 Summary

The proposed works on the operational STW site will comprise new tanks plant and equipment as follows: new ferric sulphate dosing and storage, upgraded inlet screen, extension to existing elevated inlet works, new concrete aeration lane, new aeration lane distribution chamber and returned activated sludge (RAS) mixing chamber, new RAS pumping station, new centrate liquors buffer tank (reuse of existing tank) and pumping station, two new concrete final settlement tanks (FST), outfall pumping station (for a portion of the final effluent), and associated pipework, cabling for power and telemetry, access and security upgrades. All the above upgrade works will be located within the existing STW site operational boundary.

The offsite development will consist of a new outfall pipe and outfall structure. The outfall pipe utilises open cut and pipe jacking / tunnelling methods to reach the new outfall structure on the River Thames, with all watercourses along the route tunnelled under.

The scheme is regulatory driven and included in the Ofwat approved Business Plan for 2020 to 2025 and has a number of benefits to the environment, public and surrounding area and will provide increased capacity and resilience to accommodate population growth within the catchment up to 2031 for the STW and for the next 80 years for the outfall. A key benefit and function will be the improvement to the constrained ditch system which receive the current treated effluent discharge. By removing the peak final effluent flow and pre-treated storm flows into the Roundmoor and Boveney ditch system, there will be a reduction in the flood impact to the Eton Wick residents and users of Dorney Common, caused by the overtopping and overwhelming of the ditches.

The improvements to the existing STW treatment process to create a more effective and resilient system will have benefits to the wider water quality parameters, positively affecting the habitats and species, with the aim of supporting the improvement of it's WFD status. In addition, the removal of the pre-treated storm flows into the ditch system and directing them underground to the River Thames means the public that live near to and the animals that live in and use the ditches are not exposed to the pre-treated storm effluent.

The primary objective of the scheme is to make the site compliant with its future Environmental Permit requirements and more resilient for the future growth within the catchment. These will be regulated by the Environment Agency through the existing environmental permitting regime. TWUL are also regulated by Ofwat on various environmental targets and obligated to environmental management under the Water Industry Act, as well as having their own asset standards to comply to, for example performance commitments to net gain in biodiversity.

The environmental assessments within this report have identified the following conclusions in relation to the STW upgrade, outfall pipeline and outfall structure. Overall it is deemed that the proposed development is not likely to give rise to any significant environmental effects; and it is therefore considered that an Environmental Impact Assessment is not required:

Table 14.1: Summary of individual specific topic sections.

Assessment of Effects	Significance of Effects	Mitigation Measures
Air Quality and Odour		
During construction: *Impacts from odour are not expected during construction.* *Negligible to low risk of dust impacts.* *Negligible risk of impacts of emissions from construction plant and machinery and emissions from construction-related road traffic.*	*No significant environmental effects are expected from air quality and odour during the construction phase.*	*Provide general site management and good housekeeping procedures (see Section 2.5.6 and 2.6.5 for details).* *Implement a CEMP, which includes measures to control or mitigate potential adverse impacts caused by the construction works (see Section 2.5.6 and 2.6.5 for details).*
During operation: *Odour impacts are unlikely to have significant effects due to the design of the site upgrades and the proposed plant upgrades not being significant sources of odour (see Section 1.3.1 for list of assets).* *Negligible risk of impacts of emissions from operation-related road traffic.*	*No significant environmental effects are expected from air quality and odour during the operation phase.*	*The proposed changes to the STW will result in an improvement (i.e., reduction) in odour emissions at the site through the design.* *TWUL will continue to operate the Slough STW in accordance with the existing Odour Management Plan (document reference AM-OMP Slough STW dated March 2016) and their Asset Standards .*
Carbon and Climate Change		
During construction: *Embodied carbon related to the construction: 113,500 tCO2e* *Plant Machinery fuel use: 770 tCO2e*	*The most significant contributor to the total amount of carbon equivalent emission from the project is from embodied carbon of materials and products used in construction.*	- *Use low carbon and recycled materials.* - *Use of carbon management tools* - *Reduce material quantity where possible* - *Use hybrid and electric plant* - *Use of low emission or electric vehicles* - *Seek to minimize number of construction days*
During operation: *Operational Energy use of the new STW upgrade assets: 250 tCO2e*	*Other operational carbon emissions such as embodied carbon from maintenance materials and operational waste are expected not to have a significant impact on the overall emissions.*	- *Potential use of renewable energy on site.* - *Increased production of renewable energy from existing assets.* - *Offsetting measures*

Assessment of Effects	Significance of Effects	Mitigation Measures
Ecology		
During construction: *No designated sites or priority habitats will be negatively affected during construction.* *The scheme will result in the minor, temporary loss of Deciduous Woodland priority habitat at the Cress Brook temporary crossing.* *Protected species surveys identified a badger footprint on the STW site and Schedule 1 and priority bird species were seen or heard on the STW site and along the route of the outfall. No other signs have been found on the STW site and along the route of the outfall. Some trees with potential bat roost features were identified, of which one tree with low potential is likely to be felled.* *The proposed outfall on the River Thames has the potential to disrupt riparian, bankside and marginal habitat.*	*No significant environmental effects are expected from terrestrial and aquatic ecology during the construction phase.*	*A CEMP will be prepared for works within Jubilee River and Dorney Wetlands LWS and Dorney Common and Cress Brook LWS. Additionally, the LPA will be contacted regarding the works in these areas (see details in Section 4.3.3 and 4.4.3).* *A CEMP will be prepared to detail the mitigation measures for the construction of the outfall on the River Thames, temporary bridge across the Cress Brook, and to ensure overall environmental protection and management during the works (see details in Section 4.4.3.11).* *TWUL has a performance commitment that on all projects where there is permanent habitat loss, a net gain in biodiversity must be achieved as a result of the project. Outline areas for reinstatement (including the Deciduous Woodland at the Cress Brook crossing), replacement and enhancement have been identified and are shown on the Landscape and Biodiversity Enhancement Plan.*
During operation: *No designated sites, priority habitats or protected species will be affected during operation.* *A beneficial impact of the scheme relates to improvements to water quality in the Roundmoor and Boveney Ditch upon operation of the proposed new outfall and maintenance of a base-flow.*	*No significant environmental effects are expected from terrestrial and aquatic ecology during the operation phase. Beneficial impacts are anticipated due to improved water quality in the Roundmoor and Boveney Ditch.*	*No mitigation measures recommended for operational phase.* *TWUL has a performance commitment that on all projects where there is permanent habitat loss, a net gain in biodiversity must be achieved as a result of the project. Outline areas for reinstatement, replacement and enhancement have been identified and are shown on the Landscape and Biodiversity Enhancement Plan.*

Assessment of Effects	Significance of Effects	Mitigation Measures
Flood Risk and Water Environment		
During construction: *The STW site is not within an area of flood risk (Flood Zone 1). The pipe and outfall are located in Flood Zone 2 and 3.* *Construction impacts are largely associated with localised scour of channel bed and banks, riparian vegetation clearance, and potential fine sediment release. These will all be managed via implementation of construction best practice.*	*No significant environmental effects are expected from flood risk and water environment during the construction phase.*	*Prior to construction activities an Environmental Management Plan (EMP) will be written to provide the specific measures to mitigate impacts of construction activities on local watercourses. This would include the management of dewatering, silt-laden runoff, riparian vegetation removal, pollutants, and construction drainage.* *Environmental Permits would be applied for relevant activities such as discharges with appropriate risk assessments and methodologies approved.* *The EMP will be provided to the contractor to incorporate into the CEMP.*
During operation: *The STW site is not located in an area of flood risk (Flood Zone 1). The pipe and outfall are located in Flood Zone 2 and 3.* *The proposed development of the STW site will not generate major areas of new hardstanding. Any hardstanding areas that are no longer required once construction has been completed will be returned to their original state and thus surface water run-off will be reduced.* *The additional new structures within the STW site should not impede any groundwater flow.* *The proposed new outfall will reduce flood risk from Roundmoor Ditch, including at Eton Wick and Dorney Common.* *The quality of the water that will be discharged will be improved which will have a beneficial impact on the environment.*	*No significant environmental effects are expected from flood risk and water environment during the operation phase.* *Beneficial impacts are anticipated due to reduced flood risk from Roundmoor Ditch and improved water quality discharge.*	*No mitigation measures recommended for operational phase. Residual risks and their management are included in Appendix X.*

Assessment of Effects	Significance of Effects	Mitigation Measures
Geology and Soils		
During construction: *The proposed works within the STW and along the outfall route are not expected to result in significant adverse impacts to identified receptors (agricultural soil, surface water, groundwater, construction and maintenance workers and local residents) based on the implementation of mitigation measures and best practice in construction to sever potential contaminant pathways during the works and protect soil resources.* *There is potential to cause damage to high grade agricultural soils if mitigation measures are not incorporated into the proposed construction works.*	*Given the existing site use and the best practice mitigation measures proposed, the construction activities are not expected to result in significant adverse impacts on sensitive receptors with regards to ground contamination.* *No significant environmental effects are expected from geology and soils during the construction phase.*	*A Soil Management Plan will be developed for the topsoil and subsoil strip which will be required to install the temporary construction compound. The land will be reinstated following the construction phase.* *A CEMP will be developed for the construction works to outline mitigation measures in accordance with environmental commitments. The CEMP will include measures for the storage and handling of soils, unforeseen contamination, materials and waste, and waste management.*
During operation: *No adverse impacts are anticipated from the operation of the scheme as it is not expected to result in potential pollutant linkages.*	*No significant environmental effects are expected from geology and soils during the operation phase.*	*No mitigation measures recommended for operational phase.* *Any adverse operational effects from ground contamination will be prevented by industry standard control measures as is currently practised at the STW.*

Assessment of Effects	Significance of Effects	Mitigation Measures
Heritage and Archaeology		
During construction: *The STW upgrade, pipeline and outfall will not physically affect the status of any statutory designations.* *The primary impacts to setting are during the construction period, and effects will only be temporary.* *In terms of non-designated archaeological remains, following implementation of mitigation measures the residual impact of the route would be negligible. The outfall structure is located on previously disturbed ground, reducing potential risk to archaeological assets.*	*No significant environmental effects are expected to heritage and archaeology during the construction phase.*	*Given the likely extent of ground disturbance within the STW boundary, the need for archaeological mitigation would likely be determined by the survival, or otherwise, of historic soil profiles which is not thought to be likely due to previous disturbance.* *Implementation of pre-construction archaeological investigation, which would inform the need for and provide the scope of a robust programme of mitigation. These phases of investigation will be carried out at the earliest opportunity to leave sufficient time for the formulation of an appropriate mitigation strategy which will be incorporated within the CEMP.*
During operation: *Given the scale of the design proposals, changes to setting from the proposed upgrade within the STW boundary are negligible.*	*No significant environmental effects are expected to heritage and archaeology during the operation phase.*	*No mitigation measures recommended for operational phase.*

Assessment of Effects	Significance of Effects	Mitigation Measures
Landscape and Visual		
During construction: *Very localised effects on landscape character and landscape receptors with permanent effects are limited to the removal of scrub and recent planting within the STW, and removal of small numbers of mature trees along the outfall route at the Cress Brook temporary crossing. Landscape character and landscape effects are considered likely to be significant adverse at Dorney Common only, and this will only be during the construction phase for a short-term duration. The effects on residential visual amenity are not significant.* *Temporary effects upon visual receptors during the construction phase will be short in duration and will vary with distances between the construction activities and the receptors.*	*No significant permanent environmental effects are expected from landscape and visual impacts during the construction phase.*	*A CEMP will be implemented that will include mitigation measures identified in Section 8.3.3 and 8.4.3, for example: construction works and temporary facilities should be located greater than 15m from the root protection area of retained trees and hedgerows; breaks in the linear vegetation on the STW southern boundary should be planted with hedgerows and trees consistent with operational access and depth of cover over new infrastructure; and, compensatory planting in nearby locations within the STW should be provided where direct replacement of lost vegetation is not possible. The Outline Landscape and Biodiversity Enhancement Plan also outlines mitigation opportunities (see Appendix W).*
During operation: *Ongoing restoration of disturbed areas to original uses can be expected to continue during the first year of the operational phase. During this period ongoing local degrading of the landscape character will remain temporary and will not cause significant adverse effects.* *During the operational phase the new infrastructure within the STW will be low level and of low visibility in the wider landscape and no significant visual effects will arise. Incidence of new infrastructure within the landscape outside of the STW will be restricted to access covers at ground level along the outfall route which will not lead to significant adverse effects at any location.* *It is considered that the adverse visual effects of the new outfall installation will not be significant.*	*No significant environmental effects are expected from landscape and visual impacts during the operation phase.*	*Ongoing mitigation measures to be outlined in the CEMP and Outline Landscape and Biodiversity Enhancement Plan (Appendix W).*

Assessment of Effects	Significance of Effects	Mitigation Measures
Noise and Vibration		
During construction: *It is considered unlikely that there would be any adverse impact during the construction phase of the STW upgrade, pipeline and outfall at the closest noise sensitive receptors.* *There would be no adverse impacts from vibration during the STW upgrade. Vibration from construction activities along the pipeline may result in very limited annoyance to sensitive receptors.* *Given the busy nature of the roads in the area it is not anticipated that the addition of the required construction traffic would cause a significant effect.*	*No significant environmental effects are expected from noise and vibration during the construction phase.*	*Embedded mitigation includes the use of plant no older than five years within the STW, which is likely to be the quietest available plant.* *All construction activity will be managed in accordance with BS 5228-1, which requires that noise control measures should be adopted. The contractor will implement a management plan to control noise and vibration during the construction phase. The management plan would include general procedural measures that represent examples of best practice on construction sites (see Section 9.3.3 and 9.4.3 for details).*
During operation: *It is considered unlikely that there would be any noticeable increase in operational noise from the STW at residential receptors on Wood Lane, therefore, significant operational noise impacts are not anticipated.* *The operation of the outfall once complete would not be noise generating. The discharge of the outfall into the River Thames would be underwater and therefore not generate noise. Significant noise impacts are therefore not anticipated.*	*No significant environmental effects are expected from noise and vibration during the operation phase.*	*No mitigation measures recommended for operational phase.*

Assessment of Effects	Significance of Effects	Mitigation Measures
Traffic and Transport		
During construction: *The construction assessment considers the phasing of works (that includes a high-level construction schedule), routing of construction traffic, access to the works, and vehicle movements.* *All routes take account of the identified project stakeholders and receptor, as well as avoid the major centres of Eton Wick and Eton.*	*No significant environmental effects are expected from traffic and transport during the construction phase.*	*Construction Traffic will be required to use identified preferred routing options and traffic management. All routes take account of the identified project stakeholders and receptors, as well as avoiding the major centres of Eton Wick and Eton.*
During operation: *Traffic movements will be no greater than current levels during operation.* *Future sludge vehicle movement projections indicate that there would be a 4% decrease in vehicle movements per day up until the scheme design horizon and decrease further beyond.* *Routine maintenance is not considered to significantly impact traffic movements during operation.*	*No significant environmental effects are expected from traffic and transport during the operation phase.*	*No mitigation measures recommended for operational phase.*

14.2 Conclusions

This report has been produced to support a request for an Environmental Impact Assessment Screening Opinion from the local planning authorities, Buckinghamshire Council (South Bucks Area) and Slough Borough Council, in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 for the proposed upgrade to the Slough Sewage Treatment Works and the associated new outfall to the River Thames. Jacobs has carried out an assessment of the scheme on behalf of TWUL to enable Buckinghamshire Council (South Bucks Area) and Slough Borough Council to provide a formal Screening Opinion of the scheme.

Subject to EIA not being required, TWUL plan to utilise permitted development rights for all of the scheme where applicable and submitting a planning application for the temporary highway access to the works compound off the B3026, if deemed necessary following consultation with the LPA.

Details of the embedded mitigation measures outlined within this report will be included in a CEMP produced and implemented by a contractor employed by TWUL undertaking the construction of the scheme. The CEMP, as well as an outline Environmental Management Plan, will form part of the contractor's documentation to be integrated into the delivery of the scheme.

There will be some temporary disruption while the improvements and new infrastructure are installed and constructed but this is outweighed by the long-term benefits highlighted above and throughout the report.

As described in this report, given the location, type and scale of the project, the proposed development is not likely to give rise to any significant environmental effects; and it is therefore considered that an Environmental Impact Assessment is not required.

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Appendix A. Glossary

Term	Description
Air Quality Management Area (AQMA)	An area declared by a local authority which has been determined will exceed the relevant air quality objective.
Baseline	In environmental assessment, 'baseline conditions' are the environmental conditions in existence before the occurrence of an impact from a development i.e. they are the existing conditions that would be affected.
Common land	Area of land over which certain people have traditional rights, such as access on foot, to graze livestock or collect firewood. It is owned for example by a local council, privately or by the National Trust. It is usually referred to as a common.
Consent	A statutory permission given to an applicant by a statutory authority, such as the local planning authority or the Secretary of State, that allows a development to be carried out within a specific area of land.
Conservation area	An area designated under section 69 of the Planning (Listed Building and Conservation Areas) Act 1990 as being an area of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance.
Cumulative effects	Effects upon the environment that result from the incremental impact of an action when added to other past, present or reasonably foreseeable actions. Each impact by itself may not be significant but can become a significant effect when combined with other impacts.
Designation/ Designated	Area of land which has been given a special status due to its particular characteristic or purpose. Normally there are restrictions on activities and developments that might affect a designated or protected area. Local authorities and other statutory authorities such as Environment Agency can designate an area of land providing that it is a matter of public interest.
Effect	Term used to express the consequence of an impact. The significance of effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Flood risk	The exposure, vulnerability and hazard associated with flooding.
Floodplain	A floodplain is a land over which water flows or is stored during a fluvial flood event or would flow but for the presence of flood defences. It is categorised into different zones based on the flood risk. The zones comprise Flood Zone 1, Flood Zone 2, Flood Zone 3

	with Flood Zone 3 is split into two different types of zones: Flood Zone 3a and Flood Zone 3b (functional floodplain).
Green Belt	A designation for land around certain cities and large built-up areas, which aims to keep this land permanently open or largely undeveloped. The purpose of the Green Belt is to: • check the unrestricted sprawl of large built-up areas • prevent neighbouring towns from merging • safeguard the countryside from encroachment • preserve the setting and special character of historic towns • assist urban regeneration by encouraging the recycling of derelict and other urban land Green Belts are defined in the development plan of a local planning authority.
Greenhouse gases (GHG)	A gaseous compound that absorbs infrared radiation and traps heat in the atmosphere. Greenhouse gases are usually expressed in terms of carbon dioxide equivalent (CO_2e).
Heritage assets	The historic environment assets such as archaeological remains, historic buildings and historic landscapes which have archaeological, architectural, artistic or historic value.
Landscape	An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. European Landscape Convention (ELC) 2000. About the relationship between people and place. Inclusive, covering natural, rural, urban, and peri-urban areas and applies not only to special or designated landscapes or countryside but to everyday or degraded landscapes. 'A resource that results from the way that different components of our environment - natural and cultural - interact together and are perceived. (GLVIA3).
Landscape and visual impact assessment (LVIA)	A "... tool used to identify and assess the significance of and the effects of change resulting from... a project on both the landscape as a resource and on people's views and visual amenity." (GLVIA3)
Landscape character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse. (GLVIA3)
Landscape Receptor	Defined aspect of the landscape resource that potentially could be affected by the project.

Listed building	A building or structure designated under section 69 of the Planning (Listed Building and Conservation Areas) Act 1990 as being of special architectural or historic interest.
Local green space	Protective designation of green areas of particular importance to local communities. Local Green Space should only be designated where: • the green space is reasonably close to the community it serves • the green area is clearly special to a local community and holds a particular local significance, for example because of its beauty, historic significance, recreational value (including as a playing field), tranquillity or richness of its wildlife • the green area concerned is local in character and is not an extensive tract of land. Land designated as Local Green Space in a local or neighbourhood plan has the same level of protection as Green Belt.
Local Nature Reserve (LNR)	Sites that are designated by the local authority under Section 21 of the National Parks and Access to the Countryside Act 1949 for nature conservation which have wildlife or geological features that are of special interest locally.
Local plan	A statutory development plan prepared by the local planning authority in consultation with the local community. It sets out the vision and framework for the future development of the local area with detailed policies to address needs and opportunities in relation to housing, the economy, community facilities and infrastructure, as well as environmental protection.
National character area (NCA)	Natural England has divided England into 159 distinct natural areas. Each is defined by a unique combination of landscape, biodiversity, geodiversity, history, and cultural and economic activity. Their boundaries follow natural lines in the landscape rather than administrative boundaries.
Public right of way (PRoW)	A widely known right to cross private land is known as a 'right of way'. If this is a right granted to everyone it is a 'public right of way'.
Receptor	A defined individual environmental feature usually associated with population, fauna and flora that have potential to be impacted by a development.
Scheduled monument	Scheduled monuments are protected by law designated under the Ancient Monuments and Archaeological Areas Act 1979 and are, by definition, of national importance.
Setting (cultural heritage)	The setting of an asset is the surroundings in which a place is experienced, while embracing an understanding of perceptible evidence of the past in the present landscape.

Significance	A measure of the importance, or gravity, of the environmental effect, defined by significance criteria specific to the environmental aspect.
Site of Special Scientific Interest (SSSI)	Site designated as being of special interest for its flora, fauna or geological or physiographical features and protected under the Wildlife and Countryside Act 1981.
Special Protection Area (SPA)	A site designated under the Birds Directive due to its international importance for the breeding, feeding, wintering, or the migration of, rare and vulnerable species of birds.
Walkers, cyclists and horse riders (WCH)	A term to describe users of PRoW, e.g. pedestrians, cyclists or horse riders.

Appendix B. Acronyms and Abbreviations

Acronym /Abbreviation	Description
AADT	Annual average daily traffic
AMP7	Seventh Asset Management Period, running from 2020 to 2025
AONB	Area of Outstanding Natural Beauty
API	Air Photo Interpretation
AQMA	Air Quality Management Area
AQO	Air quality objective
AQS	Air quality strategy
ASP	Activated sludge plant
BMERC	Buckinghamshire and Milton Keynes Environmental Record Centre
BNG	Biodiversity Net Gain
BOA	Biodiversity Opportunity Area
BW	Bridleway
Capex	Capital expenditure
CDM	Construction (design and management)
CEMP	Construction Environmental Management Plan
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
db	Decibel
DBA	Desk-based assessment
Defra	Department for Environment, Food and Rural Affairs

DMRB	Design Manual for Roads and Bridges
DWF	Dry weather flow
EA	Environment Agency
ECoW	Ecological Clerk of Works
eDNA	Environmental DNA
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPS	European Protected Species
EPSL	European Protected Species Licences
FP	Footpath
FST	Final Settlement Tanks
FTE	Full Time Equivalent Employee
FtFT	Flow to Full Treatment
GCN	Great crested newt
GHG	Greenhouse gas
GIS	Geographical Information Systems
GLVIA3	Guidelines for Landscape and Visual Impact Assessment
GPDO	Town and County Planning (General Permitted Development) (England) Order 2015
GPR	Ground Penetrating Radar
ha	Hectare
HEA	Historic England Archive
HER	Historic Environment Record

HGV	Heavy goods vehicle (also includes heavy duty vehicles)
HIAB	Hydrauliska Industri AB lorry - a lorry mounted crane
HLC	Historic Landscape Characterisation
HS2	High Speed 2
IAIA	International Association for Impact Assessment
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment
IRZ	Impact Risk Zone
IUCN	International Union for Conservation of Nature
km^2	Square Kilometer
kVa	Kilo-volt-ampere
kW	Kilowatt
kWh	Kilowatt hour
l/s	Litres per second
$L_{Aeq,16h}$	Annual average noise levels for the 16-hour period between 0700 – 2300
$L_{Aeq,T}$	Average of the total sound energy (Leq) measured over a specified period of time (T), weighted to take into account human hearing
LAQM	Local Air Quality Management
LCA	Landscape Character Area
LDV	Light duty vehicles
LNR	Local Nature Reserve
LOAEL	Lowest Observed Adverse Effect Level
LPA	Local Planning Authorities

LWS	Local Wildlife Site
MAFF	Ministry of Agriculture, Fisheries and Food
MAGIC	Multi-Agency Geographic Information for the Countryside
mAOD	Metres above ordnance datum
MCA	Multicriteria Assessment
MEWP	Mobile Elevating Work Platforms
NBN	National Biodiversity Network
NCA	National Character Area
NCN	National Cycle Network
NERC	Natural Environment and Rural Communities
NGR	National Grid Reference
NHLE	National Heritage List for England
NNR	National Nature Reserve
NO_2	Nitrogen dioxide
NOEL	No Observed Effect Level
NO_x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NPSNN	National Policy Statement for National Networks
NSIP	Nationally significant infrastructure project
OMP	Odour Management Plan
ONS	Office for National Statistics

Opex	Operational expenditure
PE	Population Equivalent
PM_{10}	Particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of 2.5 microns or less
PRA	Preliminary Roost Assessment
PRoW	Public rights of way
RBWM	Royal Borough of Windsor and Maidenhead
RoFSW	Environment Agency Risk of Flooding from Surface Water
RPA	Root protection area
SAC	Special Area of Conservation
SBC	Slough Borough Council
SFRA	Strategic Flood Risk Assessment
SOAEL	Significant Observed Adverse Effect Level
SSSI	Site(s) of Special Scientific Interest
STW	Sewage Treatment Works
TBM	Tunnel Boring Machine
tCO_2e	Tonnes of carbon dioxide equivalent
TPO	Tree preservation order
TVB LEP	Thames Valley Berkshire Local Enterprise Partnership
TVERC	Thames Valley Environmental Record Centre
TWUL	Thames Water Utilities Limited
UKHabs	Habitat Characteristic Assessments

UT	Upper Tier
UXO	Unexploded ordnance
WCA	Wildlife and Countryside Act 1981 as amended
WCH	Walking, cycling and horse-riding
WER	Water Environment Regulations
WFD	Water Framework Directive
WHO	World Health Organization
WINEP	Water Industry National Environment Programme
ZTV	Zone of theoretical visibility

Appendix C. Environmental Constraints Plans

C.1 ECP 1km

C.2 ECP 5km

Appendix D. Site Location Plan

D.1 SLP A.1

D.2 SLP A.2

D.3 SLP A.3

Appendix E. STW Upgrade Above Ground Structures

Appendix F. Outfall Pipe and Outfall Structure

Appendix G. Outfall Structure Illustration

Appendix H. Construction Schedule

Appendix I. Construction Phasing

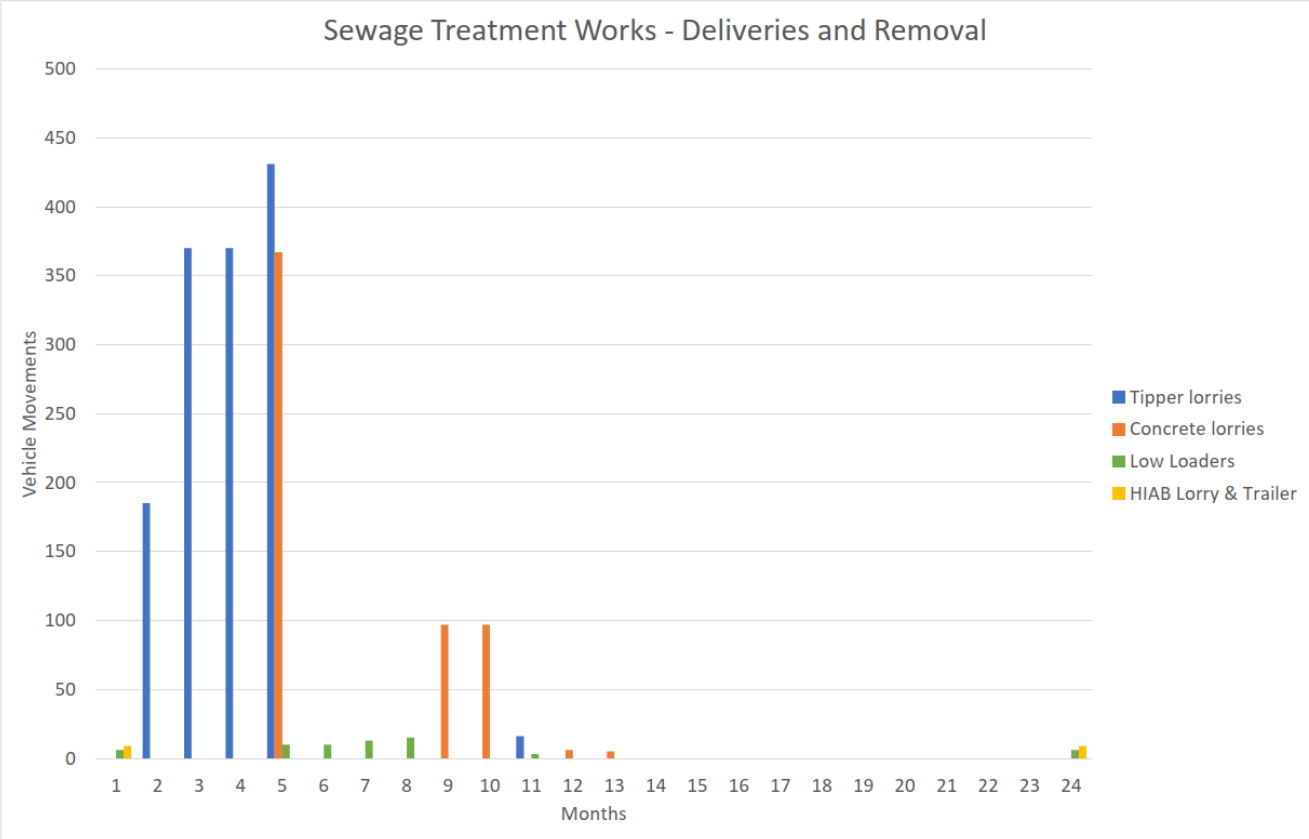
Appendix J. Traffic Routes

Appendix K. Traffic Management

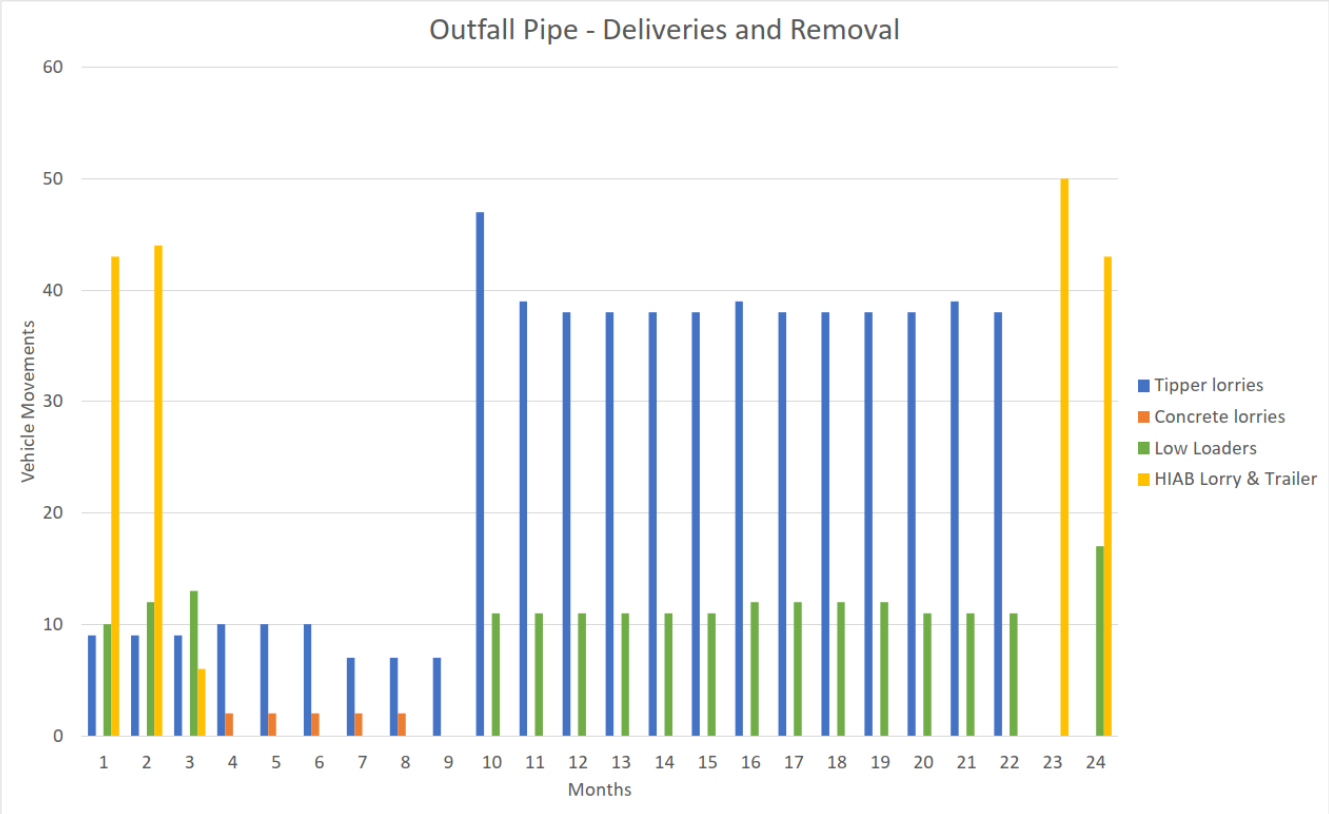
K.1 Total number of vehicle movements.

		Tipper lorries	Concrete lorries	Low Loaders	HIAB Lorry and Trailer
Permanent Works:	Outfall pipe	585	10	170	
	Sewage Treatment Site	1371	572	31	
Temporary Works:	All temporary works	0	0	85	204
	Totals	**1956**	**582**	**286**	**204**

K.2 Vehicle movements Vs project duration for the STW area of the project.



K.3 Vehicle movements Vs project duration for the outfall area of the project.



K.4 Traffic Management Plan

Appendix L. Outfall Option Route Plans

Appendix M. Embodied Carbon Data

EES (Parent / Element)	Asset Description	Emissions after Process Adjustment	Capital Delivery %?	STW / Outfall and Route
Parent	Kiosk and Housings <= 20 GFAM2	6.26		STW
Parent	Kiosk and Housings <= 20 GFAM2	6.26		STW
Parent	Kiosk and Housings <= 20 GFAM2	6.26		STW
Parent	Landscaping	2.17		STW
Parent	Site Clearance	7.85		STW
Parent	Roads and Paths	8.12		STW
Parent	New Power Supply to Site Boundary	55.62		STW
Parent	Tank Storage	25.99		STW
Parent	Tank Storage	25.99		STW
Parent	Inlet Works - Main Screens <350,000 PE	6422.41		STW
Parent	Pumping Station - Chamber Construction <50 KW	42.28		STW
Parent	Activated Sludge Plant < 350,000 PE	4873.95		STW
Parent	Secondary Sedimentation <350,000 PE	4694.56		STW
Parent	Flow Management - Storm Tanks & Outfalls < 350,000 PE	5718.17		STW
Parent	Pumping Station - Chamber Construction <50 KW	53.35		STW
Parent	Return Liquors <350,000 PE	660.59		STW
Parent	Flow Management - Balancing Tanks < 350,000 PE	28690.59		STW
Parent	Flow Management - Balancing Tanks < 350,000 PE	28690.59		STW
Parent	Energy & Services <350,000 PE	735.52		STW
Parent	Activated Sludge Plant < 350,000 PE	5361.35		STW
Parent	Primary Sedimentation <350,000 PE	6772.93		STW
Parent	Secondary Sedimentation <350,000 PE	5164.02		STW
Parent	Secondary Sedimentation <350,000 PE	5164.02		STW
Parent	Activated Sludge Plant < 350,000 PE	5361.35		STW
Parent	Pumping Station - Chamber Construction >50 KW	278.51		STW
Parent	Tertiary Treatment Plant - Mechanical <350,000 PE	875.24		STW
Element	Drainage: Treatment Works Site	12.3	25% Capital Delivery Incorporated	STW
Element	Concrete Chambers: Treatment Works Site	2.1	25% Capital Delivery Incorporated	STW
Element	Actuators : Treatment Works assets	0.6375	25% Capital Delivery Incorporated	STW

Element	Metalwork access platform - Building	1.675	25% Capital Delivery Incorporated	STW
Element	Concrete Chambers: Treatment Works Site	1.05	25% Capital Delivery Incorporated	STW
Element	Flowmeter: Magnetic	51.85	25% Capital Delivery Incorporated	STW
Element	Concrete Chambers: Treatment Works Site	1.38875	25% Capital Delivery Incorporated	STW
Element	Concrete Chambers: Treatment Works Site	23.075	25% Capital Delivery Incorporated	STW
Element	Switchgear HV : Treatment Works assets	2.0875	25% Capital Delivery Incorporated	STW
Element	High Integrity Gate Valve (Ring Main Only)	17.8375	25% Capital Delivery Incorporated	STW
Element	High Integrity Gate Valve (Ring Main Only)	12.7375	25% Capital Delivery Incorporated	STW
Element	PLC Hardware	0.0005	25% Capital Delivery Incorporated	STW
Element	Flowmeter: Magnetic	25.925	25% Capital Delivery Incorporated	STW
Element	Flowmeter: Magnetic	25.925	25% Capital Delivery Incorporated	STW
Element	Local HV Power Cabling: Pumping Station assets	0.775	25% Capital Delivery Incorporated	STW
Element	Concrete Chambers: Treatment Works Site	2.1	25% Capital Delivery Incorporated	STW
Element	Penstocks: (Actuated): Treatment Works assets	8.775	25% Capital Delivery Incorporated	STW
Element	Penstocks: (Actuated): Treatment Works assets	7.3125	25% Capital Delivery Incorporated	STW
Element	Penstocks: (Actuated): Treatment Works assets	7.3125	25% Capital Delivery Incorporated	STW
Parent	Roads and Paths	12.19		Outfall and Route
Parent	Site Clearance	0.89		Outfall and Route
Parent	Sheet Piling	0.62		Outfall and Route
Parent	Landscaping	2.24		Outfall and Route
Parent	Landscaping	465.01		Outfall and Route
Parent	Roads and Paths	4.06		Outfall and Route
Parent	Shafts (Civils Only)	212.54		Outfall and Route
Parent	Shafts (Civils Only)	118.08		Outfall and Route
Parent	Shafts (Civils Only)	314.88		Outfall and Route
Parent	Sewers: Isolated Manhole Work <=2.5m depth	8.96		Outfall and Route
Parent	Sewers: Isolated Manhole Work <=2.5m depth	8.96		Outfall and Route
Parent	Sewers: Isolated Manhole Work <=2.5m depth	35.82		Outfall and Route
Parent	Rehab / Trenchless: Directional Drilling	337.5		Outfall and Route
Parent	Bad Ground or >2.5m : Unpaved - Open Cut	119.06		Outfall and Route
Parent	Shafts (Attenuation Tank With Pump)	374.8		Outfall and Route
Parent	Bad Ground or >2.5m : Unpaved - Open Cut	1137.5		Outfall and Route

Parent	**Bad Ground or >2.5m : Unpaved - Open Cut**	**37.5**		**Outfall and Route**
Parent	**Pumping Station - Chamber Construction <50 KW**	**43.4**		**Outfall and Route**
Element	**Pipework : Below Ground (Treatment Works)**	**49.9**	**25% Capital Delivery Incorporated**	**Outfall and Route**
Element	**Pipework : Below Ground (Treatment Works)**	**1.75**	**25% Capital Delivery Incorporated**	**Outfall and Route**
Element	**Pipework : Below Ground (Treatment Works)**	**17.55**	**25% Capital Delivery Incorporated**	**Outfall and Route**
Element	**Pipework : Below Ground (Treatment Works)**	**24.45**	**25% Capital Delivery Incorporated**	**Outfall and Route**
Element	**Pipework : Below Ground (Treatment Works)**	**52.65**	**25% Capital Delivery Incorporated**	**Outfall and Route**
Element	**Pipework : Below Ground (Treatment Works)**	**35.1**	**25% Capital Delivery Incorporated**	**Outfall and Route**
Element	**Headworks**	**10.3**	**25% Capital Delivery Incorporated**	**Outfall and Route**
Element	**Concrete Thrust Blocks: River intake**	**1.75**	**25% Capital Delivery Incorporated**	**Outfall and Route**
Element	**Concrete Thrust Blocks: River intake**	**1.75**	**25% Capital Delivery Incorporated**	**Outfall and Route**
Element	**Bulk earthworks: River intake**	**0.0325**	**25% Capital Delivery Incorporated**	**Outfall and Route**

Appendix N. Operational Carbon Data

Facility	Equipment Type	Motor Size (kW)	Anticipated Run Time (hrs/year)	KWh/Year	kg CO2e /Year
Outfall Pumping Station	Pump	25	4380	109500	23250
Outfall Pumping Station	Pump	25	4380	109500	23250
Outfall Pumping Station	Pump	25	4380	109500	23250
Outfall Pumping Station	Valve	0.45	6	2.7	1
Outfall Pumping Station	Valve	0.45	6	2.7	1
Outfall Pumping Station	Pump	0.75	12	9	2
Outfall Pipe Jubilee Crossing Shaft	Pump	15	36	540	115
Outfall Pipe Jubilee Crossing Shaft	Pump	15	12	180	38
Ferric Dosing System	Health and Safety	8.6	8760	75336	15996
Ferric Dosing System	Pump	0.2	6132	1226.4	260
Ferric Dosing System	Pump	0.2	2628	525.6	112
Ferric Dosing System	Mixing	15	8760	131400	27900
ASP	Mixer	3.71	8760	32499.6	6901
ASP	Mixer	3.71	8760	32499.6	6901
ASP	Blower	350	52	18200	3864
ASP	Pump	2.5	8760	21900	4650
ASP	Pump	2.5	8760	21900	4650
RAS/SAS Pumping Station 5-8	Pump	21	6132	128772	27342
RAS/SAS Pumping Station 5-8	Pump	21	2628	55188	11718
RAS/SAS Pumping Station 5-8	Pump	21	52	1092	232
FST	Scraper	1	8760	8760	1860
FST	Scraper	1	8760	8760	1860
FST	Pump	1	8760	8760	1860
FST	Pump	1	8760	8760	1860

Facility	Equipment Type	Motor Size (kW)	Anticipated Run Time (hrs/year)	KWh/Year	kg CO2e /Year
Centrate Liquors Buffer Tank	Pump	5	4380	21900	4650
Centrate Liquors Buffer Tank	Mixer	15	8760	131400	27900
Centrate Liquors Buffer Tank	Pump	5	52	260	55
Centrate Liquors Buffer Tank	Odour Control	3	8760	26280	5580
PFT & SAS Liquor Return Pumping Station	Pump	7.5	8760	65700	13950
PFT & SAS Liquor Return Pumping Station	Pump	7.5	52	390	83
PFT & SAS Liquor Return Pumping Station	Odour Control			0	0
Centrate Return Pumping Station	Pump	5	8760	43800	9300
Centrate Return Pumping Station	Pump	5	52	260	55
Inlet Works	Screen	5	365	1825	388
Inlet Works	Pump	5	365	1825	388
Inlet Works	Penstock	1	365	365	78
Storm System	Valve	1	365	365	78
Storm System	Valve	1	365	365	78
Total				1179549	250454

Appendix O. Ecology: Preliminary Ecological Appraisal

Appendix P. Ecology: Bat Survey Report

Appendix Q. Ecology: Riparian Mammal Report

Appendix R. Ecology: UK Habitat Classification Survey Results

Appendix S. Ecology: Photographs of the Site

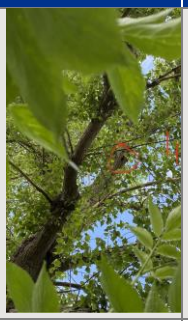
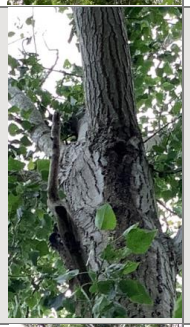
Target Note	Description	Photograph
BS1	A badger footprint recorded in the west of the STW.	
TN1	Invasive Himalayan balsam recorded in the west of the STW.	
TN2	Pile of grass cuttings suitable for breeding reptiles.	
Photograph 1	Cress Brook.	

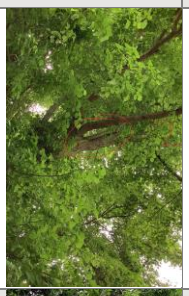
Target Note	Description	Photograph
Photograph 2	Dorney Common.	
Photograph 3	Roundmoor Ditch.	
Photograph 4	Jubilee River.	

Appendix T. Ecology: Ground Based Bat Roost Assessment Results

Appendix U. Ecology: Ground Based Bat Roost Assessment Photographs

Tree Number	Tree Photograph	PRF 1	PRF 2	PRF 3	PRF 4	PRF 5
T1	Obscured by dense woodland					
T2						
T3						
T4						
T5						

Tree Number	Tree Photograph	PRF 1	PRF 2	PRF 3	PRF 4	PRF 5
T6						
T7						
T8						
T9						
T10						

Tree Number	Tree Photograph	PRF 1	PRF 2	PRF 3	PRF 4	PRF 5
T11						
T12						
T13						
T14						
T15						

Tree Number	Tree Photograph	PRF 1	PRF 2	PRF 3	PRF 4	PRF 5
T16						

Appendix V. Ecology: Desk Study Bird Records

Protected and priority bird species returned in the desk study

Common name	Latin name	Year of latest record	Grid reference
Arctic Tern	*Sterna paradisaea*	2012	SU938793
Avocet	*Recurvirostra avosetta*	2014	SU933793
Barn Owl	*Tyto alba*	2019	SU935775
Barnacle Goose	*Branta leucopsis*	2017	SU938785
Bearded Tit	*Panurus biarmicus*	2013	SU933793
Bewick's Swan	*Cygnus columbianus*	2012	SU938793
Bittern	*Botaurus stellaris*	2012	SU938793
Black-headed Gull	*Chroicocephalus ridibundus*	2017	SU9478
Black-tailed Godwit	*Limosa*	2015	SU946784
Brambling	*Fringilla montifringilla*	2016	SU9580
Bullfinch	*Pyrrhula*	2020	SU926795
Canada Goose	*Branta canadensis*	2018	SU930791
Cetti's Warbler	*Cettia cetti*	2017	SU935775
Common (Mealy) Redpoll	*Acanthis flammea*	2011	SU938793
Common Crossbill	*Loxia curvirostra*	2014	SU933793
Common Gull	*Larus canus*	2016	SU933793
Common Sandpiper	*Actitis hypoleucos*	2016	SU933793
Common Tern	*Sterna hirundo*	2017	SU933793
Cuckoo	*Cuculus canorus*	2017	SU933793
Curlew	*Numenius arquata*	2014	SU938785
Curlew Sandpiper	*Calidris ferruginea*	2014	SU9478
Dunlin	*Calidris alpina*	2015	SU933793
Dunnock	*Prunella modularis*	2017	SU9478
Ferruginous Duck	*Aythya nyroca*	2011	SU938793
Fieldfare	*Turdus pilaris*	2019	SU926795
Firecrest	*Regulus ignicapilla*	2013	SU9478
Gadwall	*Mareca strepera*	2018	SU946784
Gannet	*Morus bassanus*	2016	SU935775
Garganey	*Spatula querquedula*	2014	SU938785
Golden Plover	*Pluvialis apricaria*	2016	SU933793
Goldeneye	*Bucephala clangula*	2015	SU933793
Grasshopper Warbler	*Locustella naevia*	2017	SU933793
Great Black-backed Gull	*Larus marinus*	2020	SU938785
Green Sandpiper	*Tringa ochropus*	2017	SU9478
Greenshank	*Tringa nebularia*	2015	SU933793
Grey Partridge	*Perdix*	2013	SU933793
Grey Wagtail	*Motacilla cinerea*	2017	SU933793
Greylag Goose	*Anser*	2018	SU930791
Hen Harrier	*Circus cyaneus*	2013	SU933793
Herring Gull	*Larus argentatus*	2019	SU938785

Common name	Latin name	Year of latest record	Grid reference
Hobby	*Falco subbuteo*	2015	SU933793
Honey-buzzard	*Pernis apivorus*	2014	SU933793
House Martin	*Delichon urbicum*	2017	SU9478
House Sparrow	*Passer domesticus*	2017	SU946784
Kestrel	*Falco tinnunculus*	2017	SU933793
Kingfisher	*Alcedo atthis*	2018	SU946784
Lapwing	*Vanellus*	2020	SU926795
Lesser Black-backed Gull	*Larus fuscus*	2019	SU938785
Lesser Redpoll	*Acanthis cabaret*	2017	SU933793
Lesser Spotted Woodpecker	*Dendrocopos minor*	2015	SU9478
Linnet	*Linaria cannabina*	2017	SU9478
Little Egret	*Egretta garzetta*	2017	SU933793
Little Ringed Plover	*Charadrius dubius*	2014	SU938785
Mallard	*Anas platyrhynchos*	2017	SU933793
Marsh Tit	*Poecile palustris*	2013	SU9478
Meadow Pipit	*Anthus pratensis*	2017	SU926795
Mediterranean Gull	*Larus melanocephalus*	2014	SU933793
Mistle Thrush	*Turdus viscivorus*	2019	SU938785
Montagu's Harrier	*Circus pygargus*	2012	SU938793
Mute Swan	*Cygnus olor*	2020	SU936776
Osprey	*Pandion haliaetus*	2014	SU9478
Oystercatcher	*Haematopus ostralegus*	2016	SU933793
Peregrine	*Falco peregrinus*	2016	SU9580
Pink-footed Goose	*Anser brachyrhynchus*	2013	SU938785
Pintail	*Anas acuta*	2015	SU9379
Pochard	*Aythya ferina*	2017	SU933793
Quail	*Coturnix*	2012	SU938793
Red Kite	*Milvus*	2020	SU936776
Redshank	*Tringa totanus*	2015	SU933793
Redstart	*Phoenicurus*	2015	SU9580
Redwing	*Turdus iliacus*	2017	SU915792
Reed Bunting	*Emberiza schoeniclus*	2017	SU933793
Ring Ouzel	*Turdus torquatus*	2011	SU938793
Ringed Plover	*Charadrius hiaticula*	2014	SU9478
Ringed Plover	*Charadrius hiaticula*	2014	SU938785
Roseate Tern	*Sterna dougallii*	2011	SU938793
Ruff	*Calidris pugnax*	2016	SU9478
Scaup	*Aythya marila*	2018	SU935775
Shelduck	*Tadorna*	2017	SU9478
Short-eared Owl	*Asio flammeus*	2011	SU938793
Shoveler	*Spatula clypeata*	2018	SU946784

Common name	Latin name	Year of latest record	Grid reference
Skylark	*Alauda arvensis*	2017	SU933793
Smew	*Mergellus albellus*	2011	SU938793
Snipe	*Gallinago*	2018	SU946784
Song Thrush	*Turdus philomelos*	2019	SU930791
Spotted Flycatcher	*Muscicapa striata*	2017	SU9478
Starling	*Sturnus vulgaris*	2018	SU934784
Stock Dove	*Columba oenas*	2017	SU9379
Swift	*Apus*	2017	SU9379
Tawny Owl	*Strix aluco*	2015	SU933793
Teal	*Anas crecca*	2018	SU946784
Tundra Ringed Plover	*Charadrius hiaticula subsp. tundrae*	2012	SU940795
Turtle Dove	*Streptopelia turtur*	2011	SU938793
Velvet Scoter	*Melanitta fusca*	2016	SU935775
Water Pipit	*Anthus spinoletta*	2013	SU915792
Whimbrel	*Numenius phaeopus*	2014	SU9379
Whinchat	*Saxicola rubetra*	2017	SU933793
White-fronted Goose	*Anser albifrons*	2018	SU935775
Whooper Swan	*Cygnus*	2015	SU933793
Wigeon	*Mareca penelope*	2018	SU938785
Willow Warbler	*Phylloscopus trochilus*	2016	SU933793
Wood Sandpiper	*Tringa glareola*	2014	SU938785
Woodcock	*Scolopax rusticola*	2011	SU938793
Yellow Wagtail	*Motacilla flava*	2015	SU933793
Yellowhammer	*Emberiza citrinella*	2019	SU938785
Yellow-legged Gull	*Larus michahellis*	2013	SU933793

Appendix W. Outline Landscape and Biodiversity Enhancement Plan

Appendix X. Flood Risk Assessment

Appendix Y. Geotechnical and Geoenvironmental Desk Study

Appendix Z. Heritage Desk Based Assessment

Appendix AA. Arboricultural Constraints Report

Appendix BB. Landscape and Visual Figures

BB.1 Potential Landscape Receptors 2km

BB.2 Potential Visual Receptors 2km

Appendix CC. Landscape and Visual: Summary of Viewpoints

CC.1 Viewpoint Locations

CC.2 Viewpoint Photographs

Summary of Viewpoints

In the summary table below, a bold viewpoint number indicates that an annotated photograph has been included below within this appendix. The annotated photographs illustrate the landscape and the location of the proposals. Whereas the potential for effects has been considered from all viewpoints, the illustrated viewpoints have been selected to enable an appreciation of visual issues from the principal visual receptors identified by the study, and to show potential effects on landscape receptors where applicable.

Viewpoint Number	Location and Observations
1	On footway on west side of Wood Lane just south of M4 overbridge. 2No views towards STW Upgrade. No view available due to intervening infrastructure and mature trees. Recent roadside planting on west side of Wood Lane will provide additional screening of the STW.
2	Wood Lane close to Public Bridleway, and close to residential properties. 1No view towards STW Upgrade. No view due to intervening residential development and mature trees.
3	Informal path on north bank of Jubilee River adjacent to Manor Farm Weir and Jubilee Manor Farm WQM Station. 1No view towards location of northern RC Shaft. RC Shaft construction work will be visible.
4/**4A**	Informal path on north bank of Jubilee River west of Manor Farm Weir. 2No views looking towards location of northern RC Shaft, outfall route and STW Upgrade. STW Upgrade and RC Shaft construction work will be visible above retained vegetation.
5	Bridge carrying Public Bridleway over Jubilee River. 1No view looking towards Manor Farm Weir. Higher elements of northern RC Shaft construction work may be visible above bank side vegetation on north side of the river.
6 /6A	Bridleway/NCN Route 61 on south bank of Jubilee River to east of Manor Farm Weir. 2No views looking across river towards location of northern RC Shaft. Higher elements of northern RC shaft construction work may be visible above retained vegetation.
7	Bridleway NCN Route 61 on south bank of Jubilee River to west of Manor Farm Weir. 1No view looking towards location of northern RC Shaft, outfall route and STW Upgrade. STW Upgrade and RC Shaft construction work may be visible above retained vegetation.
8	Public Footpath on higher ground between Jubilee River and Dorney Common. 1No view looking towards location of northern RC Shaft, outfall route and STW Upgrade. If visible construction works will be visible in the mid ground above retained vegetation.
9	Northeast corner of Dorney Common near to end of Public Footpath linking NCN Route 61 to Dorney Common.

Viewpoint Number	Location and Observations
	1No view towards location of southern RC Shaft and outfall route across Dorney Common. The construction of the shaft and outfall route will be clearly visible.
10	On northeast side of Dorney Common near residential properties at Colemorton Crescent. 2No views; View 1 looking west towards the outfall route crossing of Common Road; View 2 looking north towards the southern RC Shaft – see photograph. Construction work will be clearly visible in both views
11	On east side of Dorney Common close to Common Road (B3026), residential properties at Eton Wick Road and Public Footpath (Eton/48/1). 2No views; View 1 looking across Dorney Common south of Comon Road; View 2 Looking along Common Road – see photograph. The construction work including compounds and the road crossing will be clearly visible from this viewpoint.
12	On Dorney Common immediately north of Common Road (B3026) at crossing of outfall route. 3No views; View 1 looking north towards the southern RC Shaft; View 2 looking east towards Eton Wick; View 3 looking southwest to Cress Brook at crossing of outfall route. Construction work will be clearly visible from this viewpoint seen against a backdrop of Eton Wick.
13	On southeast side of Dorney Common near residential properties at Tilstone Close. 1No view looking towards Cress Brook at crossing of outfall route. Construction work and the removal of trees from the tree belt will be clearly visible.
13A	On southeast side of Dorney Common near residential properties at Tilstone Close. 2 views; View 1 looking north towards southern RC shaft; View 2 looking south towards Cress Brook at crossing of outfall route through tree belt – see photograph. Construction work will be clearly visible from this viewpoint including the removal of trees from the tree belt.
14	On south side of Dorney Common close to Public Footpath (DOR/3/1) accessed by footbridge over Cress Brook. 2No views; View 1 looking north towards the southern RC Shaft and the crossing of Common Road; View 2 towards outfall route close to residential properties at Eton Wick – see photograph. Construction work will be clearly visible from this viewpoint.
15	On Public Footpath (DOR/3/1) close to Cress Brook at crossing of outfall route. 1No view looking southeast towards outfall route and outfall location. Construction work will be clearly visible.
16	On Public Footpath (DOR/3/1) near residential properties at Tilstone Close. 1No view looking southeast towards outfall route and outfall location. Construction work will be clearly visible.
17	On Public Footpath (DOR/4/1) adjacent to Boveney Conservation Area and NCN Route 4 (DOR/2/2).

Viewpoint Number	Location and Observations
	2No views; View 1 looking north towards Cress Brook at crossing of outfall route; View 2 looking east towards outfall location (not visible). Construction work will be clearly visible in both views.
18	On NCN Route 4 (DOR/2/2) close to Boveney Lock and outfall location. 1 No view looking north towards outfall route and Cress Brook at crossing of outfall route. Construction work will be clearly visible.
19	On Thames Path (DOR/18/1) to east of Boveney Lock and west of outfall route crossing. 1No view looking northeast to outfall location. Outfall construction will be clearly visible in the foreground and some trees and lower storey vegetation in this view will be removed. The new outfall will be visible at the end of the existing bankside infrastructure and an increased area of hard surfacing will be installed in the foreground.
20	On NCN Route 4 (DOR/2/3) to east of Boveney Lock and west of outfall route crossing. 1No view looking northeast towards crossing of outfall route. Construction work will be clearly visible in the foreground and some trees and lower storey vegetation will be removed to the right of NCN Route 4 where an increased area of hard surfacing will be installed to the right.
21	On NCN Route 4 (DOR/2/3) to east of Boveney Lock and east of outfall route crossing. 2No views; View 1 looking southwest to crossing of outfall route; View 2 looking northwest towards Cress Brook at crossing of outfall route. In View 1 the construction works will just be coming into view. In View 2 construction works will be visible crossing the arable field.
22	On Thames Path (DOR/18/1) to east of Boveney Lock and east of outfall route crossing. 1No view looking southwest towards crossing of outfall route. The path is in the bankside tree belt with limited forward vision – the construction work will not be visible at this point.
23	On Thames Path (DOR/18/2) at public area on north side of Boveney Lock close to lock cottage. 1No view looking northeast towards the outfall location. Construction of the outfall will be and associated limited loss of vegetation will be clearly visible in the mid ground. The new outfall will just be visible at the far end of the existing bankside infrastructure.
24	On north side of Dorney Common close to residential properties. 1No view looking east to southern RC Shaft and outfall route. Construction work will be clearly visible seen against a backdrop of the urban edge of Eton Wick.

Appendix DD. Landscape and Visual: Potential Constraints Summary

Potential Constraints	Description and Sensitivity	General Observations and Effects Overview
Policy	**Slough Development Plan Policies** CG2 - Linear Park	Development proposals and mitigation should give special attention to the potential effects on landscape and visual receptors within the linear park along the Jubilee River. *Effects: The pipeline will pass under the Jubilee River which will minimise disturbance and effects on both landscape and visual receptors during the construction phase.*
	Buckinghamshire Council Policies South Bucks Local Plan Policy L4 – River Thames Setting.	Development proposals and mitigation should give special attention to the potential effects on landscape and visual receptors within the setting of the River Thames. *Effects: The outfall will introduce a new built element with potential for very local effects during both construction and operational phases*
	Royal Borough of Windsor & Maidenhead Policies Local Plan Policy N2 -Setting of the Thames	Development proposals and mitigation should give special attention to the potential effects on landscape and visual receptors within the setting of the River Thames. *Effects: The outfall will introduce a new built element with potential for very local effects during both construction and operational phases.*
Designations	**Landscape & Landscape Related** Within 1km study area, no landscape designations apply, and the following landscape related designations apply: Grade II Registered Park and Garden at Huntercombe Manor (Very High Sensitivity) Conservation Areas at Boveney and Clewer Village (part) (High Sensitivity)	*Effects: No landscape designations affected. Due to lack of proximity and visual connection no landscape related designations will be affected.*
Landscape Receptors	**National Character Area NCA115 – Thames Valley (NE379)** The NCA covers a large area extending well beyond the study areas which are in the central part of the NCA.	The landscape character is locally consistent with the NCA description. *Effects: Due to route length, the construction phase will temporarily affect the landscape of a small and local part of NCA115. Nil effect during operational phase.*
	No landscape character assessment within Slough Borough Council area.	The local landscape within Slough is characterised by flat topography to the north of the Jubilee River

Potential Constraints	Description and Sensitivity	General Observations and Effects Overview
	The northern part of the outfall route crosses land in Slough before passing into LCA 26.2 – see below.	and raised ground between the river and Dorney Common all set out for recreation and biodiversity uses. *Effects: The proposed routing will cause local effects during the operational phase including some minor loss of trees – see below.*
	The Chiltern Landscape Character Assessment - LCA 26.2 Dorney Floodplain The southern part of the outfall route crosses land in Buckinghamshire.	The landscape character is locally consistent with the LCA26.2 description. The size, flat terrain, and openness of Dorney Common is a distinctive local feature. South of the Common the route crosses agricultural land bounded by strong hedgerows with trees which define local character beyond the Common. *Effects: The proposed routing across Dorney Common close to the urban edge of Eton Wick will limit effects upon the open character of the Common during the construction phase. Operational effects will be very limited due to the low level of above ground infrastructure and reinstatement of existing land uses.*
	The Royal Borough of Windsor & Maidenhead Landscape Character Assessment - LCA14b Settled Developed Floodplain – Bray LCA14b lies across the River Thames opposite the outfall.	The part of LCA14b across the River Thames from the outfall comprises the Royal Windsor Racecourse, a large area of open grass land with well-established blocks of trees and scrub along the south side of the river. *Effects: Nil effect on the setting of LCA14b.*
	Trees and Hedgerows There are no trees subject to Tree Preservation Orders. See also Arboricultural Constraints Report – the assessment ref no and category is shown below in brackets. STW - established hedgerow/scrub along and within the southern boundary (G1 – C3) and the recent block planting on raised ground between the boundary fence and existing infrastructure. Outfall route - the following vegetation features (north to south) are crossed or potentially affected:	No mature trees will be affected within the STW, but the hedgerow/scrub and recent tree planting will be removed reducing screening and setting of the STW. Strong linear vegetation features are important constituents of the local landscape character. The outfall route will break through these features and leave small permanent gaps. *Effects: Level of effect will be determined by extent of removals and of replacement planting where feasible.*

Potential Constraints	Description and Sensitivity	General Observations and Effects Overview
	– Individual trees, tree belts and scrub north of Jubilee River (G2 - C2) – Mature tree belt to south of Cress Brook (G18 - B2) – Mature tree belt with understorey to east of Boveney Lock – also affected by the outfall. (G30 - B2, T28 – B2, T29 – B3, G27 - C2)	
Visual Receptors	**Residential Properties** (High/medium sensitivity) North of M4 – extensive residential areas behind tall noise fencing Wood Lane – two storey properties backing onto the STW which includes tall mature vegetation to the east of the infrastructure. Eton Wick - immediately to the east of the outfall route, there are numerous two-story properties on Eton Wick Road, Colenorton Crescent and Tiltstone Avenue that adjoin Dorney Common and the agricultural field to the south. Dorney and Boveney – properties on the edge of the Common and facing on to Common Road and Boveney Road. Residential property on island at Boveney Lock.	North of M4 – No visual connectivity – *Nil effect.* Wood Lane – No visual connectivity – *Nil effect.* Eton Wick - There is significant tree and hedgerow vegetation along the interface between Dorney Common and Eton Wick which provides edge definition and affords a visually porous buffer; however, many properties have commanding views westwards across Dorney Common and southwards towards the River Thames that will be highly valued by occupiers. *Effects: Limited to the construction phase – magnitude will be variable relating to proximity to outfall route, southern RC Shaft and contractor compounds etc. and to screening afforded by intervening vegetation.* Boveney and Dorney – There are unobstructed long views across Dorney Common that will be highly valued by occupiers. *Effects: Limited to the construction phase. Viewpoints will be at distances of circa 700-900m from construction activities that will be seen across the vista against the backdrop of the urban edge of Eton Wick.* Lock Cottage - There are mature trees and other vegetation to the east of the property. A tall wooden fence surrounds the property. *Effects: Partly screened mid ground views will be available from the property across the lock and river to the outfall during construction and operational phases.*

Potential Constraints	Description and Sensitivity	General Observations and Effects Overview
	PRoW (High/medium sensitivity) From north to south with proximity to outfall route. Local authority route numbers provided where known (Buckinghamshire). Routes crossed: BW (61), FP DOR/3/1, BW DOR/2/3, FP DOR/18/1 Routes with visibility: Public Footpath in Slough, FP DOR/4/2, FP DOR/4/1, FP DOR/26/1	BW (61) is NCN Route 61 – see below. BW DOR/2/3 and FP DOR/18/1 run close together at the crossing point. They are NCN Route 4 and the Thames Path National Trail respectively – see below. Crossed FP DOR/3/1 - there will be an unobstructed view to the south across arable land to the outfall route. With visibility – there is an elevated view from the public footpath in Slough towards the Slough STW in which the outfall route north of the Jubilee River will be in the mid ground but is screened by mature vegetation along the Jubilee River. Footpaths DOR/4/2 and DOR/4/1 are located circa 400m to the west from which there will be an unobstructed view across arable land to the outfall route. Footpath DOR/26/1 is very short connecting BW/DOR/2/2 with FP DOR/18/1. *Effects: Limited to construction phase only.*
	Thames Path National Trail (FP DOR/2/3). (Very high sensitivity) Promoted nationally by National Trails, and locally including leisure, circular walks etc. The outfall route crosses the Thames Path which runs along the north side of the River Thames and is close to the outfall.	The outfall route to the north across open arable land will be well/partially screened by belt of trees to north of the Thames Path when approaching the crossing point from either direction. *Effects: Limited to construction phase, subject to sympathetic design in vicinity of outfall.*
	National Cycleway Network (NCN) (Very high sensitivity) Promoted nationally by Sustrans (this includes linking traffic free routes (not on the National Cycle Network)), and locally including leisure, circular walks etc. The outfall route crosses NCN Route 61 which runs along the south side of the Jubilee River, and NCN Route 4 along the north side of the River Thames close to the outfall.	When approaching the crossing point on NCN Route 61 from either direction, the outfall route to the north and south will be well/partially screened by belts of trees and other vegetation on both sides of the Jubilee River. The outfall route across open arable land to the north will be clearly visible from NCN Route 4 when approaching the crossing point from either direction. *Effects: Limited to construction phase, subject to sympathetic design in vicinity of outfall.*
	Publicly Accessible Land	

Potential Constraints	Description and Sensitivity	General Observations and Effects Overview
	Dorney Common: Circa 0.6km of the outfall route crosses registered common land at Dorney Common. The Common is in agricultural use. It is privately owned. It is available for unrestricted public access subject to rules and byelaws applying to the Common. There are informal beaten paths across and around the Common. (High sensitivity) Local Green Space Designations 1-3 in Eton and Eton Wick Neighbourhood Plan - see Policy EN2. (Medium sensitivity)	Dorney Common is a wide expanse of flat open grassland crossed by the B3026 Common Road. The outfall route follows the east side of the Common along the urban edge of Eton Wick and crosses Common Road. Construction phase works will be visible from most of the Common. *Effects: Limited to the construction phase only and variable with viewpoint and distance.* Recreation Grounds at Stockdale Road/Colenorton Crescent; Bell Lane and Common Road; Eton Wick Recreation Ground (Haywards Mead) *Effects: Due to lack of proximity and visual connection the Local Green Space Designations will not be affected.*
	Public Highways The outfall route crosses Common Road B3026. (Medium sensitivity) The STW and northern end of the outfall route is near to Wood Lane and to the M4. (Low sensitivity)	From Common Road there are wide unobstructed views across Dorney Common and the surrounding countryside. Wood Lane crosses over the M4 providing a brief elevated view southwards which is partly screened by roadside vegetation. Views from the M4 are screened by the STW. *Effects: Limited to construction phase only.*
	Recreational/Sporting Facilities (Low Sensitivity) Eton Rowing Lake - located 0.8km at nearest point Windsor Racecourse - located across the River Thames from the outfall	*Effects - Nil effect due to strong screening belts of mature vegetation within the setting of the River Thames combined with the distances between areas accessible to visitors and the route/outfall.*
	River Thames Waterway (Very high sensitivity)	The river is a navigable waterway well used by pleasure craft and scheduled passenger services. (Windsor to Maidenhead). *Effects: The outfall will be clearly visible to users of the waterway during the construction and operational phases.*

Appendix EE. Human Health Screening Checklist

Questions to be considered	Is there potential relevance to the scheme and why?	Is this likely to result in a significant impact and why?
1. Will construction, operation, decommissioning or demolition works of the Project involve actions that will cause physical changes in the locality (topography, land use, changes in waterbodies, etc.)?	Yes – temporary works during pipeline construction that cross common land, PRoW, road; temporary works during construction of the outfall structure may impede users of the River Thames; permanent construction of the outfall structure, including removal of trees if necessary.	No – the works across common land and PRoW are temporary and will be reinstated to be utilised by residents, as well as measures implemented to minimise impact during construction; during operation, the outfall will release the same volume of flows into the River Thames that are currently being released via Boveney Ditch but with improved treatment, therefore, conditions for users of the river will be better than before.
2. Will the Project involve the use, storage, transport, handling or production of substances or materials which could be harmful to human health, to the environment or raise concerns about actual or perceived risks to human health?	Yes – materials will be used, stored, transported and handled during construction of the STW, pipeline and outfall, however, these are not perceived to be a risk to human health; spoil will be generated throughout construction, however, an assessment of contamination has been undertaken to determine this to be of no significance (see Section 6).	No – appropriate methods of handling materials and spool will be employed to ensure any perceived risks to human health are prevented.
3. Will the Project release pollutants or any hazardous, toxic or noxious substances to air or lead to exceeding ambient air quality standards?	No – not applicable to scheme, and an assessment of contamination and air quality has been undertaken to determine this to be of no significance (see Section 6 and 2 respectively).	No – not applicable to scheme.
4. Will the Project cause noise and vibration or the releasing of light, heat energy or electromagnetic radiation?	Yes – an assessment of noise and vibration has been undertaken to determine this to be of no significance (see Section 9).	No – see assessment and mitigation outlined in Section 9.
5. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater, coastal wasters or the sea?	No – TWULs and industry operational standards prevent the release of contaminated water into the environment, the scheme also looks to improve on this further through treatment upgrades to the STW.	No – construction best practice and operational standards prevent the release of pollutants.

Questions to be considered	Is there potential relevance to the scheme and why?	Is this likely to result in a significant impact and why?
6. Will there be any risk of accidents during construction or operation of the Project that could affect human health or the environment?	Yes – there is always a potential risk of accidents during construction that may affect human health or the environment; an assessment of major accidents and disasters has determined effects to not be considered significant (see Section 10).	No – health and safety, construction best practice, and other processes and measures are to be implemented to minimise this risk.
7. Will the Project result in environmentally related social changes, for example, in demography, traditional lifestyles, employment?	No – local employment may see an increase during construction, which would correlate in the increased usage of local amenities, however, this will be temporary; there will not be an increase in staff required for the maintenance of the scheme.	No – not applicable to scheme.
8. Are there any routes or facilities on or around the location which are used by the public for access to recreation or other facilities, which could be affected by the Project?	Yes – see Question 1.	No – see Question 1.
9. Are there any transport routes on or around the location that are susceptible to congestion or which cause environmental problems, which could be affected by the Project?	No – not applicable to scheme.	No – not applicable to scheme.
10. Is the Project located in a previously undeveloped area where there will be loss of greenfield land?	Yes – the pipeline route will cross common land.	No – the construction works will be temporary, and the land will be reinstated.
11. Are there existing land uses within or around the location e.g. homes, gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying that could be affected by the Project?	Yes – see Question 1 and Section 10.3.3.	No – see Question 1 and Section 10.3.3.

Questions to be considered	Is there potential relevance to the scheme and why?	Is this likely to result in a significant impact and why?
12. Are there areas within or around the location which are densely populated or built-up, that could be affected by the Project?	Yes – the most built-up areas within the scheme study area are south slough and Eton Wick, with smaller built-up areas that include Dorney.	No – the assessments that make up this report demonstrate no significant impacts are perceived on these areas and subsequent populations.
13. Are there any areas within or around the location which are occupied by sensitive land uses e.g. hospitals, schools, places of worship, community facilities, that could be affected by the Project?	Yes – see Section 10.3.3.	No – see Section 10.3.3.
14. Are there any areas within or around the location which contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism, minerals, that could be affected by the Project?	No – not applicable to scheme.	No – not applicable to scheme.
15. Are there any areas within or around the location which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, that could be affected by the Project?	No – this formed part of the assessment conducted within the Geology and Soils section which determined this to be of no significance (see Section 6).	No – see Section 6.
16. Is the Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the Project to present environmental problems?	Yes – flooding, erosion, and landslides have been considered in the assessment of major accidents and disasters, which determined effects to not be considered significant (see Section 11).	No – health and safety, construction best practice, and other processes and measures are to be implemented to minimise this risk.
17. Would the project result in a widening of inequalities in society through differential or disproportionate environmental, social or economic changes to people who are more vulnerable?	No – not applicable to scheme, also see Question 7.	No – not applicable to scheme, also see Question 7.

Questions to be considered	Is there potential relevance to the scheme and why?	Is this likely to result in a significant impact and why?
18. Does the project have the potential to affect population health (through changes in determinants of health)?	Yes – the assessment conducted here has determined that some determinants may be affected by the scheme.	No – the scheme will not have a significant impact on human health through changes in determinants of health, which has been determined through this assessment and the other topic assessment that make up this report, and the mitigation measures recommended reduce this potential for significant impacts further.

Appendix FF. Major Accidents and Disasters

Event	Potential for scheme vulnerability	Justification	Mitigation
Geological			
Landslides / mass movement / avalanche	?	Potential for unstable ground along the pipeline route.	See mitigation outlined in Geology and Soils Section 6.
Sinkholes	X	N/A	Not relevant in the context of the proposed scheme.
Ground hazards / aggressive ground conditions / mobilization of contamination	?	Potential for contaminated land along the pipeline route.	See mitigation outlined in Geology and Soils Section 6.
Hydrological			
Inland flooding	✓	Works area includes extensive flood risk areas.	See mitigation outlined in Flood Risk and Water Environment Section 5.
Coastal flooding	X	N/A	Not relevant in the context of the proposed scheme.
Hydrological scour from rivers	?	Potential during works on rivers.	See mitigation outlined in Flood Risk and Water Environment Section 5.
Biological			
Animal strikes	?	Dorney Common is utilised as grazing land for cattle, although it does not support large mammals permanently.	Stakeholder engagement, works boundaries, and safety best practices and protocols can be utilised to mitigate animal strikes.
Epidemics	X	N/A	Not relevant in the context of the proposed scheme.
Animal and insect infestation	X	N/A	Not relevant in the context of the proposed scheme.
Meteorological			

Event	Potential for scheme vulnerability	Justification	Mitigation
Low temperatures / heavy snow	?	Potential vulnerability during scheme construction (dependent on time of construction) and / or operation.	Potential for standard controls to be applied, such as implementation of construction best practices. Design standards will be utilised to mitigate vulnerability of the scheme against potential low temperatures / heavy snow. It would also be considered as part of the Construction Management Plan and Environmental Management Plan.
Severe weather (drought, hail, rain, lightning, tornado, high winds)	X	N/A	Not relevant in the context of the proposed scheme.
Wildfire	X	N/A	Not relevant in the context of the proposed scheme.
Fog	X	N/A	Not relevant in the context of the proposed scheme.
Poor air quality	X	N/A	Not relevant in the context of the proposed scheme.
Engineering			
Bridge / viaduct failure	X	N/A	Not relevant in the context of the proposed scheme.
Dam / reservoir failure	X	N/A	Not relevant in the context of the proposed scheme.
Flood defence failure	✓	Potential for flood defence failures as the works area includes flood risk areas protected by flood defences.	See mitigation outlined in Flood Risk and Water Environment Section 5.
Roadside structure failure	?	Potential for roadside structure failure due to location of the M4 to the	Design standards will be utilised to mitigate vulnerability of the scheme

Event	Potential for scheme vulnerability	Justification	Mitigation
		STW, and the B3026 to the pipeline route.	against potential roadside structure failure.
Building fire / failure	?	Low likelihood of a building fire / failure that impacts construction and / or operation of the proposed scheme.	Design standards and standard incident management plans will be utilised to mitigate vulnerability of the scheme against potential building fire / failure.
Critical infrastructure failure / utilities failure	?	Potential for infrastructure and / or utilities failure to impact operation of the proposed scheme.	Design standards and standard back up power utilised to mitigate infrastructure and / or utilities failure. Opportunity to tunnel under gas main, rising main and high-voltage cable located on Dorney Common, north of the B3026.
Industrial accidents			
Defence / military accidents (UXO, aircraft crashes)	?	UXOs may be present in the works area.	See mitigation outlined in Geology and Soils Section 6.
Industrial sites (COMAH)	X	There are no COMAH sites located within 3 miles of the STW, pipeline, and outfall.	Not relevant in the context of the proposed scheme.
Mining	?	There are no mining cavities identified in the works area, although there are underground and surface ground workings identified on the STW.	See mitigation outlined in Geology and Soils Section 6.
Terrorism / civil unrest / public disorder			
Attack on people (bomb, chemical, vehicle)	?	Low likelihood of an attack on people that impacts construction and / or	Risk is similar to other STWs, pipelines, and associated outfalls in the UK. No specific measures

Event	Potential for scheme vulnerability	Justification	Mitigation
		operation of the proposed scheme.	are considered to be required for the proposed scheme.
Rioting and protest	?	Low likelihood for rioting or protests to impact construction and / or operation of the proposed scheme.	Risk is similar to other STWs, pipelines, and associated outfalls in the UK. No specific measures are considered to be required for the proposed scheme.
Cyber attack	X	N/A	Not relevant in the context of the proposed scheme.
Suicide	X	N/A	Not relevant in the context of the proposed scheme.
Armed conflict / complex emergency	X	N/A	Not relevant in the context of the proposed scheme.
Natural disasters			
Earthquakes	X	N/A	Not relevant in the context of the proposed scheme.
Tsunamis	X	N/A	Not relevant in the context of the proposed scheme.
Volcanic eruptions	X	N/A	Not relevant in the context of the proposed scheme.
Famine	X	N/A	Not relevant in the context of the proposed scheme.
Displaced populations	X	N/A	Not relevant in the context of the proposed scheme.
Transport			
Traffic accidents	?	Potential for traffic accidents due to the M4 being within close vicinity of the works area and the B3026 being crossed by the pipeline	Design standards and safety best practices and protocols will be utilised to mitigate vulnerability of the scheme

Event	Potential for scheme vulnerability	Justification	Mitigation
		route. Incidents are unlikely to be of the magnitude to cause significant environmental impacts.	against potential traffic accidents.

Key:

✓ = Yes, likely

? = Unknown, potential

X = No, unlikely

Appendix GG. Cumulative Effects Assessment Methodology

GG.1 Combined Effects Methodology

For the combined effects assessment, the assessment identifies, on a proportionate basis, the key receptors of potentially significant effects identified in the other environmental topic sections (Sections 2 to 10) and considers how those effects may combine during both the construction and operational phases.

In cases where the effects reported in the individual topic sections have already taken account of the interactions with other topics, they are not repeated, although references are made back to the relevant, earlier sections.

GG.2 Cumulative Effects Methodology

Consideration of cumulative effects comprised the identification and characterisation of other proposed projects within 2km of the scheme with the potential to contribute to cumulative effects with the scheme.

GG.2.1 Step 1: Identify a long list of 'other projects' in the study area

To identify a long list of other relevant proposed projects, data has been gathered to identify the following types of proposed developments within the study area:

- Developments with planning permission under the Town and Country Planning Act;
- Promoted and proposed sites;
- Local plan allocations;
- Developments (e.g. rail) under the Transport and Works Act; and,
- Local authority studies.

The developments of interest are major developments or major planning applications, which were defined by the following criteria:

- Housing (including hotels, care homes, residential use, student accommodation etc.) – 10 or more houses, or a site area of 0.5ha or more.
- Non-residential (including offices, industrial, retail, mixed use, sports/recreation, cemeteries, educational, health care etc.) – buildings with 1000sqm or more, or developments with 1ha or greater.
- Minerals and waste – sites of 1ha or more.
- Infrastructure (including transport, water, communications, energy etc.) – sites of 1ha or more.

Alongside this data, other projects within the study area for which EIA scoping opinions have been requested were gathered from relevant local planning authorities' planning portals (Slough Borough Council, Buckinghamshire Council (South Bucks Area), and RBWM); and Nationally Significant Infrastructure Projects (NSIP) were identified in the study area by searching The Planning Inspectorate's website.

The following information was recorded, as appropriate, for all relevant proposed projects identified within the study area:

- Application reference;
- Applicant name and description of development;

- Approval status;
- Allocation policy;
- Local Plan;
- Tier (see below); and,
- Type of development.

All other relevant proposed projects identified have been categorised as Tier 1, Tier 2, or Tier 3. Tier 1 projects meet one of the following criteria:

- under construction;
- permitted but not yet implemented; or,
- submitted but not yet determined.

Tier 2 projects are NSIPs for which an EIA scoping report has been submitted and an EIA scoping opinion requested. As part of this assessment, it has also been deemed appropriate to include Town and Country Planning projects for which an EIA scoping report has been submitted as these projects are also likely to be developed and to have significant environmental effects.

Tier 3 projects meet one of the following criteria:

- projects on The Planning Inspectorate's Programme of Projects for which an EIA scoping report has not yet been submitted;
- identified in the relevant development plan; or,
- identified in other plans or programmes.

Tier 1 projects are the most likely to have associated environmental information available for use in an assessment of cumulative effects. Tier 3 projects are the least likely to have this information.

GG.2.2 Step 2: Refine the long list to a short list

At Step 2, criteria were applied in order to decide whether or not to include each of the other projects in the cumulative effects assessment. This reduced the long list from Step 1 to a short list of projects to be investigated further.

The criteria used at this stage to identify projects for inclusion in the short list were as follows:

- potential temporal overlap between the other projects and this scheme; and,
- scale and nature of the other projects, with a judgement made as to whether an interaction of effects with the scheme is likely. Other projects were provisionally screened against indicative thresholds identified under Schedule 3 of the EIA Regulations 2017).

These criteria were applied to the projects listed in the long list in order to identify which projects would be included in the short list. The results are provided in Appendix HH.

GG.2.3 Step 3: Identification of potential for cumulative effects

All projects identified on the short list are considered to have the potential to contribute to cumulative effects with the scheme.

The short-listed projects were assessed alongside the scheme for potential cumulative effects. Information available at the time of conducting the assessment has been utilised, and consideration given to the following:

- the duration of effect;
- the extent of effect;
- the type of effect (e.g. additive or synergistic);
- the frequency of the effect;
- the 'value' and resilience of the receptor affected; and,
- the likely success of mitigation.

GG.3 Assumptions and Limitations

The long list of other projects was produced using data available at the end of August 2021, and, therefore, any projects brought into the public domain after the end of August have not been included in this assessment. Data will continue to be gathered to inform updates to this work in later stages of project development.

The long list of other projects contains information pertaining to major applications from 1 August 2016. Other projects with EIA scoping opinions were collected covering the period from 1 August 2018 to 31 August 2021. This three-year timespan was deemed proportionate, and it is considered likely that projects at the scoping stage prior to 1 August 2018 would by now have progressed to the application stage, and hence be captured in the long list.

A search of the Slough Borough Council planning portal for the 'west' area selection returned over 3500 matches, however, only 500 of these were available to view. Due to the inaccessibility of the other applications, it cannot be confirmed whether there are any other major applications within the zone of influence in this area of Slough that may contribute to cumulative effects. It is worth noting that the STW upgrade will be confined to the current STW site boundary and the outfall and associated pipeline are to the south-west of this, therefore, the primary cumulative effects that would occur between potential major applications in Slough revolve around traffic interaction, resources, and waste. These interactions should be negligible, based on the assessments and approaches to mitigation outlined in Section 3 and via traffic management.

Projects were provisionally screened against indicative thresholds identified under Schedule 3 of the EIA Regulations 2017. Projects which exceed those thresholds have the potential to cause significant environmental effects, and such projects were therefore included in the short list. Although the thresholds are indicative only, and the sensitivity of the receiving environment would also be taken into account in any formal EIA screening opinion determination, the use of the thresholds for shortlisting is considered proportionate for this assessment.

It has been assumed that, due to the duration of the scheme, there is likely to be a temporal link between identified other projects and this scheme. It would not be proportionate at this stage to check online for evidence relating to construction dates for the long list of other projects.

Applications that have been refused planning permission were excluded from the short list as it would be unlikely for these projects to be constructed and to have potential for cumulative effects.

Similarly, other projects at various stages of the appeals process have been excluded from the long list as to be proportionate for this assessment, and to include the most likely developments to gain approval and likely to have cumulative effects. Although this is a limitation, changes to the application status of other projects will continue to

be gathered in further data collection to inform updates to this work in later stages of the project development and assessment.

It should be noted that no Tier 3 projects were identified using the cumulative effects methodology as part of this assessment.

Appendix HH. Cumulative Effects Assessment Long List