



Annex B1: Scope Discussion Document

Standard Gate two submission for London
Water Recycling SRO

Notice – Position Statement

This document has been produced as the part of the process set out by RAPID for the development of the Strategic Resource Options (SROs). This is a regulatory gated process allowing there to be control and appropriate scrutiny on the activities that are undertaken by the water companies to investigate and develop efficient solutions on behalf of customers to meet future drought resilience challenges.

This report forms part of suite of documents that make up the 'Gate 2 submission.' That submission details all the work undertaken by Thames Water in the ongoing development of the proposed SRO. The intention at this stage is to provide RAPID with an update on the concept design, feasibility, cost estimates and programme for the schemes, allowing decisions to be made on their progress.

Should a scheme be selected and confirmed in the Thames Water final Water Resources Management Plan (WRMP), in most cases it would need to enter a separate process to gain permission to build and run the final solution. That could be through either the Town and Country Planning Act 1990 or the Planning Act 2008 development consent order process. Both options require the designs to be fully appraised and, in most cases, an environmental statement to be produced. Where required that statement sets out the likely environmental impacts and what mitigation is required.

Community and stakeholder engagement is crucial to the development of the SROs. Some high-level activity has been undertaken to date. Much more detailed community engagement and formal consultation is required on all the schemes at the appropriate point. Before applying for permission Thames Water will need to demonstrate that they have presented information about the proposals to the community, gathered feedback and considered the views of stakeholders. We will have regard to that feedback and, where possible, make changes to the designs as a result.

The SROs are at a very early stage of development, despite some options having been considered for several years. The details set out in the Gate 2 documents are still at a formative stage.

Disclaimer

This document has been written in line with the requirements of the RAPID Gate 2 Guidance and to comply with the regulatory process pursuant to Thames Water's statutory duties. The information presented relates to material or data which is still in the course of completion. Should the solutions presented in this document be taken forward, Thames Water will be subject to the statutory duties pursuant to the necessary consenting process, including environmental assessment and consultation as required. This document should be read with those duties in mind.



London Effluent Reuse SRO Gate 2 Environmental Studies

Scoping Report

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1 Introduction

1.1 SRO Background

London Reuse has been identified as a Strategic Regional Option (SRO) in the PR19 Final Determination, with funding allocated to Thames Water. As part of the assessment of water companies' PR19 business plans, Ofwat introduced proposals to support the delivery of SROs and set out an associated gated process for the co-ordination and development of a consistent set of strategic water resource options. This gated process provides a mechanism for the industry, regulators, stakeholders and customers to input into the development and scheduling of strategic solutions, through a combined set of statutory and regulatory processes.

The primary objective of the Gate 2 environmental assessment studies is to provide regulatory assessments for the London Reuse SRO and to ensure environmental and social considerations (including mitigation and net gain opportunities) of options are included in regional plans and that detailed feasibility, concept design and multi-solution decision making has been suitably informed.

1.2 London Effluent Reuse SRO Background

Options for the London Reuse SRO comprise a range of river flow augmentation (Teddington direct river abstraction (DRA)), planned indirect reuse (Mogden Reuse; Beckton Reuse), and blackwater reuse (Mogden South Sewer Reuse) in the London area. The options are based on diverting wastewater away from their normal discharge locations either at Beckton sewage treatment works (STW) in east London or Mogden STW in west London. These are significantly sized STW (the largest and fourth largest in the UK respectively) that offer water resource potential by amending the normal discharge route away from estuarine systems to freshwater systems.

Options and sub-options to be considered in the Gate 2 environmental assessment studies are those which have been included in the Gate 1 environmental assessment studies reporting to RAPID on 5 July 2021.

2 Tasks

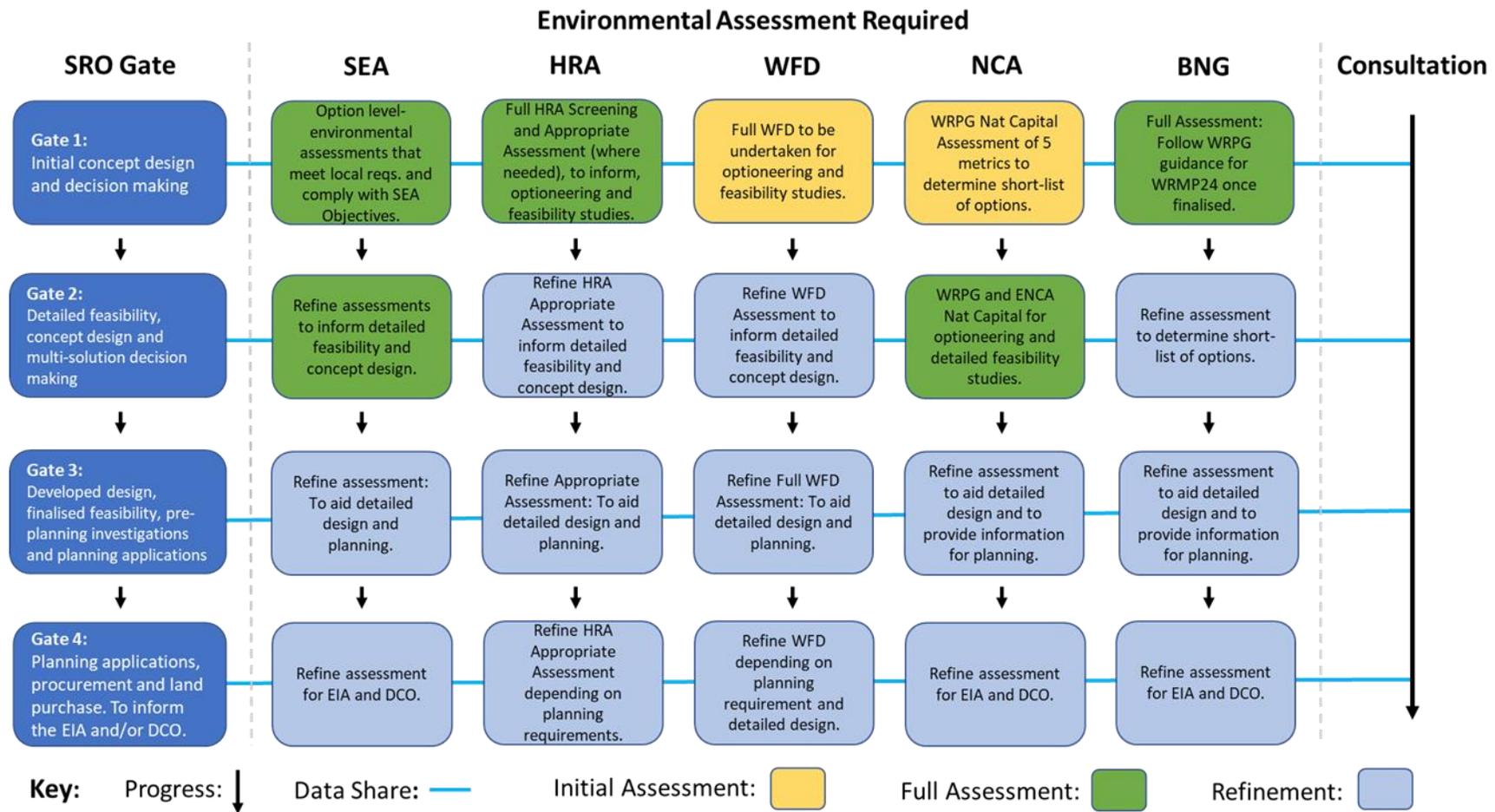
2.1 Gate 2 Scoping & Planning

The scope for the Gate 2 environmental assessment has been developed, with **the objective to deliver regulatory assessments of environmental effects of the London Reuse SRO in the context of the All Company Working Group (ACWG) guidance**. The ACWG guidelines set out that Gate 2 builds on Gate 1 activities to improve the detail and breadth of studies to develop concept solution designs with reduced uncertainty in costs and benefits for a key decision point for strategic solutions (see **Figure 2.1**). The SRO schemes are to be developed to a standard suitable for submitting into final regional plans and / or final water resources management plans (WRMPs). This stage of the programme aims to further enhance the funding portfolio, based on refined and consistent costs and benefits, with suboptimal solutions eliminated and viable solutions carried forward to the pre-planning stage.

To achieve this, a suite of supporting environmental assessments aligned and developed from those submitted in Gate 1 will be delivered to provide the necessary physical environment, water quality, navigation, ecology, biodiversity, natural capital and wider environmental evidence base to inform the Habitat Regulations Assessment (HRA), Water Framework Directive (WFD) assessment and Strategic Environmental Assessment (SEA). The scope of the environmental assessments is informed by the RAPID and regional planning requirements, ACWG methodologies and latest tools from regulators, recommendations made by the Gate 1 assessments, as well as commitments made to stakeholders (National Advisory Unit (NAU), Port of London Authority (PLA) and Drinking Water Inspectorate (DWI)) during Gate 1 engagement on environmental evidence reports. Section 2.2 sets out the scope for the Gate 2 technical workstreams to deliver the environmental evidence and assessments and regulatory assessments.

Following review of latest relevant technical specification, guidance and appraisal criteria, as well as general project planning, we will hold a workshops with each of the NAU and PLA technical working groups in late November and December 2021. The purpose of this initial engagement activity will be to provide an overview of the Gate 2 scope of works for the different disciplines and to agree our approach to the Gate 2 environmental studies.

Figure 2.1 Environmental Assessment Integration with SRO Gates



2.2 Technical Work Streams

2.2.1 Task 1 Physical Environment

The Gate 2 physical environment technical workstream is set out below for:

1. Aquatic modelling
2. Aquatic physical environment assessment
3. Water quality assessment.

2.2.1.1 Task 1.1 Aquatic Modelling

Following the Gate 1 gap analysis, high-level assessments and commencement of additional data collection through the SRO monitoring programme, a suite of hydrodynamic and water quality modelling packages have been specified to provide scenario runs with which to aid the Gate 2 environmental assessments and inform refined feasibility and concept design of the schemes. The suite of modelling packages will consist of the following (further details presented in **Table 2.1** and **Table 2.2**):

- Pan-SRO 1D hydrodynamic and water quality modelling of the fluvial River Thames.
- 3D hydrodynamic and water quality modelling of the West London discharge locations and weir pools.
- 2D/3D hydrodynamic and water quality modelling of the Thames Tideway.

Outputs from Gate 1 that will be used are the Methodology Scoping Report, data collated and reviewed in the Evidence Reports, experience from tideway model runs undertaken in Gate 1, and comments received from stakeholders.

Additional data to be used in Gate 2 are spot and continuous water quality data being collected by the pan-SRO monitoring programme; fluvial hydromorphological data and continuous tideway salinity and level data being collected in the London reuse monitoring programme; available Environment Agency and PLA data; and outfall/ DRA intake design information from the engineering consultant. Operating patterns for scenarios will be informed by Thames Water or WRSE water resources modelling, and river flow conditions in the water quality and hydrodynamic modelling may also be parameterised using those water resources models dependent on feedback from Environment Agency. A summary of the full London Effluent Reuse SRO monitoring programme is provided in Appendix A.2.

Technical tasks to be undertaken in Gate 2 are summarised in **Table 2.3**. The technical tasks are designed to build upon the assessments undertaken in Gate 1 and accommodate the commitments made to stakeholders through responses made to stakeholder comments. A summary of the Gate 2 commitments made in response to NAU Gate 1 comments is provided in Appendix A.1, including sign-posting to the technical tasks that deliver each commitment.

Table 2.1 London Effluent Reuse Gate 2 Modelling Scope

	Atkins Infoworks 1D Fluvial	3D Fluvial	HRW Telemac 3D Tideway
Reach	Cricklade to Teddington Weir	3D modelling of discharge plumes at and downstream of Mogden reuse and Teddington DRA outfalls	Teddington Weir to 3km D/S Beckton
Hydraulic parameters	For pre-selected output nodes: <ul style="list-style-type: none"> • Time series flows (15 minute model timestep) • Water level • Wetted cross sectional area • Mean velocity 	2D modelling of weir pool aquatic habitat change of Sunbury and Molesey weir pools. 3D at outfalls: <ul style="list-style-type: none"> • Velocity • Dilution/dispersion characteristics 2D at weir pools <ul style="list-style-type: none"> • Velocity • Wetted depth • Wetted perimeter. 	<ul style="list-style-type: none"> • Tidal dynamics • Water level (and as applied to full bathymetry also gives water depth profile and wetted width profile at model time step for pre-selected output locations) • Velocity
Water quality parameters	<ul style="list-style-type: none"> • Dissolved Oxygen • Biological Oxygen Demand (BOD) • Temperature • Suspended solids • Organic nitrogen • Ammoniacal nitrogen • Nitrite • Nitrate • Orthophosphate • Silicate • Chlorophyll • Conservative tracer 	3D at outfalls: <ul style="list-style-type: none"> • Temperature differences • Conservative tracer 	<ul style="list-style-type: none"> • Salinity • Suspended sediment • BOD • Dissolved Oxygen • Ammoniacal nitrogen and oxidised nitrogen • Temperature, including atmospheric interaction • Chemical status – through the inclusion of a conservative tracer

Table 2.2 London Effluent Reuse Gate 2 Modelling Scenarios

	Atkins Infoworks 1D Fluvial	3D Fluvial	HRW Telemac 3D Tideway
Phase 1: Reference Condition Runs	<ol style="list-style-type: none"> Moderate-low flow: 1 in 5 - 10 year return. period Very low flow: 1 in 20 year return. period Extremely low flow: 1 in 50 - 100 year return. period Naturalised (version of very low flow) Very low flow + 'Near Term' Future: AMP7 NEP water quality changes Very low flow + 'Long Term' Future: Climate change 2050s + environmental destination Extremely low flow+ 'Long Term' Future: Climate change 2050s + environmental destination 	<ol style="list-style-type: none"> Moderate-low river flow (e.g. 11.0 m³/s), without SRO Very low river flow (e.g. 9.0 m³/s), without SRO Exceptionally low river flow (e.g. 7.0 m³/s), without SRO 	<ol style="list-style-type: none"> Moderate-low flow: 1 in 5 - 10 year return. period Very low flow: 1 in 20 year return. period Extremely low flow: 1 in 50 - 100 year return. period Naturalised (version of very low flow) Very low flow + 'Near Term' Future: AMP7 NEP water quality changes Very low flow + 'Long Term' Future: Climate change 2050s + environmental destination Extremely low flow+ 'Long Term' Future: Climate change 2050s + environmental destination
Phase 2: Initial Scenario Runs	Above (except Naturalised) + <ul style="list-style-type: none"> 200 MI/d Mogden Reuse 	Above + <ul style="list-style-type: none"> 200 MI/d Mogden Reuse 	Above (except naturalised) + <ul style="list-style-type: none"> 200 MI/d Mogden Reuse 300 MI/d Beckton Reuse
Phase 3: Additional Scenario runs	<ul style="list-style-type: none"> Alternative Mogden Reuse variants 	<ul style="list-style-type: none"> Additional reference conditions; and Additional LRU SRO operating patterns. 	<ul style="list-style-type: none"> Additional reference conditions Additional London Effluent Reuse SRO operating patterns Cumulative effects with other SROs or non-SRO options which amend the freshwater flow or STW effluent flow into the Thames Tideway.

Table 2.3 Aquatic Modelling Technical Tasks

Task item	Scope of assessment	Approach to assessment
a. Scenario development	<ul style="list-style-type: none"> Develop reference condition sets and scenarios for Gate 2 acceptable to NAU. To include range of low flow conditions (current meteorology), near future changes (e.g. water quality enhancements), future climate 	<ul style="list-style-type: none"> Liaison[†] with SRO project team to develop and describe the suggested set of seven reference conditions and associated option / variant / in-combination scenarios
b. Fluvial 1D modelling scenarios	<ul style="list-style-type: none"> Development and implementation of an InfoWorks model to simulate hydrodynamic and quality changes under varying reference conditions and operational scenarios. Preparation of time-series input data (flow and water quality) for London Reuse discharges and abstractions for incorporation into model runs 	<ul style="list-style-type: none"> Collate EA and SRO datasets into format agreed with modellers
c. 3D fluvial modelling of outfalls and weir pools	<ul style="list-style-type: none"> Development and implementation of a 3D TELEMAC model to simulate hydrodynamic changes in the River Thames local to outfall and weir pools under varying reference conditions and operational scenarios. Identify scenario conditions for incorporation into model runs 	<ul style="list-style-type: none"> Collate SRO datasets into model conditions
d. Estuarine TELEMAC modelling scenarios	<ul style="list-style-type: none"> Development and implementation of tideway 3D TELEMAC model to simulate hydrodynamic and quality changes in the tideway under varying reference conditions and operational scenarios. Preparation of time-series input data (flow and water quality) for incorporation into model runs 	<ul style="list-style-type: none"> Collate EA, PLA and SRO datasets into format agreed with modellers
e. Interpretation of model outputs	<ul style="list-style-type: none"> Review and display of model output 	<ul style="list-style-type: none"> Graphical and tabular data display to identify and illustrate similarities and variance between reference conditions; and between paired reference conditions/ option scenarios.
f. Oversight of wider modelling outputs for fluvial and estuarine	<ul style="list-style-type: none"> Integration of modelling activities into SRO project team 	<ul style="list-style-type: none"> Liaison with SRO project team, NAU and PLA

Outputs are model validation report(s), short technical model report(s) and graphical and tabular representations of model output for use in the Gate 2 assessment.

2.2.1.2 Task 1.2 Aquatic Physical Environment Assessment

Outputs from Gate 1 that will be used are: the Methodology Scoping Report; data collated and reviewed in the Physical Environment Evidence Report; and tideway model runs undertaken as part of the Gate 1 assessment.

Additional data to be used in Gate 2 are: fluvial and estuarine hydromorphological data being collected in the London reuse monitoring programme; updated EA and PLA data requests; Gate 2 fluvial and tideway modelling outputs (Section 2.2.1.1); and outfall/ DRA intake design information from the engineering consultant.

Task item	Scope of assessment	Approach to assessment
a. Monitoring scoping workshop with monitoring supplier	<ul style="list-style-type: none"> Integration of hydromorphological surveys into SRO project team 	<ul style="list-style-type: none"> Liaise with fluvial hydromorphology survey contractor over monitoring specification and output format
b. Refinement of Strategic Option utilisation	<ul style="list-style-type: none"> Identify appropriate option utilisation patterns, interrogate and display output for communication to SRO project team 	<ul style="list-style-type: none"> Liaise with Thames Water water resources team over potential use patterns of London Reuse SRO options Specify WARMS2 model runs Interpret WARMS2 model output

Task item	Scope of assessment	Approach to assessment
c. Flow change	<ul style="list-style-type: none"> Assessment of discharge, level and velocity patterns throughout the study area (both river and estuary) for the range of reference conditions and scenarios with reuse option 	<ul style="list-style-type: none"> Liaise with Licensing Review contractor over potential alternatives for Gate 2. Develop and interrogate fluvial flow series at key locations for Gate 2 reference conditions and scenario sets (including Q95) Interrogate TELEMAC model outputs for tidal study reaches.
d. Review of outfall (and DRA intake) design including screening together with local velocity effects	<ul style="list-style-type: none"> Assess effects of operation of outfalls and DRA intake within the river and provide any need to alter the design based on evidence 	<ul style="list-style-type: none"> Interrogate 3D fluvial modelling outputs to describe significance of changes in flow velocity field plume and changes in depth. Liaison with SRO project team and NAU
e. River mainstem, weir pool and estuarine wetted habitat change	<ul style="list-style-type: none"> Assess effects on level, velocity and wetted habitat change including at Sunbury, Molesey and Teddington weir pools 	<ul style="list-style-type: none"> Interrogate 3D fluvial modelling outputs together with hydromorphological survey data (Lower Thames areas of marginal habitat and the high sensitivity habitats around River Roding/ Creekmouth) to describe significance of changes in flow velocity and wetted area to provide information for change for key species in the ecological assessments (see Section 2.2.2.2).
f. Fish pass and barrier passability	<ul style="list-style-type: none"> Assess effect on passability of fish passes at weirs (Sunbury, Molesey and Teddington) and weirs in the Enfield Island Loop 	<ul style="list-style-type: none"> Confirm critical levels for fish pass operation. Review river level model outputs calculated under varying scenarios and compare these with critical levels for fish pass operation to identify any potential impacts and their magnitude. Interrogate 3D fluvial modelling outputs to describe significance of changes in flow velocity and wetted area to provide information for change for key species in fisheries assessment (see Section 2.2.2.2).
g. Future climates assessment	<ul style="list-style-type: none"> Agree conditions of two climate change scenarios with EA and the aspects these cover (at a minimum upstream river flow change) 	<ul style="list-style-type: none"> Incorporate climate change scenarios into all aspects of the assessment for the river and tidal reaches, including specification of scenarios, to quantify effects of climate change baseline changes alongside reuse option effects.
h. Richmond Pound drawdown Physical Environment assessment	<ul style="list-style-type: none"> Asses the specific effects of planned annual maintenance drawdown on the physical habitats within Richmond Pound 	<ul style="list-style-type: none"> Agree with PLA[†] and NAU a drawdown regime to incorporate within model scenario parameterisation. Interrogate estuarine TELEMAC modelling outputs to describe changes in habitat availability during those periods (baseline) and with reuse option.
i. Estuarine sediment assessment	<ul style="list-style-type: none"> Understand key regulatory concerns Develop and agree key assessment points to understand any sediment changes in the estuary 	<ul style="list-style-type: none"> Review with NAU and PLA approach to assessing key potential effects. Interrogate modelled sediment dynamics output (estuarine TELEMAC model) to describe variability in sediment dynamics during reference conditions and with reuse option scenarios.
j. Navigation assessment	<ul style="list-style-type: none"> Develop and agree with PLA further tidal navigation assessment scope, including model requirements 	<ul style="list-style-type: none"> Draft scope for modelling and agree with PLA Liaison[†] with SRO project team Interrogate estuarine TELEMAC modelling outputs to describe variability in navigation effects during reference conditions and with reuse option scenarios. Prepare navigation impacts assessment report

Outputs are a Physical Environment Evidence Report cataloguing and describing the reference conditions used throughout the assessments, together with a Physical Environment Assessment Report cataloguing and describing the effects of London Reuse SRO. As with Gate 1 it is envisaged that the assessments will be undertaken on a reach basis and describe the worst case scenario (e.g. largest size of Reuse option in a reach). Where the worst case identifies a significant pathway effect, other option variants will also be assessed in order to provide specificity for all option sizes. The downstream

extent of the study area in the Thames Estuary will be reviewed in relation to pathways identified by the updated Gate 2 Physical Environment assessment.

The Physical Environment Evidence Report and Assessment Report will provide input to the Ecological Assessments and information that will be directly used in the Regulatory Assessments. A Tidal Navigation Impacts Assessment Report will also be prepared for the PLA.

2.2.1.3 Task 1.3 Water Quality Assessment

Outputs from Gate 1 that will be used are the Methodology Scoping Report, data collated and reviewed in the Water Quality Evidence Report, tideway model runs undertaken as part of the Gate 1 assessment.

Additional data to be used in Gate 2 are the water quality data from the pan-SRO monitoring programme; continuous tideway salinity data from the London Reuse monitoring programme; updated EA and PLA data requests; Gate 2 fluvial and tideway modelling outputs (Section 2.2.1.1); and outfall/DRA intake design information from the engineering consultant.

Task item	Scope of assessment	Approach to assessment
a. Water temperature change	<ul style="list-style-type: none"> Assessment of water temperature effects throughout the study area (both locally at outfalls, downstream in river and in estuary) for the range of reference conditions and scenarios with reuse option 	<ul style="list-style-type: none"> Interrogate 3D river modelling outputs for freshwater study reaches. Interrogate TELEMAC model outputs for tidal study reaches. Information on temperature change from treatment processes and conveyance routes will be included in the assessment.
b. General physico-chemical change	<ul style="list-style-type: none"> Assessment of modelled WFD water quality parameters throughout the study area (both river and estuary) for the range of reference conditions and scenarios with reuse option 	<ul style="list-style-type: none"> Interrogate 1D river modelling outputs for freshwater study reaches. Interrogate TELEMAC model for tidal study reaches.
c. WFD chemicals	<ul style="list-style-type: none"> Assessment of WFD and EQSD chemical quality throughout the study area (both river and estuary) for the range of reference conditions and scenarios with reuse option 	<ul style="list-style-type: none"> Interrogate conservative tracer results from 1D river modelling fluvial model for freshwater study reaches with receiving watercourse data from the pan-SRO water quality monitoring programme to inform discharge quality information for the Engineering Consultant. Interrogate conservative tracer results from TELEMAC model for tidal study reaches with final effluent quality data from the pan-SRO water quality monitoring programme. Liaison with SRO project team.
d. Olfactory water quality assessment	<ul style="list-style-type: none"> Assessment of specific olfactory cues and inhibitors throughout the study area (both river and estuary) for the range of reference conditions and scenarios with reuse option 	<ul style="list-style-type: none"> Interrogate conservative tracer results from 1D river modelling fluvial model for freshwater study reaches with data from the pan-SRO water quality monitoring programme to inform concentrations of olfactory cues and inhibitors in freshwater reaches. Interrogate conservative tracer results from TELEMAC model outputs for tidal study reaches with data from the pan-SRO water quality monitoring programme to inform concentrations of olfactory cues and inhibitors in freshwater reaches.
e. Mogden/Beckton final effluent discharge fate	<ul style="list-style-type: none"> Collaborative working with Engineering Consultant on changes to concentrations of chemicals discharged in final effluent from inclusion of process water 	<ul style="list-style-type: none"> Use Engineering Consultant's review of environmental fate (to solid wastes, liquid wastes or conversion) of chemicals to identify changes in final effluent concentration. Review estuarine dilution assessment in sub-tasks C and D to account for sensitivity to these effects.
f. Richmond Pound drawdown water quality assessment	<ul style="list-style-type: none"> Assesses the specific effects of planned annual maintenance drawdown on water quality within Richmond Pound 	<ul style="list-style-type: none"> Interrogate estuarine TELEMAC modelling outputs to describe changes in general physico-chemical water quality and

Task item	Scope of assessment	Approach to assessment
g. Tideway salinity monitoring	<ul style="list-style-type: none"> Installation of Delta Wharf and Barking Riverside sites once Thames Water licence agreements are in place with landowners. Quarterly maintenance visits (four). 	temperatures during those periods (baseline) and with reuse option. <ul style="list-style-type: none"> As per previous installations and to design specification agreed with the PLA through the temporary River Works Licences.

Outputs are a Water Quality Evidence Report cataloguing and describing the reference conditions used throughout the assessments, together with a Water Quality Assessment Report cataloguing and describing the effects of London Reuse SRO. The downstream extent of the study area will be reviewed in relation to pathways identified by the updated Gate 2 Water Quality assessment.

The reach based reporting style and use of worst case+ assessments are as described for the Aquatic Physical Environment task above (see Section 2.2.1.2). The Water Quality Evidence Report and Assessment Report will provide input to the Ecological Assessments and information that will be directly used in the Regulatory Assessments.

2.2.2 Task 2 Ecology

2.2.2.1 General

Outputs from Gate 1 that will be used are the Methodology Scoping Report, data collated and reviewed in the Evidence and Assessment Reports (Appendix B.2.1-B.2.7) covering the physical and ecological features. Each Gate 1 Evidence Report sets out the baseline conditions/communities for each topic, summarises the existing monitoring data collected through various monitoring programmes (including monitoring data from regulators) and provides an impact assessment for each topic associated with the LRU SRO. Each report provides the interpretation of the potential impacts in view of the baseline data for discussion and agreement with the relevant regulators to ensure that the statutory assessments (e.g., SEA, WFD, HRA) are fit for purpose.

The following general tasks are required for the updates of the Evidence Reports in Gate 2:

- Update the baseline sections of the ecological topics with any additional monitoring data that will be made available from the regulators and the Thames Water SRO monitoring programmes for 2020 and 2021.
- Update all baseline sections to include the data from the Gate 2 monitoring programme.
- Update all baseline sections to include the data requested from Local Record Centres.

2.2.2.2 Task 2.1 Fisheries Assessment

The outputs for Gate 2 will include a Fisheries Evidence Report cataloguing and describing the reference conditions used throughout the assessments using the updated data available in Gate 2, together with a Fisheries Assessment Report which considers the effect of modelled and empirical physical environment and water quality outputs upon fisheries receptors.

The Fisheries Assessment Report will include updated recommendations for additional mitigation measures (if required) to inform the discussion with the design/engineering team.

The assessment scope includes workshops/meetings with the technical experts from the regulators at different stages with the following meetings proposed:

- A meeting in December 2021 to agree that the baseline data and approach to data interpretation is fit for purpose for Gate 2 (prior to updating baseline section in late December 2021).
- A meeting in February 2022 to agree the approach to updating the assessment in Gate 2 (prior to completing the updates by April 2022).
- A meeting in May 2022 to discuss the outcomes of the assessments.

Task item	Scope of assessment	Approach to assessment
a. Fish (WFD/NERC) Freshwater and	<ul style="list-style-type: none"> Update the Gate 1 assessment using additional baseline data collected during Gate 1 and Gate 2 	<ul style="list-style-type: none"> Update Gate 1 baseline data to include survey information (e.g. survey time, survey extent) to determine CPUE for comparison

Task item	Scope of assessment	Approach to assessment
Estuarine (including European eel)	(see Section 2.2.2.1) and updated physical environment and water quality assessments (including modelling)	<ul style="list-style-type: none"> with Gate 1 and Gate 2 monitoring data collected by SRO project team. Review data and update baseline sections for juvenile fish using Gate 1 and Gate 2 monitoring data. Review and refine species temperature thresholds / thermal preferenda for spawning, juvenile and adult life stages (see Section 2.2.1.3). Update assessment in consideration of the interpretation of the fluvial model (see Section 2.2.1.2) including the assessment of discharge, level and velocity patterns throughout the study area (both river and estuary) for the range of reference conditions and scenarios with reuse option Update assessment to consider modelled information on marginal exposure in the estuary. Update assessment in consideration of the interpretation of the water quality assessment (See Section 2.2.1.3). Update assessment to consider outfall designs in relation to entrainment and screening. Suggest further mitigation measures (where required) for design/engineering interface.
b. Weir pool/marginal habitat assessment (including Sunbury creek)	<ul style="list-style-type: none"> Update the Gate 1 assessment using additional baseline data collected during Gate 1 and Gate 2 (see section 2.2.2.1) and updated physical environment and water quality assessments (including modelling) 	<ul style="list-style-type: none"> Review data and update baseline sections for juvenile fish using Gate 1 and Gate 2 monitoring data. Update assessment in consideration of the interpretation of the 3D fluvial modelling of outfalls and weir pools for different scenarios. Suggest further mitigation measures (where required) for design/engineering interface.
c. Migratory fish (including European eel)	<ul style="list-style-type: none"> Update the Gate 1 assessment using additional baseline data collected during Gate 1 and Gate 2 (see section 2.2.2.1) and updated physical environment and water quality assessments (including modelling) 	<ul style="list-style-type: none"> Review monitoring data of Sunbury, Molesey and Teddington fish passes and update relevant baseline sections. Review of wider monitoring datasets for migratory species (including shad and lamprey) Update the assessment using the interpretation of the TELEMAT model data to understand how flow and levels change against critical levels identified for target fish species under different scenarios (see Section 2.2.1.1). Review of potential for impact pathway to the weirs in the Enfield Island Loop of the River Lee Diversion. Suggest further mitigation measures (where required) for design/engineering interface.
d. Olfactory cues investigations	<ul style="list-style-type: none"> Update the Gate 1 assessment using the desktop review of available information on olfactory cues In order to assess masking of migratory salmonid olfaction, data is required on the ratio of treated effluent to river water under baseline conditions and modelled under various scenarios. 	<ul style="list-style-type: none"> Update assessment in consideration of the interpretation of the fluvial (flow and water quality) model, including the fluvial flow series at key locations and extent of mixing zones (see Section 2.2.1.2). Update assessment in consideration of the interpretation of the water quality assessment, including risk to olfactory cues (See Section 2.2.1.3).
e. European Smelt	<ul style="list-style-type: none"> Update the Gate 1 assessment using additional baseline data collected during Gate 1 and Gate 2 (see section 2.2.2.1) and updated 	<ul style="list-style-type: none"> Update assessment in consideration of the interpretation of the fluvial (flow and water quality) model, including the fluvial flow

Task item	Scope of assessment	Approach to assessment
	physical environment and water quality assessments (including modelling)	series at key locations and extent of mixing zones (see Section 2.2.1.2). <ul style="list-style-type: none"> Update assessment in consideration of the interpretation of the water quality assessment, including risk to olfactory cues (see Section 2.2.1.3).

2.2.2.3 Task 2.2 Aquatic Ecology Assessment

The outputs for Gate 2 will include Freshwater and Estuarine Evidence Reports cataloguing and describing the reference conditions used throughout the assessments using the updated data available in Gate 2, together with a Freshwater and Estuarine Assessment Reports which consider the effect of modelled and empirical physical environment and water quality outputs upon aquatic ecology receptors. Data from the pan-SRO algal monitoring study will also be incorporated. The Assessment Reports will be updated to include additional mitigation measures (if required) to inform the discussion with the design/engineering team.

The Gate 2 assessment scope includes workshops/meetings with the technical experts from the regulators at different stages with the following meetings proposed:

- A meeting in December 2021 to agree that the baseline data and approach to data interpretation is fit for purpose for Gate 2 (prior to updating baseline section in December 2021)
- A meeting in February 2022 to agree the approach to updating the assessment in Gate 2 (prior to completing the updates by April 2022)
- A meeting in May 2022 to discuss the outcomes of the assessments.

Task item	Scope of assessment	Approach to assessment
a. Aquatic macroinvertebrates Freshwater and Estuarine	<ul style="list-style-type: none"> Update the Gate 1 assessment using additional baseline data collected during Gate 1 and Gate 2 (see section 2.2.2.1) 	<ul style="list-style-type: none"> Review additional studies on temperature related impacts on aquatic macroinvertebrates to understand the potential risks. Review modelling interpretation (see Section 2.2.1.3) to determine significance of temperature changes (seasonal <i>and</i> average). Review modelling to consider the extent of the mixing zone downstream of discharge locations (see Section 2.2.1.2) Update assessment in consideration of the interpretation of the fluvial model (see Section 2.2.1.2) including the assessment of discharge, level and velocity patterns throughout the study area (both river and estuary) for the range of reference conditions and scenarios with reuse option and the likely effect on a community scale if this is shown to be extensive. Update assessment to consider modelled information on marginal exposure in the estuary. Update assessment in consideration of the interpretation of the water quality assessment (see Section 2.2.1.3). Suggest further mitigation measures (where required) for design/engineering interface.
b. Marginal habitat assessment	<ul style="list-style-type: none"> Update the Gate 1 assessment using additional baseline data collected during Gate 2 	<ul style="list-style-type: none"> Update assessment in consideration of the interpretation of the fluvial (flow) model, including the fluvial flow series at key locations to consider the risk of water level changes. Include relevant SRO monitoring programme survey data such as ADCP and River MoRPh survey outputs. Suggest further mitigation measures (where required) for design/engineering interface.

Task item	Scope of assessment	Approach to assessment
c. Plants/diatoms	<ul style="list-style-type: none"> Update the Gate 1 assessment using additional baseline data collected during Gate 1 and Gate 2 (see section 2.2.2.1) 	<ul style="list-style-type: none"> Review and interpret results from the ongoing algal monitoring programme. Review modelling in Gate 2 to determine significance of temperature changes (seasonal and average) to confirm risk to increasing productivity. The assessment assumes no impacts as a result of temperature change and further review of literature is available to confirm the risks of temperature change. Update assessment in consideration of the interpretation of the water quality assessment (see Section 2.2.1.3), including temperature (if applicable based on review) and nutrients. Update assessment in consideration of the interpretation of the fluvial model (see Section 2.2.1.2) including the assessment of discharge, level and velocity patterns throughout the study area for the range of reference conditions and scenarios with reuse option and the likely effect on a community scale if this is shown to be extensive. Suggest further mitigation measures (where required) for design/engineering interface.
d. Macroalgae, Angiosperm and Phytoplankton	<ul style="list-style-type: none"> Update the Gate 1 assessment using additional baseline data collected during Gate 1 and Gate 2 (see section 2.2.2.1) 	<ul style="list-style-type: none"> Review and interpret results from the ongoing algal monitoring programme. Review modelling in Gate 2 to determine significance of temperature changes (seasonal and average) to confirm risk to increasing productivity. Update assessment in consideration of the interpretation of the fluvial model (see Section 2.2.1.2) including the assessment of discharge, level and velocity patterns throughout the study area (both river and estuary) for the range of reference conditions and scenarios with reuse option and the likely effect on a community scale if this is shown to be extensive. Update assessment to consider modelled information on marginal exposure and hydromorphology survey data (estuarine MoRPh) in estuary. Assessment of the measured and modelled sediment data (see Section 2.2.1.2) Update assessment in consideration of the interpretation of the water quality assessment (See Section 2.2.1.3). Suggest further mitigation measures (where required) for design/engineering interface.
e. Designated and protected sites and species.	<ul style="list-style-type: none"> Update assessment to consider additional baseline information, including information on risk to German hairy snail, depressed river mussel, river margins and terrestrial habitats Assessment to consider the risk associated with hydrological changes from decreased discharge and change in water level potentially resulting in inundation of key habitats (Ham Lands LNR, Isleworth Ait LNR, Syon Park SSSI) 	<ul style="list-style-type: none"> Update assessment in consideration of the interpretation of the fluvial model (see Section 2.2.1.2) including the assessment of discharge, level and velocity patterns throughout the study area (both river and estuary) for the range of reference conditions and scenarios with reuse option Include relevant SRO monitoring programme survey data such as UK Hab survey outputs Update assessment in consideration of the interpretation of the water quality assessment (see Section 2.2.1.3). Suggest further mitigation measures (where required) for design/engineering interface.

2.2.2.4 Task 2.3 INNS Assessment

The outputs for Gate 2 will include an Invasive Non-Native Species (INNS) Evidence Report cataloguing and describing the reference conditions used throughout the assessments using the updated data available in Gate 2, together with an INNS Assessment Report utilising the updated Risk Assessment Tool that will be provided by the Environment Agency. The preferencing assessment completed Gate 1 will also be update in view of the outputs from the modelling in Gate 2. The INNS Assessment Report will be updated to include mitigation measures (if required) to inform the discussion with the design/engineering team and the regulators as per the NAU requirements.

The assessment scope includes workshops/meetings with the technical experts from the regulators at different stages with the following meetings proposed:

- A meeting in December 2021 to agree that the baseline data and approach to data interpretation is fit for purpose for Gate 2 (prior to updating baseline section in late December 2021).
- A meeting in April 2022 to discuss the mitigation measures identified for the various options.
- A meeting in May to discuss the outcomes of the assessment (based on the Environment Agency Tool).

Task item	Scope of assessment	Approach to assessment
a. INNS	<ul style="list-style-type: none"> • The updated evidence and assessment report will have regard to the information from the Gate 1 and Gate 2 monitoring programme for INNS • Review and update of the full risk assessment adopting the standardised approach provided by the EA. 	<ul style="list-style-type: none"> • Update preferencing assessment in consideration of the interpretation of the fluvial (flow and water quality) model, including the fluvial flow series at key locations and extent of mixing zones (see Section 2.2.1.2) for different scenarios. • Review of the standardised tool once available from the EA. • Update assessment using standardised EA tool and recommend additional mitigation measures to inform option design • Consult with the regulators on the proposed mitigation measures for consideration in option designing

2.2.2.5 Task 2.4 Terrestrial Ecology Assessment

The outputs for Gate 2 will include a Terrestrial Ecology Evidence Report to catalogue the baseline conditions and a Terrestrial Ecology Assessment Report to assess the terrestrial ecology impacts associated with option construction and operation and recommend mitigation required to inform option design and avoid and/or mitigate against any construction/operational impacts to inform the discussion with the design/engineering team. The assessment scope includes workshops/meetings with the technical experts from the regulators at different stages with the following meetings proposed:

- A meeting in December 2021 to agree that the baseline data and approach to data interpretation is fit for purpose for Gate 2 (prior to updating baseline section in late December 2021).
- A meeting in February 2022 to agree the approach to updating the assessment in Gate 2 (prior to completing the updates by April 2022).
- A meeting in May 2022 to discuss the outcomes of the assessments.

Task item	Scope of assessment	Approach to assessment
a. Mammals	<ul style="list-style-type: none"> • Draft baseline sections to include the data requested from regulators and Local Record Centres • Complete impact assessment 	<ul style="list-style-type: none"> • Review baseline data (including Gate 2 surveys) to determine the risk to terrestrial and riparian mammals during construction and operation of the options • Complete assessment in consideration of the interpretation of the fluvial model (see Section 2.2.1.2) including the assessment of discharge, level and velocity patterns throughout the study area for the range of reference conditions and scenarios with reuse option to inform risk to riparian mammals

Task item	Scope of assessment	Approach to assessment
b. Desk based bird assessment	<ul style="list-style-type: none"> • Draft baseline section for bird communities and include Wetland Bird Survey Data • Complete impact assessment of South West London Waterbodies SPA/Ramsar site and Lee Valley SPA/Ramsar site 	<ul style="list-style-type: none"> • Suggest further mitigation measures (where required) for design/engineering interface. • Review baseline data to confirm risk to bird communities and designated species • Update assessment in consideration of the interpretation of the fluvial model (see Section 2.2.1.2) (including the empirical assessment of discharge, level and velocity patterns within the River Lee) for the range of reference conditions and scenarios with reuse option and the likely effect on a community scale if this is shown to be extensive. • Update assessment in consideration of the interpretation of the water quality assessment (see Section 2.2.1.3). • Suggest further mitigation measures (where required) for design/engineering interface.
c. Nitrogen and ammonia deposition review (Epping Forest)	<ul style="list-style-type: none"> • Draft baseline section on air quality within Epping Forest • Complete impact assessment (specific impact assessment and consideration within HRA) 	<ul style="list-style-type: none"> • Review baseline data to determine the risk to terrestrial habitats during construction of the option • Desk based air quality assessment to be completed • Suggest further mitigation measures (where required) for design/engineering interface.
d. Habitat assessment (using UKHab and MoRPh survey data)	<ul style="list-style-type: none"> • Draft baseline sections to include the data requested from regulators and Local Record Centres • Include baseline data from UKHab and MoRPh River and Estuarine surveys • Complete impact assessment 	<ul style="list-style-type: none"> • Review baseline data to determine the risk to terrestrial habitats during construction and operation of the option. • Review baseline conditions to inform the extent of functionally linked habitat. • Suggest further mitigation measures (where required) for design/engineering interface.

2.2.3 Task 3 Additional Studies to support SEA

2.2.3.1 Task 3.1 Additional Assessment Scoping Phase

- An outline of additional studies is set out below.
- The exact scope of the further assessment work that will be required has still to be defined and agreed. This process will require further planning, review of feedback from Gate 1 and interaction with the Engineering Consultant. It is proposed that this process takes place early in Gate 2 to enable more precise scope to be provided for these additional studies.

2.2.3.2 Task 3.2 Desk-based Assessment

- Desk-based assessment of the construction and or operational phase impacts for each option covering the below aspects:
 - Desk based review of contaminated land sites along proposed conveyance routes – This will include searches of free publicly available local authority contaminated land records, and, investigation of any specific registered landfill sites that are directly impacted by any of the schemes to help inform the Engineering Consultant as to potential land contamination risk and help identify suitable mitigation measures. Further assessment of the proposed tunnel and conveyance routes is proposed to be undertaken in conjunction with the Engineering Consultant to help confirm the most suitable and deliverable conveyance options. As the location of the proposed conveyance routes become refined, discussions with relevant local authority staff would be considered at the appropriate design stage (Gate 3 or Gate 4).
 - Desk based assessment of sensitive landscape and visual receptors to construction – further assessment of the key infrastructure assets proposed to be developed is to be undertaken. This will involve consideration of Local and Regional Plans in terms of designated landscape and visual protected areas to better understand local sensitivities and likely significance of

proposed scheme developments during construction and operation. The methodology and scope of this work is to be determined through early discussions held in Gate 2.

- Further desk based assessment of heritage assets and archaeological interests relevant to sites and conveyance routes. This will involve consideration of Local and Regional Plans in terms of designated heritage features and areas to better understand local sensitivities and likely significance of proposed scheme developments during construction and operation. The methodology and scope of this work is to be determined through early discussions held in Gate 2.
- Desk based assessment of recreational impacts once site selection work and conveyance optimisation complete - The methodology and scope of this work is to be determined through early discussions held in Gate 2. This will involve consideration of the scale and scope of the recreational resource i.e. local, regional, national to better understand likely significance of proposed scheme developments during construction and operation. The methodology and scope of this work is to be determined through early discussions held in Gate 2.
- Desk based air quality assessments to be completed, – once construction information is made available, in terms of likely HGV movements, plant equipment to be used and duration of works, further air quality and noise assessments can be undertaken to help identify potential further human or ecological impacts that may arise, for example, assessment as to whether critical loads of designated sites will be exceeded or not.
- Support development of mitigation / compensation measures to significant effects – this aspect of the work is proposed to be undertaken as part of the mitigation task and through the development of the CDRs with the Engineering Consultant.
- Use findings of assessments and outputs from WRSE regional plan to undertake in-combination assessments.
- Assessment of flood risk – pre-feasibility / scoping Flood Risk Assessment (FRA) during Gate 2 once refined design information is available, which would request available EA Product 4 data, complete a qualitative assessment of risk, put forward potentially appropriate mitigation measures and outline scope required for full FRA in Gate 3.

2.2.4 Task 4 Regulatory Assessments

2.2.4.1 Task 4.1 HRA

The objective of the Gate 2 HRA will be to establish whether any of the elements associated with the London reuse SRO are likely to have a significant effect on European sites (alone or in-combination with other plans or projects), adopting the precautionary principle (Stage 1 Screening), and where Likely Significant Effects (LSEs) cannot be ruled out, to determine through a Stage 2 Appropriate Assessment whether the schemes are likely to adversely affect the integrity of a European site(s).

The Gate 2 HRA, as per the ACWG methodology, aims to review and update the Gate 1 Screening and Appropriate Assessment to a standard suitable for submitting into final Regional Plans or final Water Resources Management Plans. As the Gate 2 submission does not yet form a statutory plan or project, the *principles* of the HRA process will be applied to help identify risks to feasibility and deliverability of the elements of the London reuse SRO, as well as the monitoring and mitigation requirements to reduce any remaining uncertainty.

The updated assessment will include additional evidence related to construction (including conveyance routes, duration that areas will be construction sites, etc) and operational activities that has been collected as part of the current and future environmental monitoring and investigation work packages.

This is required to reduce uncertainty in the assessment at Gate 1, provide further evidence of the impacts, and better inform the risk as to whether the site integrity test could be met if the solution were

to proceed to project level HRA. In particular, the current Appropriate Assessment will be updated in view of the updated assessments for the terrestrial and marginal habitats (see Section 2.2.2.3 and Section 2.2.2.5).

The additional data and assessment outcomes to be included in the Appropriate Assessment in Gate 2 includes (but is not limited to):

- Field monitoring including ADCP surveys and UKHab to gain further understanding of the locations, extent and sensitivity of existing marginal habitat within the River Thames. This will enhance understanding of the potential adverse effects of discharging recycled water in association with Mogden effluent reuse option and Mogden South Sewer option on supporting marginal habitat, that may be present between the outfall and abstraction points downstream. In addition, surveys include reaches and associated habitats (intertidal mudflats, coastal saltmarsh and intertidal shingle/cobble beach) potentially affected by the diversion of effluent from Beckton STWs outfall and resultant reduction in wetted habitat extent.
- The updated assessment of discharge, level and velocity patterns throughout the study area (both river and estuary) for the range of reference conditions and scenarios with reuse option.
- The updated water quality assessments.
- Other data sources including Wetland Bird Survey Data will be explored in Gate 2 for qualifying bird species of South West London Waterbodies SPA/Ramsar site, Lee Valley SPA/Ramsar site and Thames Estuary and Marshes SPA/ Ramsar site (see Section 2.2.2.5).
- Engagement with Lee Valley Regional Park Authority and/or Lee Valley Bitterns HAP group on use of proposed Beckton shaft locations by Great Bittern.
- Further assessment of the impact of recycled water release in the River Thames and River Lee Diversion on water quality within South West London Waterbodies SPA and Ramsar site and Lee Valley SPA and Ramsar site and potential impacts on macrophyte communities, invertebrate fauna and reed beds supporting qualifying bird species.
- The Gate 1 screening and Appropriate Assessment will be reviewed (and updated) in view of any changes in option design, construction and operational information, including potential air quality impacts on qualifying features of Epping Forest SAC.

2.2.4.2 Task 4.2 WFD

In accordance with ACWG published guidance for environmental assessment methods for SROs feedback received from RAPID and the regulators to the Gate 1 submissions on the London Reuse SRO will be reviewed to assist the updating of the WFD for Gate 2. EA internal guidance on WFD assessments for water resources options has changed since ACWG published guidance. Also third cycle River Basin Management Plans will be published during Gate 2. As such ACWG guidance/tools will require updating for Gate 2. The team are already conversant with the guidance changes and these will be set out in a methodology note for communication to the Area level EA staff.

Gate 1 assessments, including the ACWG spreadsheet proformas, will be reviewed and updated to include these revisions together with additional evidence (including substances included in WFD Directions from 22/12/2018 e.g. dioxins) that has been collected as part of the current and future environmental monitoring and investigation work packages and updates to option designs by the Engineering Consultant. An assessment of potential in-combination schemes will be undertaken based on WRSE outputs of likely scheme combinations.

2.2.4.3 Task 4.3 SEA

In accordance with ACWG published guidance for environmental assessment methods for SROs feedback received from RAPID and the regulators to the Gate 1 submissions on the London Reuse SRO has been reviewed to assist the updating of the SEA for Gate 2.

The Gate 1 option-level environmental assessment followed an objectives-led approach in line with the ACWG published guidance for environmental assessment methods for SROs. It is proposed for the Gate 2 submissions to use broadly the same methodology and SEA objectives as adopted in Gate 1. The approach is to follow the ACWG guidance with refinement of the key indicator questions to have regard to comments received following the Gate 1 submissions. In particular:

- Consideration has been given to how changes in supply will affect the resilience of the donor region. This is an additional key indicator question to be considered in Objective 3.5, Objective 5.1 and Objective 8.3.
- SEA Topic: Biodiversity, flora and fauna: SEA Objective 1.5 as a separate objective has been removed and will instead be a consideration under SEA objective 1.1 with further indicator question added.

The updated SEA topic questions and guidance is given in the table below.

SEA topic	SEA objective	Key indicator questions
Biodiversity, flora and fauna	1.1 To protect designated sites and their qualifying features	<ul style="list-style-type: none"> • Is the option likely to affect the conservation status of any SPAs, SACs, Ramsar sites, SSSIs or National Nature Reserves? • Will it affect HRA compliance (taken from HRA assessment results)? • Will the option affect the marine environment, habitats and species (including MCZs and MPAs)? • Is the option likely to affect ancient woodland? • Will the option affect the freshwater environment, habitats and species?
	1.2 To avoid a net reduction, and where possible enhance, in non-monetised natural capital assets	<ul style="list-style-type: none"> • Are there any opportunities for habitat creation or restoration and a net benefit/gain for biodiversity? • Will the option contribute to the loss or gain in habitat connectivity? • Does it protect, conserve and enhance biodiversity natural capital and the ecosystem services the natural capital provides (taken from the natural capital assessment results)?
	1.3 To protect and enhance biodiversity, priority habitats and species	<ul style="list-style-type: none"> • Will the option protect and enhance priority habitats and species / habitats and species of principal importance? • Will the option affect a priority habitat on the priority habitat inventory?
	1.4 To avoid and, where required, manage invasive and non-native species (INNS)	<ul style="list-style-type: none"> • Is there a possibility for INNS to be spread/ introduced? • Is there an opportunity to improve biodiversity value through removal of INNS?
Soil	2.1 To protect and enhance the functionality, quantity and quality of soils, including the protection of high-grade agricultural land	<ul style="list-style-type: none"> • Will the option affect high grade agricultural land? • Will the option promote the efficient use of land? • Will the option prevent soil erosion and retain soil stocks as a natural resource? • Will the option involve use of brownfield or greenfield land? • Is the option likely to affect SSSIs of geological importance?
Water	3.1 To minimise or manage flood risk, taking climate change into account	<ul style="list-style-type: none"> • Is the option vulnerable to flood risk? • Will the option contribute to the risk of flooding? • Will the option protect and enhance the environmental resilience of the water environment to climate change, flood risk and drought?
	3.2 To enhance or maintain groundwater quality and resources	<ul style="list-style-type: none"> • Will the option affect groundwater quality or quantity?
	3.3 To enhance or maintain surface water quality, flows and quantity	<ul style="list-style-type: none"> • Will the option affect surface water quality or quantity?
	3.4 To meet WFD objectives	<ul style="list-style-type: none"> • Is the option likely to contribute to or conflict with the achievement of WFD objectives (taken from the WFD assessment results)?
	3.5 To improve water efficiency through provision of access to a resilient and sustainable supply of water.	<ul style="list-style-type: none"> • Does the option provide a reliable and sustainable water supply which meets changing demand? • Will the option affect the resilience on the donor region?
Air	4.1 To minimise air emissions during construction and operation	<ul style="list-style-type: none"> • Is the option in an air quality management area (AQMA)? • Will the option affect local air quality?

SEA topic	SEA objective	Key indicator questions
Climatic Factors	5.1 To introduce climate mitigation where required and improve the climate resilience of assets and natural systems	<ul style="list-style-type: none"> • Is there potential for the option to incorporate climate mitigation measures to reduce its carbon footprint, such as lower embodied carbon or incorporating renewable energy? • Is the option vulnerable to climate change effects? • Does the option include climate resilience measures? • Will the option affect the resilience on the donor region?
	5.2 To minimise embodied and operational emissions	<ul style="list-style-type: none"> • Will the option affect carbon or other greenhouse gas (GHG) emissions? • Will the option minimise energy demand during construction and operation?
Landscape	6.1 To conserve, protect and enhance landscape and townscape character and visual amenity	<ul style="list-style-type: none"> • Will the option have an effect on the character of the landscape or townscape, including views? • Will the option improve access to the countryside? • Will the option create or improve green infrastructure which contributes to access to the landscape? • Will the option protect and enhance designated landscapes and features? • Will the option affect visual amenity?
Historic Environment	7.1 To conserve/protect and enhance historic assets/cultural heritage and their setting, including archaeological important sites	<ul style="list-style-type: none"> • Will the option affect designated historic assets, sites and features? • Will the option affect the setting and/or significance of a historic asset? • Will the option affect archaeological important sites?
Population and Human Health	8.1 To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	<ul style="list-style-type: none"> • Will the option allow for economic development? • Will the option provide employment opportunities? • Will the option affect road or rail infrastructure? • Will the option minimise disturbance from noise, light, visual, and transport? • Will the option affect the local area in terms of noise emissions?
	8.2 To maintain and enhance tourism and recreation	<ul style="list-style-type: none"> • Will the option have an effect on active lifestyles, such as impacts on active travel through disruption to pedestrian and cycle routes? • Will the option affect Public Rights of Way? • Will the option maintain or enhance tourism? • Will the option affect water resources that are used to provide tourist facilities?
	8.3 To secure resilient water supplies for the health and wellbeing of customers	<ul style="list-style-type: none"> • Will the option secure resilient water supplies for the health and wellbeing of customers? • Will the option affect the resilience on the donor region? • Does the option promote water efficiency and encourage a reduction in water consumption?
	8.4 To increase access and connect customers to the natural environment, provide education or information resources for the public	<ul style="list-style-type: none"> • Does the option improve access to the natural environment for recreation, including those living within deprived areas?
Material Assets	9.1 To minimise resource use and waste production	<ul style="list-style-type: none"> • Will the option minimise the use of resources? • Will the option minimise the production of waste?
	9.2 To avoid negative effects on major built assets and infrastructure	<ul style="list-style-type: none"> • Will the option reuse existing infrastructure? • Will the option affect major built assets and infrastructure, including transport infrastructure?

It is assumed that the options assessed at Gate 1 will comprise the options to be assessed at Gate 2. The Gate 1 SEA assessments will be updated in accordance with the Gate 2 requirements set out in the ACWG published guidance for environmental assessment methods for SROs. This will comprise addressing more detailed design information and mitigation measures as well as taking account of the further assessments undertaken in Gate 2, including the additional studies to support the SEA (referenced above) along with the updated HRA, WFD and Natural Capital assessments. Additional design information available at Gate 2 will reduce the level of uncertainty compared to the Gate 1 assessment.

The results of the SEA assessments, for each option of the London Reuse SRO, will be presented in SEA output tables. These output tables will be in the same format as those adopted in Gate 1 using the same SEA assessment significance ratings used in the SEA Gate 1 assessment report.

Discussions be held with the Lead Engineering Consultant, to discuss mitigation and enhancement measures that were identified and included at Gate 1 and to further develop mitigation measures for inclusion in the Conceptual Design Reports (CDRs) with these measures taken into account in the SEA assessments as embedded mitigation. Additionally, further mitigation measures (to those embedded mitigation measures identified and costed for in the CDRs) will be identified or be further developed from those identified in Gate 1.

An assessment of the likely significant environmental effects of the London Reuse SRO in combination with those of other relevant plans, programmes or projects, including the regional water resource plans, other major plans, programmes and projects will be undertaken for the SEA at Gate 2. Consideration of in-combination effects will be undertaken for up to one of each of the four main reuse option types only. In addition to which up to two further assessments will be undertaken to take account of potential combining of options, i.e. Beckton reuse option along with a Mogden reuse option. Ricardo's knowledge of other SROs will enable us to take account of the in-combination effects for the effects from the relevant SROs related to the supply of water into the London Reuse SRO system (primarily the freshwater River Thames).

Interaction with the regional assessment being undertaken by WRSE will continue during Gate 2. It is proposed to review the final metrics and feedback from the regional planning process to the London Reuse SRO assessments for SEA. Two further inputs to the regional planning process for these metrics will be provided to WRSE in November 2021 and one more between January 2022 and March 2022. Feedback from WRSE will be reported in the Gate 2 submissions, if made available with sufficient time to incorporate their inputs.

2.2.4.4 Regulatory Assessments Assumptions

- It is proposed for the Gate 2 submissions to use broadly the same methodology and SEA objectives as adopted in Gate 1 with amendments made as referenced in Section 2.2.4.3.
- It is assumed that the 4 main options (and total of 11 sub-options) assessed at Gate 1 will comprise the options to be assessed at Gate 2.
- The area under consideration for the assessment of the reuse options reflects the spatial scope of the London Reuse SRO, which remains the same area as assessed during Gate 1. This primarily includes specific areas of the River Thames catchment area at or downstream of Shepperton, and River Lee Diversion and Walthamstow Reservoirs. Assessment of plant and conveyance infrastructure will use information in updated Conceptual Design Reports provided by the Lead Engineering Consultant.
- It is assumed that the reuse recycled water discharged will comply with both environmental permit conditions and Drinking Water Safety Plan (DWSP) raw water requirements.
- For a DRA outfall, it is assumed that diverted effluent will comply with environmental permit conditions.
- It is assumed that the DRA intake would include appropriate fish screening and all new outfalls would include appropriate eel management measures.
- The in-combination assessments will only be undertaken for up to one sub-option of each of the four main reuse options i.e. only one of the Beckton reuse sub-options of 100, 200 or 300 Ml/d would be assessed for in-combination effects. Furthermore, it is anticipated that only one of either the Mogden reuse sub-options or the Mogden South Sewer option would come forward for development.
- It is assumed that in addition to the assessment of the individual reuse options as per Gate 1 an assessment of up to two combination of reuse options will be undertaken in Gate 2 i.e. Beckton plus Mogden.
- The in-combination effects will consider known major projects and other SROs that could affect the London Reuse SRO system known at a point in time (aligned with 'design freeze' in February 2022) to be agreed with Thames Water.

- It is assumed that inputs on environmental mitigation measures will be for up to four CDRs with one produced per each main option will include relevant good practice guidance.
- Topic specific engagement with Historic England, Local Authorities and Non-Government Organisations will be undertaken.

2.2.5 Task 5 Mitigation and Enhancement

2.2.5.1 Task 5.1 Natural Capital (NC), Task 5.2 Biodiversity Net Gain (BNG) & Task 5.3 Renewables

At Gate 1 a BNG assessment and an outline NC assessment was completed with the latter based on 5 metrics. Given the level of methodology (e.g. the ACWG, ENCA and WRSE) at the time this was completed using the Defra Metric 2.0 and followed the methodology available. Over recent months new methodologies have been developed notably the updated Defra metric 3.0 and the Environment Agency’s NC baseline methodology. Furthermore, the NC assessment at Gate 1 was limited by both engineer design and on-the-ground knowledge of habitat condition and extent. With engineering information provided, the natural capital desk-based assessment will be reassessed. At Gate 2 therefore the outputs from Gate 1 will be updated and enhanced, taking into account new knowledge of: habitats; local plans and policies; additional assessments for NC metrics (recreation and agriculture); and updated SRO design and assessments in conjunction with the use of the new methodologies available whilst remaining in line with the ACWG and Gate 2 environmental assessment expectations.

Key tasks are outlined in the table below which broadly follow:

- Draw on outputs from Gate 1.
- Identify additional data sets to be used.
- Re-scope assessment in line with Gate 2 assessment and new data accounting for aquatic and terrestrial habitats via WFD assessment outputs and the enhanced Defra Metric 3.0.
- Review and refine outputs of the NC account (including additional ecosystem services (ESS) and the underpinning BNG assessment) through stakeholder engagement.
- Reporting (including NCA and BNG workbooks for options as outlined within this submission).

Task item	Scope of assessment	Approach to assessment
a. Review of the current Gate 1 assessment	<ul style="list-style-type: none"> • A rapid re-assessment of the outputs and data sets used at Gate 1 • Develop BNG and NC approach 	<ul style="list-style-type: none"> • Against list of data used at Gate 1 produce a gap analysis of data, summarise new data sources to be used and identify any potential gaps and risks. • Agree approach with Thames Water and key stakeholders
b. Collate additional information re habitats	<ul style="list-style-type: none"> • Detailed assessment of national and local plans and policies that may support specific BNG objectives and delivery • Account for more detailed habitat information and build into the GIS • Review habitat condition data collected as part of the monitoring programme (UKHabs assessment and river MoRPh surveys) 	<ul style="list-style-type: none"> • Literature review • Initial stakeholder engagement to understand local policies and plans etc – local groups and regulators etc noting stakeholder plan to be agreed with Thames Water. • Review field monitoring outputs to understand habitat condition and identify any key gaps. • Habitat type and extent mapped • Re-run the GIS habitats assessment layers based on new data (e.g. field data and additional open source data layers such as zoomstack for river forestry inventory and national habitat network data, and linear hedgerow habitats etc). • Work with the engineering team to ensure that any changes related to construction working widths are agreed.
c. Run the BNG metric to assess habitat loss, mitigation and 10% gain	<ul style="list-style-type: none"> • Provide an account of the habitat losses as a result of the options and assess opportunity areas 	<ul style="list-style-type: none"> • Provide outputs of habitat types that are likely to be lost or affected by the SRO options. Assess extent of impact and calculate types and extent of habitat

Task item	Scope of assessment	Approach to assessment
	<ul style="list-style-type: none"> • Provide outputs in terms of key habitats and opportunity areas and extent to feed into the NC assessment (i.e. ha of habitat types). • Identify habitat mitigation within a buffer area where identified plans, policies and national habitat networks where sufficient opportunity for mitigation and BNG uplift or if not note that will need to look at a wider area for compensation. 	<ul style="list-style-type: none"> • required for mitigation and a minimum of 10% additional gain (BNG principles) • Aquatic habitats will be assessed based on the assumption that new metric can account for affected water course.
d. River condition from WFD outputs with respect to aquatic habitats	<ul style="list-style-type: none"> • Using WFD outputs as a surrogate to establish potential long-term (operational) impacts on aquatic habitats. • Refine our existing approach. 	<ul style="list-style-type: none"> • Review WFD output in the context of flow change to support the reporting of potential habitat losses, impacts of benefits from a BNG and NC perspective. • Refine our existing approach to linking ecology and hydrology to provide robust assessment over the lifetime of the assets. • Note: this step will be completed in conjunction with step c above.
e. Assess NC metrics based on broad habitat types and BNG uplifted assessment	<ul style="list-style-type: none"> • NC account based on ESS outlined in table below. • Account to be developed that includes monetised and non-monetised accounts. • Will provide an account for BNG uplift assessment (i.e. potential NC uplift/benefits). 	<ul style="list-style-type: none"> • Complete NC account based on key habitats size and account for a range of ESS as tabulated below and BNG outputs. This will provide a more robust account of NC following the detail provided by the GIS assessment and knowledge from both wider in the field data collection and import of additional data sets. • The NC account will be supported by a risk register related to assets (both quantity and quality) for the key habitat (i.e. Coastal margins, farmland, freshwater, marine, mountains moorlands and heaths, semi natural grasslands, urban and woodlands as applicable) • Asset extents will be mapped. • Workbooks provided of baseline impacts (related to construction area/permanent loss areas) and an assessment of NC related to mitigated and uplifted habitat potential. • Clearly differentiate net gain from compensation and mitigation. • Note: discussion required at point a) with Thames Water regarding the required detail on the accounts (and in the context on monetised elements how these will be presents (e.g. lifetime of assets or yearly uplift etc).
f. Workshops with key stakeholders	<ul style="list-style-type: none"> • Refine BNG and NC outputs through discussion with key stakeholder groups to ensure that all opportunities areas within a BNG buffer zone have been considered and to agree and develop initial outputs. 	<ul style="list-style-type: none"> • We have assumed the need to up to 3 half day workshops to explain a) approach b) outputs and b) refine outputs in terms of local knowledge of plans, policies and ambitions etc. • Any required updates to the BNG and NC outputs will be agreed to account for any key new opportunity areas.
g. Re-run metrics	<ul style="list-style-type: none"> • Both BNG and NC account will be rerun once to account for outputs from the workshops 	<ul style="list-style-type: none"> • Update both BNG and NC accounts in light of workshops. • Update associated workbook/accounts.
h. Final reporting	<ul style="list-style-type: none"> • Report outlining the approach, key findings and any requirements for Gate 3 	<ul style="list-style-type: none"> • Short summary approach appendix covering BNG and NC outputs with a specific additional section on renewable opportunities.

Task item	Scope of assessment	Approach to assessment
		<ul style="list-style-type: none"> Key outputs will be a series of combined BNG and NC summary workbooks and opportunity mapping at a high level.

2.2.5.2 Mitigation and Enhancement Assumptions

- Defra Metric 3.0 to be used with assumption that the aquatic (River) Metric will allow for length of river to be assessed in terms of BNG within new Defra metric 3.0.
- NE NC approach will be taken into account to assess the baseline NCA noting that this does not assess NC associated with mitigations and BNG opportunities – so bespoke method will be applied.
- Number/ length of pipelines and other infrastructure does not change.
- Three workshops to discuss opportunities with key stakeholders.
- Based on one run of metrics as per components assessed at Gate 1 but including metrics outlined above.
- Assumed one run of the BNG to output a 10% BNG gain.
- NC account based on data available and likely to be a mix of qualitative, quantitative and monetised.
- High level review of renewable energy opportunities within the options to allow for a NC assessment of renewables.

2.2.6 Task 6 Permitting

There is a need during Gate 2 to begin identifying environmental permitting requirements to support London Reuse options. This will be completed in conjunction with the work package being coordinated by Eliot Simons looking at environmental permitting and operating agreements across the other SROs operating within the River Thames.

Scoping and definition surrounding environmental permits for wastewater discharges is likely to need to include:

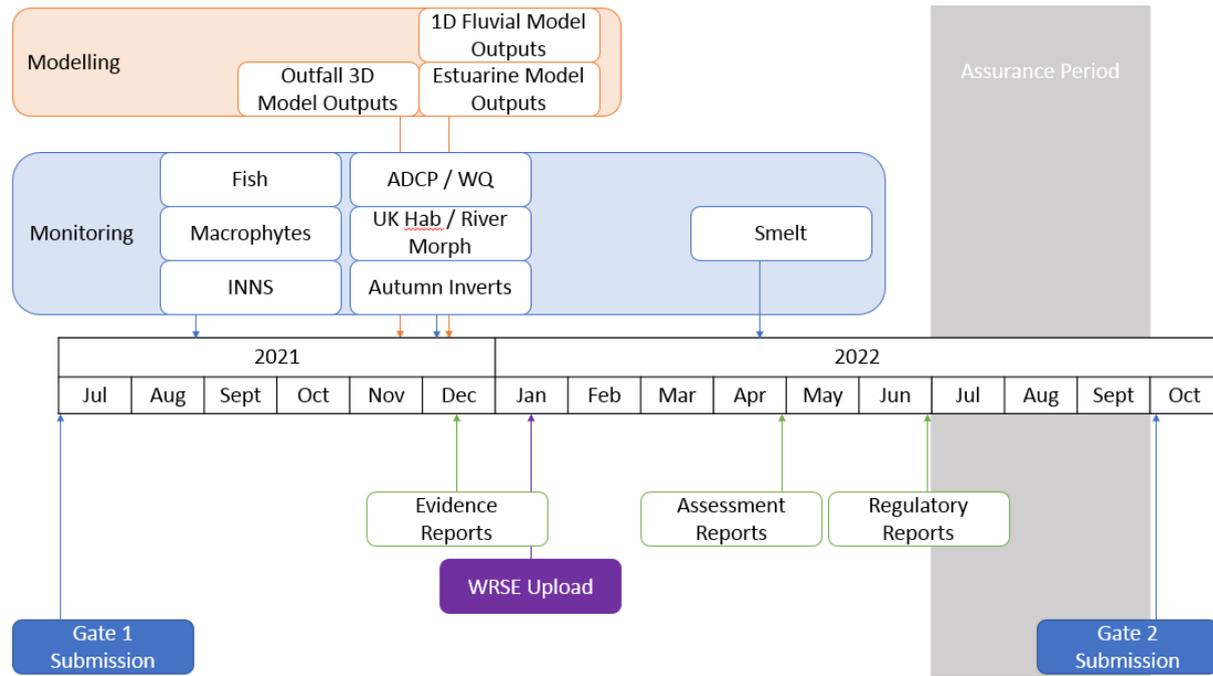
- Scoping permitting requirements, determinands/parameters and their acceptability
- National EA Water Quality Policy liaison
- Local EA Water Quality Officer liaison
- EA National Permitting Service liaison
- Drafting of potential permit conditions.

Additionally, in order for the SRO to move forward robustly, iterative liaison with the LRU engineering partner Jacobs will need to take place to inform design and permitting conditions. We envisage the key deliverable to be a technical paper outlining environmental permitting requirements for the SRO which will be developed through consultation with the above parties to provide an agreed permitting position at the end of Gate 2.

3 Project Programme

Figure 3.1 provides a high-level summary timeline and indication of key interdependencies.

Figure 3.1: High-level summary timeline



4 Deliverables

In accordance with the project programme set out in Section 3, there will be five tranches of deliverables issued leading up to the Gate 2 Rapid submission in October 2022.

4.1 Environmental Evidence Report

The Gate 1 Environmental Evidence reports will be updated to contain evidence only, with the assessment element being moved to a separate Environmental Assessment report (Section 4.2). The revised Environmental Evidence reports for Gate 2 will include the additional data available gathered from various further surveys and desk-studies referenced above. The reason for preparing a standalone Environmental Evidence report is to streamline the reports, making them easier for the reader to review and efficiently find the information they require. This approach will also make updating the evidence reports in future Rapid gates more straight forward as they will essentially become a catalogue of data.

The Gate 2 Environmental Evidence report will consist of the following topic areas, Physical Environment, Water Quality and Ecology and cover the full scope of those sub-topics as set out in Sections 2.2.1 and 2.2.2. A new report will be produced to summarise the datasets available from the additional studies to support SEA, The reports will be updated to catalogue the updated data (capped at December 2021) to be used in the Gate 2 environmental assessments, from sources such as the SRO monitoring programme 2020-2022, updated Environment Agency data requests, local biodiversity record centre requests and fluvial and tideway modelling outputs.

The Gate 2 Environmental Evidence report will be delivered in December 2021, with comments sought by Thames Water, NAU and PLA by end of January 2022.

4.2 Environmental Assessment Report

The environmental assessment elements of the Gate 1 Environmental Evidence report will be lifted into a new standalone Gate 2 Environmental Assessment report. The Gate 2 Environmental Assessment report will cover the same topics as the Environmental Evidence Report. The environmental assessments will be updated using the data catalogued in the Gate 2 Environmental Evidence Report (i.e. data to December 2021). The exception to this will be a late inclusion of 2022 smelt survey, UK Hab and River MoRPh survey data expected to be available in late April 2022 and on account of the limited existing baseline data available.

The Gate 2 Environmental Assessment Report will be delivered in April 2022, with comments sought by Thames Water, NAU and PLA by end of May 2022.

4.3 Reporting of Additional Studies to Support SEA

Desk based reports will be produced for the additional studies to support SEA. It is proposed that the information collected would be provided in a single evidence report the results of which would be set out in the updated SEA matrices.

4.4 Regulatory Reports

As per the approaches outlined in Section 2.2.4, the Gate 1 regulatory assessment reports (HRA, WFD and SEA) will be updated during Gate 2. The regulatory assessments will be informed by the environmental assessments and make use of the updated environmental data available to the point of December 2021. The updated regulatory assessment reports will be prepared for issue at the end of June 2022, with comment sought by Thames Water, NAU and PLA by the end of July 2022.

4.5 Mitigation and Enhancements Reports

As per the approaches outlined in Section 2.2.5, an updated Natural Capital assessment report will be prepared. The updated Natural Capital report will be prepared for issue at the end of June 2022, with comment sought by Thames Water, NAU and PLA by the end of July 2022.

5 Communications

5.1 Design / Engineering Interface

Throughout the Gate 2 process it will be critical for the environmental assessment and engineering workstreams to interface seamlessly over a range of key issues, enabling environmental considerations to help shape option design and decision making and engineering considerations and decisions to be efficiently assessed within the environmental assessment scope.

At this stage, the following specific areas for engagement have been identified:

- In-combination workshop, optioneering and assessment – interface to enable efficient route to determine the potential options and size variants that might operate in-combination. The findings of the in-combination environmental assessment will be fed back into the optioneering assessment to refine decision making.
- Review CDR design and embedded (designed-in) mitigation measures – As engineering design is refined during Gate 2, the environmental assessment team will engage with the engineering team to reconfirm agreement of mitigation measures that are embedded in the option design and lead discussions on any key environmental issues identified through the Gate 2 assessments that might require additional mitigation measures to be designed and specified.
- Environmental/ Engineering Lower Thames reuse outfall constraints interface – Initial workshop in August to review the outcomes of the Ricardo Mogden Reuse / South Sewer outfall environmental constraints mapping exercise. As option design and conveyance routes are refined this information will be used to direct the location of physical environment and terrestrial ecology surveys, the findings and assessment of which will then be fed back to the engineering team to help shape final Gate 2 design.
- Environmental/ Engineering/ Planning pipeline / tunnel routing interface – interface with the new planning optioneering workstream on conveyance routing to include full environmental consideration within that separate process. Initially, Gate 1 environmental findings from the HRA and SEA will be conveyed to the planning team for inclusion in their optioneering study. Any key findings from the optioneering study will need to be fed back to the environmental assessment team for assessment. Findings from the planned terrestrial ecology surveys of the conveyance routes will also need to be fed back to the planning team.
- Environmental/ Engineering/ Planning treatment works location optioneering interface - interface with the new planning optioneering workstream on location of treatment works to include full environmental consideration within that separate process. Initially, Gate 1 environmental findings from the HRA and SEA will be conveyed to the planning team for inclusion in their optioneering study (not part of this scope). Any key findings from the optioneering study will need to be fed back to the environmental assessment team for assessment. Findings from the planned terrestrial ecology surveys of the treatment sites will also need to be fed back to the planning team.
- Environmental/ Engineering treatment works water quality/ permitting interface – the environment team will set out the environmental water quality limits at point of discharge that are likely to be permissible and discuss these with the engineering team for comment on what is achievable. The agreed discharge concentrations will then be fed into the water quality modelling being undertaken by Atkins. The environmental and engineering team will then engage with the Environment Agency for their initial views on permitting conditions.
- Environmental/Engineering temperature interface – the environmental team will lead discussions with the engineering team on the key issues around Mogden and DRA discharge temperature following Environmental Agency temperature workshop at the end of Gate 1. The outputs of the

water quality modelling and further assessment of continuous water quality sonde data in the Lower Thames will be discussed with the engineering team to consider level of mitigation that might be required and what feasible mitigation options might be available.

5.2 Modelling Interface

The environmental team will lead engagement with the Lower Thames modelling suppliers of: 1) the 1D modelling of the full fluvial study area (Atkins); 2) the 3D modelling of the outfall and sensitive fluvial sites (HR Wallingford); and 3) TELEMAC modelling of the estuarine study area (HR Wallingford):

- Scenario development – the environmental team will work with the modelling suppliers to set out the scenarios to be run following engagement with the NAU and PLA to target the modelling at the required option variants and environmental conditions.
- Processing of required data for fluvial and tidal models – the environmental team will process the required environmental data sets to a format suitable for including within the modelling (see Task 1.1).
- Model output interpretation and analysis – the environmental team (including support from Elfed Jones and John Baugh of HR Wallingford) will review and interpret the outputs from the modelling packages.

A1 Gate 2 Commitments Signposting

NAU Comment #	Topic	SRO Commitment	Where covered
12	Physical Environment	Further assessment of suspended sediment movement.	Task 1.2i Estuarine sediment assessment
15	WFD	Continuation of WFD assessment through Gate 2.	Task 4.2 WFD assessment
16	General	Review of appropriate downstream extent of the study area in light updated Gate 2 Physical Environment and Water quality assessments.	Task 1.2 Physical Environment assessment Task 1.3 Water Quality assessment
44	HRA	Consideration of duration for construction areas to be in use.	Task 4.1 HRA
47	HRA	Check with Lee Valley Regional Park Authority and/or Lee Valley Bitterns HAP group that Beckton reuse construction sites are not suitable for great bittern.	Task 4.1 HRA
48	HRA	Use of updated Gate 2 data to review impacts on wintering birds.	Task 2.4b Bird assessment
53	HRA	Consideration of pre-construction soil sampling requirements.	Task 3.2 Desk based contaminated land study
56	HRA	All findings to be reviewed with the benefit of additional data/conceptual design understanding.	All Tasks (1-6)
58	NCA	Revision of BNG assessment using the Defra Biodiversity Metric 3.0.	Task 5.2(c) Biodiversity Net Gain assessment
66	NCA	Additional detail on enhancement opportunities.	Task 5.2b Additional habitat data Task 5.2c Biodiversity Net Gain assessment
68	NCA	Consider delivery of one scheme with a higher mg/l option over two schemes with lower mg/l to reduce the carbon involved with building infrastructure	Section 5.1. Design / Engineering Interface - Review CDR design and embedded (designed-in) mitigation measures
69	NCA	Consider utilisation of more local suppliers to reduce transport emissions.	Section 5.1. Design / Engineering Interface - Review CDR design and embedded (designed-in) mitigation measures
70	NCA	Consider reed bed and sea grass planting options.	Task 2.4d Habitat assessment (using UKHab and MoRPh survey data) Section 5.1. Design / Engineering Interface - Review CDR design and embedded (designed-in) mitigation measures
71	NCA	Assess carbon in a consistent manner across the schemes.	Carbon is an Engineering workstream. Section 5.1. Design / Engineering Interface - Review CDR design and embedded (designed-in) mitigation measures
73	NCA	Consider nitrogen deposition in Epping Forest including stakeholder engagement.	Task 2.4c Nitrogen and ammonia deposition review (Epping Forest)
74	NCA	Provide additional detail on habitat to target for mitigation / enhancement.	Task 2.4d Habitat assessment (using UKHab and MoRPh survey data) Task 5.2b Additional habitat data Task 5.2c Biodiversity Net Gain assessment

NAU Comment #	Topic	SRO Commitment	Where covered
77	Estuarine Ecology	Review assessment of impact of the SRO on saltmarsh habitat.	Task 2.2b Marginal habitat assessment Task 2.2d Macroalgae, Angiosperm and Phytoplankton Task 2.2e Designated and Protected Sites Assessment
92	SEA	Clearly differentiate net gain from compensation and mitigation.	Task 5.2e Assess NC metrics based on broad habitat types and BNG uplifted assessment
94	Water Quality	Obtain missing EA Teddington sonde data.	Task 1.3 Water Quality Assessment (data request)
95	WFD	Include RBMP3 outputs.	Task 4.2 WFD assessment
99	WFD	Include incombination assessment.	Task 4.2 WFD assessment
101	WFD	Take account of physical environment (hydrological) assessment outcomes and how they may affect detonation.	Task 4.2 WFD assessment
103	WFD	Include dioxins in the assessment.	Task 4.2 WFD assessment
112	WFD	Continue to work with the EA in Gate 2 to explore the temperature effects and their pathways of ecological impact and the appropriate consideration of mitigation and permit control.	Task 1.3a Water Temperature Change Environmental/Engineering temperature interface group NAU Technical Forum on WQ
113	WFD	Continue review of interaction with SRO and Mogden oxygenation plant through refined tideway modelling of dissolved oxygen.	Task 1.3b General physico-chemical change Task 1.3e Mogden / Beckton final effluent discharge fate NAU Technical Forum on Modelling and WQ
116	WFD	Inclusion of Teddington WFD monitoring point.	Task 1.3c WFD Chemicals
118	WFD	As per Comment 112.	As per Comment 112.
119	WFD	As per Comment 113.	As per Comment 113.
122	SEA	Account for a wider envelope of river flows (more extremes), climate change and other realistic operating regimes.	Task 1.2g Future climates assessment
124	SEA	As per Comment 112. As per Comment 113.	As per Comment 112. As per Comment 113.
126	SEA	Further assessment of specific ecological impacts in light of updated Gate 2 Physical Environment assessments.	Task 2 Ecology
129	SEA	Reduction of uncertainties.	Inherent through the gated assessment process.
130	SEA	As per Comment 126.	As per Comment 126.
132	Water Quality	Update of Gate 1 WQ assessment using additional monitoring data and 1D modelling.	Task 1.3 Water Quality assessment
133	Water Quality	A fuller suite of WQ sampling and analysis is underway for the SRO and will be used together with enhanced scheme design in Gate 2.	Task 1.3 Water Quality assessment NAU Technical Forum on WQ
134	Water Quality	Inclusion of additional WQ monitoring data into Gate 2 assessment.	Task 1.3 Water Quality assessment NAU Technical Forum on WQ Also see Appendix A2.2 for additional monitoring information.

NAU Comment #	Topic	SRO Commitment	Where covered
135	Water Quality	Initiate environmental permitting discussions with the Environment Agency.	Task 6 Permitting Environmental/Engineering WQ / permitting interface group.
138	Water Quality	Review and refinement of the scheme in-use dates / operating regime.	Task 1.2b Refinement of Strategic Option utilisation
139	Water Quality	Incorporate additional WQ data and modelling outputs into a refined WQ assessment in Gate 2.	Task 1.3 Water Quality assessment NAU Technical Forum on WQ
140	Water Quality	Include temperature changes in conveyance and treatment processing in Gate 2.	Environmental/Engineering temperature interface group.
141	Water Quality	As per Comment 132.	As per Comment 132.
142	Water Quality	Assessment of sub-daily temperature variability using new SRO sondes in Lower Thames.	Task 1.3 Water Quality assessment
146	Water Quality	Assessment of smaller size variants, not just largest.	Task 1.1a Scenario Development NAU Technical Forum on Modelling – 1 st meeting.
147	Water Quality	Gate 2 outfall will be iterated with 2D/3D river modelling of in-river velocities and mixing zones.	Task 1.1c 3D fluvial modelling of outfalls and weir pools NAU Technical Forum on Modelling
149	Water Quality	As per Comment 138.	As per Comment 138.
151	Water Quality	As per Comment 138.	As per Comment 138.
157	Water Quality	Review and refinement of the scheme in-use dates / operating regime, including future scenarios.	Task 1.2b Refinement of Strategic Option utilisation Task 1.2g Future climates assessment
161	Water Quality	As per Comment 139.	As per Comment 139.
162	Water Quality	1D modelling of the whole River Thames study area, plus 3D modelling of key points such as Discharge locations and weir pools.	Task 1.1 Aquatic Modelling
166	Water Quality	Assess temperature change within mixing discharge zone.	Task 1.1 Aquatic Modelling Task 1.3a Water Temperature Change
167	Water Quality	Assess water quality change under various flow conditions and scheme variants through the use of modelling.	Task 1.1 Aquatic Modelling Task 1.3 Water Quality Assessment
172	Water Quality	Include additional data collected as part of the SRO monitoring and modelling programmes in the Gate 2 assessments.	Task 1.1 Aquatic Modelling Task 1.3 Water Quality assessment Appendix A2 Gate 2 Monitoring Programme
176	Water Quality	The pan-SRO River Thames water quality model to include scenarios to understand P concentrations from PR19 upstream improvement schemes.	Task 1.1 Aquatic Modelling
190	Water Quality	Assessment scenarios to be aligned with likely operating patterns refined during Gate 2.	Task 1.2b Refinement of Strategic Option utilisation
191	Water Quality	As per Comment 139.	As per Comment 139.
198	Water Quality	As per Comment 139.	As per Comment 139.

NAU Comment #	Topic	SRO Commitment	Where covered
209	Water Quality	Potential of incombination scheme to be assessed following WRSE assessment outputs.	Task 1.1 Aquatic Modelling
210	Water Quality	Further consideration of temperature impacts in Gate 2 using SRO monitoring programme data and Gate 2 modelling.	Task 1.1 Aquatic Modelling Task 1.3a Water Temperature Change
211	Water Quality	Consider implication of reuse water being abstracted at different Lower Thames abstractions.	Task 1.1 Aquatic Modelling Task 1.3a Water Temperature Change
212	Water Quality	Deleted reach of Teddington DRA scheme to be modelled in Gate 2 modelling.	Task 1.1 Aquatic Modelling Task 1.2 Physical Environment assessment Task 1.3 Water Quality assessment
214	Water Quality	Review temperature assessment for all scheme variants in Gate 2.	Task 1.3a Water Temperature Change
218	Water Quality	WFD water quality assessment to be updated in Gate 2, with the benefit of the SRO water quality monitoring programme, fluvial 1D modelling and refined treatment process information.	Updated Gate 2 SRO WQ monitoring programme (see Appendix A2.2) Task 1.1b 1D Fluvial Modelling Task 1.3c WFD chemicals Task 5.1. Design/ Engineering treatment works water quality/ permitting interface
222	Water Quality	Continue to explore the temperature effects and their pathways of ecological impact and the appropriate consideration of mitigation and permit control.	Task 1.3a Water Temperature Change Task 2 Ecology assessment Environmental/Engineering temperature interface
223	Water Quality	Assessment of all scheme's size variants with refined scheme design.	Task 1.1a Scenario Development
225	Water Quality	As per response to comment 113.	As per response to comment 113.
228	Water Quality	Undertake further bespoke modelling in Gate 2.	Task 1.1 Aquatic Modelling
229	Water Quality	As per response to comment 228.	As per response to comment 228.
237	Fisheries	Assess impingement and entrainment of fish for updated outfall designs.	Task 1.2d Review of outfall (and DRA intake) design including screening together with local velocity effects. Task 2.1a Fish assessment
239	Fisheries	Updated assessment of level change on Desborough Loop.	Task 1.1 Aquatic Modelling Task 1.2c Level Change
241	Fisheries	Undertake water quality modelling to assess water quality change from discharges.	Task 1.1 Aquatic Modelling
242	Fisheries	Updated assessment of potential temperature change utilising additional monitoring data, scheme operation and modelling.	Task 1.1 Aquatic Modelling Task 1.3a Water Temperature Change
243	Fisheries	Review fish passage efficiency using updated Gate 2 data and modelling outputs.	Task 2.1c Migratory fish
267	Fisheries	Further assessment on the passability of fish passes will be assessed using more detailed modelling at Gate 2.	Task 1.1 Aquatic Modelling Task 2.1c Migratory fish

NAU Comment #	Topic	SRO Commitment	Where covered
271	Fisheries	Investigation of thermal plume at reuse outfalls to be investigated in Gate 2.	Task 1.1b Fluvial 1D modelling Task 1.1c 3D fluvial modelling of outfalls and weir pools Task 1.3a Water Temperature Change
272	Fisheries	Updated Gate 2 assessment of water quality assessment using Gate 2 data and modelling outputs and assessment of implications on ecology.	Task 1.1 Aquatic Modelling Task 1.3 Water Quality assessment Task 2.1 Fisheries assessment Task 2.1 Aquatic Ecology assessment
273	Fisheries	Check for additional EA juvenile fish survey data on Desborough Cut (contact Alice Rudd).	Task 2 Ecology
278	Fisheries	Updated Gate 1 assessments in Gate 2 using additional monitoring data, scheme design and modelling outputs.	Task 1.1 Aquatic Modelling Task 1.3 Water Quality assessment Task 2.1 Fisheries assessment
283	Fisheries	Gate 2 fisheries assessment to be undertaken using the updated Gate 2 water quality assessment information which utilises the expansive SRO water quality monitoring programme data from 2020-2021 and modelling outputs.	Task 1.1 Aquatic Modelling Task 1.3 Water Quality assessment Task 2.1 Fisheries assessment
284	Fisheries	Further assessment of the potential for alteration of river flow in the vicinity of the outfall that could affect the passage of migratory species to be undertaken in Gate 2.	Task 1.1b Fluvial 1D modelling Task 1.1c 3D fluvial modelling of outfalls and weir pools Task 1.2c Flow Change assessment Task 2.1c Migratory Fish assessment
288	Fisheries	As per response to comment 283.	As per response to comment 283.
290	Fisheries	Sunbury Creek to be included in Gate 2 data requests and ecological assessments.	Task 2.1b Weir pool/marginal habitat assessment (including Sunbury creek)
292	Fisheries	Design of outfall and suitable mitigation relating to discharge velocity to be assessed in more detail at Gate 2	Task 1.2d Review of outfall (and DRA intake) design including screening together with local velocity effects Task 2.1a Fish assessment Task 2.1c Migratory Fish assessment
297	Fisheries	Further Gate 2 assessment of the potential for alteration of river flow in the vicinity of the outfall that could affect the passage of migratory species.	Task 1.1b Fluvial 1D modelling Task 1.1c 3D fluvial modelling of outfalls and weir pools Task 1.2c Flow Change assessment Task 1.2d Review of outfall (and DRA intake) design Task 2.1c Migratory Fish assessment
299	Fisheries	Further Gate 2 assessment of the potential for water quality deterioration to cause a change in fish community composition.	Task 1.1b Fluvial 1D modelling Task 1.3 Water Quality assessment Task 2.1 Fisheries assessment
300	Fisheries	Effects on sensitive weir pool habitats to be assessed in Gate 2.	Task 1.1 Aquatic Modelling Task 1.2e River mainstem, weir pool and estuarine wetted habitat change Task 2.1b Weir pool/marginal habitat assessment
303	Fisheries	As per response to comment 283.	As per response to comment 283.
304	Fisheries	As per response to comment 283.	As per response to comment 283.

NAU Comment #	Topic	SRO Commitment	Where covered
307	Fisheries	As per response to comment 242.	As per response to comment 242.
308	Fisheries	As per response to comment 272.	As per response to comment 272.
309	Fisheries	Further Gate 2 review of available literature on migratory salmonid searching behaviour for attractant flows and review of timing of reuse scheme operation and salmonid migratory patterns.	Task 1.2b Refinement of Strategic Option utilisation Task 2.1c Migratory Fish assessment
315	Fisheries	Gate 2 data request to include CPUE and timed run data.	Task 2 Ecology
320	Fisheries	As per response to comment 284.	As per response to comment 284.
322	Fisheries	As per response to comment 299.	As per response to comment 299.
323	Fisheries	As per response to comment 322.	As per response to comment 322.
326	Fisheries	Further consideration for the suitability of the Hogsmill and Mole as alternative brown trout spawning grounds to be undertaken in Gate 2	Task 2.1 Fisheries assessment
334	Fisheries	Further Gate 2 assessment of temperature impact in Thames tideway and potential risk to estuarine fish community composition.	Task 1.1 Aquatic Modelling Task 1.3a Water Temperature Change Task 2.1 Fisheries assessment
335	Fisheries	Reassessment of smelt in Gate 2 using additional monitoring data, modelling and refined scheme design and operating regime.	Task 1.1 Aquatic Modelling Task 1.2 Physical Environment assessment Task 1.3 Water Quality assessment Task 2.1 European Smelt assessment
336	Fisheries	As per response to comment 335.	As per response to comment 335.
337	Fisheries	Further assessment of the potential for alteration of water quality that could affect the passage of migratory species to be undertaken in Gate 2.	Task 1.1b Fluvial 1D modelling Task 1.1c 3D fluvial modelling of outfalls and weir pools Task 1.3 Water Quality assessment Task 2.1c Migratory Fish assessment
338	Fisheries	As per response to comment 337.	As per response to comment 337.
340	Fisheries	Salinity assessment to be refined in Gate 2 utilising the additional SRO tideway sondes installed and updated tideway modelling.	Task 1.1 Aquatic Modelling Task 1.3 Water Quality assessment Task 2.1 Fisheries assessment
342	Fisheries	All pathways and risks to be reassessed in Gate 2 using additional monitoring data, modelling and refined scheme design and operating regime.	All tasks
344	Fisheries	Gate 2 fisheries assessment to consider shad and lamprey.	Task 2.1a Fisheries assessment
348	Fisheries	Gate 2 assessment to consider a range of velocities not just maximums. Data will be available as daily data across modelled years.	Task 1.1b 1D Fluvial Modelling Task 1.1c 3D Discharge and Weir Pool Modelling Task 1.2c Flow Change assessment Task 1.2d Review of Outfall Design Task 1.2e River mainstem, weir pool and estuarine wetted habitat change Task 1.2f Fish Pass Passability assessment Task 2.1 Fisheries assessment

NAU Comment #	Topic	SRO Commitment	Where covered
349	Fisheries	Gate 2 fisheries assessment to utilise modelled flow/velocity outputs with greater than monthly data granularity (daily data to be used).	Task 1.1 Task 1.1b 1D Fluvial Modelling Task 1.1c 3D Discharge and Weir Pool Modelling Task 1.2c Flow Change assessment Task 2.1 Fisheries assessment
350	Fisheries	Gate 2 fisheries assessment to utilise modelled temperature outputs with greater than monthly data granularity. Measured data from continuous sondes to be used to show the extent of sub-daily variation, with modelled outputs then showing daily variation.	Task 1.1 Task 1.1b 1D Fluvial Modelling Task 1.1c 3D Discharge and Weir Pool Modelling Task 1.3a Water Temperature Change Task 2.1 Fisheries assessment
352	Fisheries	Inclusion of olfaction study within the Gate 2 Water Quality assessment.	Updated Gate 2 SRO WQ monitoring programme to include key chemicals for olfaction masking / inhibition. Task 1.3d Olfactory Water Quality assessment Task 2.1d Olfactory cues investigations
355	Fisheries	As per response to comment 290.	As per response to comment 290.
356	Fisheries	Gate 2 review of fish passability of weirs in Reach G (weirs at TQ 37224 98280 and TQ 37678 97806)	Task 1.2f Fish Pass Passability assessment Task 2.1c Migratory Fish assessment
359	Fisheries	As per response to comment 352.	As per response to comment 352.
361	Physical Environment	Inclusion of a synthetic reference set of flow conditions for analysis of extreme flow conditions in Gate 2 approach.	Task 1.2c Flow Change
362	Physical Environment	As per response to comment 361.	As per response to comment 361.
376	Physical Environment	As per response to comment 290.	As per response to comment 290.
382	Physical Environment	Inclusion of bathymetry surveys at outfall, weir pools and other sensitive locations and fluvial modelling to inform updated Gate 2 assessment of level and velocity change affecting wetted habitats.	Updated Gate 2 SRO monitoring programme to includes bathymetry surveys at key locations (see Appendix A2.1) Task 1.1b Fluvial 1D Modelling Task 1.2e River mainstem, weir pool and estuarine wetted habitat change
383	Physical Environment	As per response to comment 382.	As per response to comment 382.
384	Physical Environment	As per response to comment 382.	As per response to comment 382.
393	Physical Environment	Inclusion of further tideway modelling scenario testing in Gate 2 assessment.	Task 1.1d Estuarine TELEMAC modelling scenarios

A2 Gate 2 Monitoring Programme

The following tables set out the monitoring programme for the London Effluent Reuse SRO in Gate 2. Locations in **green text** are sites that have been added to the original Gate 1 monitoring programme to reflect recommendations from the Gate 2 environmental assessments and/or regulatory engagement.

A2.1 Physical Environment

2020 Site No.	Survey Site	Site info	Requirements	Survey Timing
Bathymetry, flow, velocity, WQ profiling				
<ul style="list-style-type: none"> Scoping stage review site locations and liaison with environmental contractor to confirm sites. 				
	Mogden Discharge locations	TQ 08514 66791 TQ 09272 66554	Full bathymetry survey from discharge point to 200m downstream To include flow and velocity profiling. To include 200m longitudinal mid-channel transect of DO and temperature CTD profiling.	3 different flow conditions (taken between July - December)
	Lower Thames areas of marginal habitat Sunbury Creek River Ember Confluence Trowlock Island back channel Teddington DRA intake/outfall	TQ 10093 67650 TQ 15656 68227 TQ 17602 70930 TQ 17602 70930	Standard cross-section at each site showing bed profile, flow and velocity profiling. Riparian based bank profiling extension of the channel transect.	
	Sunbury Weir Pool	From weir face to 200m downstream.	Full bathymetry survey of weir pool to 200m downstream of weir. To include flow and velocity profiling.	
	Molesey Weir Pool		To include 200m longitudinal mid-channel transect of DO and temperature CTD profiling.	
	Teddington Weir Pool			
	Richmond Pound	1 cross section within 1km downstream of Teddington Weir 1 cross section with 1 km upstream of Richmond Half-tide sluice	Standard cross-section at each site showing bed profile, flow and velocity profiling	1 survey in October prior to Richmond Lock Drawdown. 1 survey at the end of November towards the end of the Richmond Lock Drawdown.
	Selected key high sensitivity habitats around River Roding / Creekmouth	TQ 45570 81837 TQ 45115 82727 TQ 44636 82809 TQ 44725 82915 TQ 44118 83195	Standard cross-section at each site showing bed profile, flow and velocity profiling Riparian based bank profiling extension of the channel transect.	Single survey

A2.2 Water Quality

A2.2.1 Spot Sampling

Site No.	Site name	Water body ID	Study Area Reach	Analysis Suites
8.	River Thames at Walton	TQ 11448 68782	Reach B	WFD (App B) EQSD (App C) DWSP
9.	River Thames at Hampton	TQ 13378 69216	Reach C	WFD (App B) DWSP
10.	River Thames upstream of Hogsmill River	TQ 16648 67120	Reach C	WFD (App B)
11.	River Thames at Teddington Weir	TQ 17020 71370	Reach C	WFD (App B) EQSD (App C) DWSP
12.	TWUL Mogden STW Final Effluent	TQ 15557 75016	N/A	WFD (App B) EQSD (App C) DWSP
13.	Mogden South Sewer	TQ 11002 70854	N/A	WFD (App B) EQSD (App C) DWSP
14.	Thames Tideway at Kew Bridge	TQ 19029 77799	Reach D	WFD (App B)
15.	River Lee at Enfield Island Loop	TQ 37362 98079	Reach G	WFD (App B) EQSD (App C) DWSP
16.	River Lee at Chingford Supply Channel	TQ 36752 93269	Reach G	DWSP
17.	KGV Reservoir	TQ 37534 97772	N/A	DSWP
18.	Lockwood Reservoir	TQ 35008 89726	N/A	DSWP
19.	High Maynard Reservoir	TQ 35430 89943	N/A	DSWP
20.	Banbury Reservoir	TQ 36289 91699	N/A	DSWP
21.	TWUL Beckton STW Final Effluent	TQ 44999 82241	N/A	WFD (App B) EQSD (App C) DWSP

A2.2.2 Continuous Sondes

Site No.	Site name	NGR	Study Area Reach	Installed	Parameters
8.	River Thames at Walton	TQ 11448 68782	Reach B	January 2021	Temperature Conductivity Dissolved Oxygen
9.	River Thames at Hampton	TQ 13378 69216	Reach C	January 2021	
	River Mole	TBC	Reach C	TBC	
10.	River Thames upstream of Hogsmill River	TQ 16648 67120	Reach C	January 2021	
	Hogsmill River	TBC	Reach C	TBC	
11.	River Thames at Teddington Weir	TQ 17020 71370	Reach C	January 2021	
15.	River Lee at Enfield Island Loop	TQ 37362 98079	Reach G	January 2021	
16.	River Lee at Chingford Supply Channel	TQ 36752 93269	Reach G	January 2021	
17.	KGV Reservoir	TQ 37534 97772	Reach G	January 2021	
18.	Lockwood Reservoir	TQ 35008 89726	Reach H	January 2021	
19.	High Maynard Reservoir	TQ 35430 89943	Reach H	January 2021	
20.	Banbury Reservoir	TQ 36289 91699	Reach H	January 2021	
21.	TWUL Beckton STW Final Effluent	TQ 44999 82241	Reach F	March 2021	
S1	Tower Pier	TQ 33331 80494	Reach F	February 2021	
S2	Greenwich Pier	TQ 38344 78010	Reach F	February 2021	
S3	Delta Wharf	TQ 38725 79761	Reach F	TBC	
S4	North Greenwich Pier	TQ 39544 80055	Reach F	February 2021	
S5	Pier at Beckton STW	TQ 45235 81440	Reach F	February 2021	
S6	Barking Riverside	TQ 46980 81803	Reach F	TBC	
S7	Pier at Crossness STW	TQ 48935 81132	Reach F	February 2021	

A2.3 Fisheries

2020 Site No.	Survey Site	Water body ID / Area	NGRs* upstream / downstream	Study Area Reach	Survey Timing	Frequency / no. surveys
Electrofishing						
LR-01	Sunbury Weir Pool (ex EA site)	Thames (Egham to Teddington)	TQ 1053 6820 TQ 1066 6840	Reach B	July - August	Annual
	Molesey main weir pool (EA site)	Thames (Egham to Teddington)	TQ 14927 68955	Reach C		
LR-09	Downstream intake	Lea Navigation Enfield Lock to Tottenham Locks	TQ 37543 97894 TQ 37633 97824	Reach G		
Juvenile fish surveys – seine netting						
	Potential Desborough Cut outfall location	Thames (Egham to Teddington)	TQ 08082 65969 TQ 08192 65976	Reach A	Late August	Annual
	Desborough Cut	Thames (Egham to Teddington)	TQ 08670 66077 TQ 08777 66101	Reach A		
	Potential discharge location – D/S of A244 bridge	Thames (Egham to Teddington)	TQ 09258 66540 TQ 09331 66611	Reach B		
LR-01	Sunbury Weir Pool (ex EA site)	Thames (Egham to Teddington)	TQ 1053 6820 TQ 1066 6840	Reach B		
	U/S of Thames Walton abstraction	Thames (Egham to Teddington)	TQ 11514 68836 TQ 11595 68907	Reach B		
	Between TW Walton and Hampton intake	Thames (Egham to Teddington)	TQ 12557 68953 TQ 12660 68920	Reach C		
	Molesey back weir pool	Thames (Egham to Teddington)	TQ 14927 68956 TQ 15009 68895	Reach C		
	Molesey main weir pool (EA site)	Thames (Egham to Teddington)	TQ 14927 68955	Reach C		
	Between Sunbury Lock and Surbiton intake	Thames (Egham to Teddington)	TQ 16018 67759 TQ 16059 67719	Reach C		
LR-02	LTOA Ham Road	Thames (Egham to Teddington)	TQ 1786 7071 TQ 1781 7082	Reach C		
LR-09	Downstream intake	Lea Navigation Enfield Lock to Tottenham Locks	TQ 37543 97894 TQ 37633 97824	Reach G		
Reservoir Seine and Fyke net surveys						
LR-13	King George V Reservoir (North)	King George V Reservoir	TQ 37272 96195	Reach G	July - August	Annual
LR-14	William Girling Reservoir	William Girling Reservoir	TQ 36706 94205	Reach G		
LR-15	High Maynard Reservoir	High Maynard Reservoir	TQ 35484 89708	Reach H		
LR-16	Low Maynard Reservoir	Low Maynard Reservoir	TQ 35167 89526	Reach H		
LR-17	Lockwood Reservoir	Lockwood Reservoir	TQ 35277 90227	Reach H		

2020 Site No.	Survey Site	Water body ID / Area	NGRs* upstream / downstream	Study Area Reach	Survey Timing	Frequency / no. surveys
LR-18	East Warwick Reservoir	East Warwick Reservoir	TQ 34814 88497	Reach H		
LR-19	Walthamstow 4 Reservoir	Walthamstow 4 Reservoir	TQ 35115 88526	Reach H		
Smelt Ichthyoplankton Surveys						
	Battersea Bridge (Site 1) <u>or</u> Imperial Wharf Marina (site 2)	Putney Bridge (A219) – Battersea Bridge (A3220)	TQ 26848 77382 TQ 26396 76159	Reach D	Feb - April	9 fortnightly surveys
	Hurlingham Yacht Club Pier (Site 3) <u>or</u> Hurlingham Yacht Club Buoys (Site 4)		TQ 25256 75494 TQ 24510 75679	Reach D	Feb - April	9 fortnightly surveys
	Putney (Site 5)		TQ 24510 75679	Reach D	Feb - April	9 fortnightly surveys
Smelt Egg/Sediment Surveys – Mid Channel Day Grab and Airlift Sampling						
TS1	West site	Putney Bridge (A219) – River Wandle	TQ 24367 75644	Reach D	Feb - April	5 fortnightly surveys
TS2	Mid site		TQ 24573 75554			
TS3	East site		TQ 24768 75470			
Smelt Egg/Sediment Surveys – Waded Kick/Sweep Sampling						
TS1	West site	Putney Bridge (A219) – River Wandle	TQ 24335 75548	Reach D	Feb - April	5 fortnightly surveys
TS2	Mid site		TQ 24541 75449			
TS3	East site		TQ 24740 75369			
I			TQ 24910 75335			
J			TQ 25034 75317			
K			TQ 25425 75312			
Smelt eDNA						
	Teddington – Putney Bridge 8 sites 2.5km apart	Teddington – Putney Bridge (A219)	TQ 16403 71728	Reach D	Feb - April	9 fortnightly surveys
			TQ 17150 73263			
			TQ 17154 74882			
			TQ 17836 76810			
			TQ 19652 77430			
			TQ 21419 76350			
			TQ 22520 78220			
			TQ 23681 76198			

*NGRs for new sites (i.e. those without 2020 site numbers) are indicative and need to be verified by the monitoring team and agreed with the environmental assessment team prior to survey.

A2.4 Freshwater Ecology

A2.4.1 Macroinvertebrates

2020 Site No.	Survey Site	Water body ID / Area	NGRs* upstream / downstream	Study Area Reach	Survey Timing	Frequency / no. surveys
Aquatic macroinvertebrates – Pond net, kick/sweep or airlift						
<ul style="list-style-type: none"> Initial scoping phase – walkover to identify representative sites for new survey locations (those highlighted in blue below) Engagement with regulators and environmental contractor to confirm monitoring programme 						
	Desborough Cut	Thames (Egham to Teddington)	TQ0848566040	Reach A	Autumn 2021, Spring 2022 & Autumn 22	Bi-annual
	Upper section of Reach B	Thames (Egham to Teddington)	TBC	Reach B		
	D/S Sunbury Lock	Thames (Egham to Teddington)	TQ1141168761	Reach B		
	U/S River Mole conf.	Thames (Egham to Teddington)	TBC	Reach C		
	D/S Surbiton Intake	Thames (Egham to Teddington)	TQ1744067824	Reach C		
	U/S Teddington Weir	Thames (Egham to Teddington)	TQ1741471171	Reach C		
	River Thames discharge location for Mogden South Sewer / Mogden reuse options, upstream of Thames Water Hampton intake	Thames (Egham to Teddington)	TQ1187369039	Reach C		
T7	River Thames: at Hampton intake	Thames (Egham to Teddington)	TQ1318169115	Reach C		
T8	River Thames: upstream of Teddington Weir	Thames (Egham to Teddington)	TQ1722171306	Reach C		
T9	Thames Tideway: d/s Teddington Weir	THAMES UPPER	TQ1641771731	Reach D		
T10	Thames Tideway: u/s Richmond Sluice	THAMES UPPER	TQ1705174991	Reach D		
T11	Thames Tideway: Isleworth Ait/Brentford	THAMES UPPER	TQ1842677610	Reach D		
T12	Thames Tideway: Kew	THAMES UPPER	TQ1935077695	Reach D		
T13	Thames Tideway: Chiswick	THAMES UPPER	TQ2172777782	Reach D		
	Enfield Island	Lea Navigation Enfield Lock to Tottenham Locks	TQ 37283 98177	Reach G		
LV1	River Lee, upstream of Thames Water King George V reservoir intake	Lea Navigation Enfield Lock to Tottenham Locks	TQ3736097993	Reach G		
Aquatic macroinvertebrates – Dredge / pond net						

2020 Site No.	Survey Site	Water body ID / Area	NGRs* upstream / downstream	Study Area Reach	Survey Timing	Frequency / no. surveys
T8	River Thames: upstream of Teddington Weir	Thames (Egham to Teddington)	TQ1722171306	Reach C		
LV2	King George V Reservoir		TQ3717195946	Reach G		
LV3	William Girling Reservoir		TQ3682594503	Reach G		
Depressed river mussel sampling – including population structure, density & distribution						
<ul style="list-style-type: none"> Initial scoping phase to define study reach and methodology. Sites listed below are indicative only and will need to be refined. 						
	Penton Hook Weir	Thames (Cookham to Egham)	TQ 04351 69434	U/S Reach A	Summer	Annual
	U/s of River Ash & Walton	Thames (Cookham to Egham)	TQ 10029 67219	Reach B		
	EA monitoring site 35900	Thames (Cookham to Egham)	TQ1744067824	Reach C		

A2.4.2 Macrophytes

2020 Site No.	Survey Site	Water body ID / Area	NGRs* upstream / downstream	Study Area Reach	Survey Timing	Frequency / no. surveys
Macrophytes – LEAFACS2 methodology (100m stretch, including grapnel spot checks)						
<ul style="list-style-type: none"> Initial scoping phase – walkover to identify representative sites for new survey locations (those highlighted in blue below) Engagement with regulators and environmental contractor to confirm monitoring programme 						
	Desborough Cut	Thames (Cookham to Egham)	TQ0848566040	Reach A	Summer growth period	Annual
	D/S Shepperton Lock	Thames (Cookham to Egham)	TQ0781765991	Reach A		
	Upper section of Reach B	Thames (Cookham to Egham)	TBC	Reach B		
	D/S Sunbury Lock	Thames (Cookham to Egham)	TQ1141168761	Reach B		
	U/S River Mole conf.	Thames (Cookham to Egham)	TBC	Reach C		
	D/S Surbiton Intake	Thames (Cookham to Egham)	TQ1744067824	Reach C		
	U/S Teddington Weir	Thames (Cookham to Egham)	TQ1741471171	Reach C		
LR-04	Downstream Thames Water Walton intake	Thames (Cookham to Egham)	TQ 13239 69117 TQ 13347 69190	Reach C		
LR-05	Downstream Thames Water Hampton intake	Thames (Cookham to Egham)	TQ 14710 69168 TQ 14809 69113	Reach C		
LR-06	Downstream Thames Water Surbiton intake	Thames (Cookham to Egham)	TQ 17613 68092 TQ 17668 68184	Reach C		
LR-07	Lower Ham Road	Thames (Cookham to Egham)	TQ 17439 71207 TQ 17553 71124	Reach C		
LR-08	Upstream intake	Lea Navigation Enfield Lock to Tottenham Locks	TQ 37278 98177 TQ 37356 98097	Reach G		

LR-09	Downstream intake	Lea Navigation Enfield Lock to Tottenham Locks	TQ 37543 97894 TQ 37633 97824	Reach G		
LR-11	Hackney Marshes	Lee (Tottenham Locks to Bow Locks/Three Mills Locks)	TQ 36433 86477 TQ 36573 86534	Reach H		

A2.4.3 Diatoms

2020 Site No.	Survey Site	Water body ID / Area	NGRs* upstream / downstream	Study Area Reach	Survey Timing	Frequency / no. surveys
Diatoms – WFD sampling methodology and eDNA						
<ul style="list-style-type: none"> Initial scoping phase – walkover to identify representative sites for survey locations Engagement with regulators and environmental contractor to confirm monitoring programme 						
	Desborough Cut	Thames (Cookham to Egham)	TBC	Reach A	Spring and autumn	Bi-annual
	D/S Shepperton Lock	Thames (Cookham to Egham)	TBC	Reach A		
	Upper section of Reach B	Thames (Cookham to Egham)	TBC	Reach B		
	D/S Sunbury Lock	Thames (Cookham to Egham)	TQ1141168761	Reach B		
	U/S River Mole conf.	Thames (Cookham to Egham)	TBC	Reach C		
	D/S Surbiton Intake	Thames (Cookham to Egham)	TQ1744067824	Reach C		
	U/S Teddington Weir	Thames (Cookham to Egham)	TQ1741471171	Reach C		
	Enfield Island	Lea Navigation Enfield Lock to Tottenham Locks	TQ 37283 98177	Reach G		

A2.4.4 Invasive Non-Native Species

2020 Site No.	Survey Site	Water body ID / Area	NGRs* upstream / downstream	Study Area Reach	Survey Timing	Frequency / no. surveys
INNS						
<ul style="list-style-type: none"> Semi-quantitative INNS survey <ul style="list-style-type: none"> Visual assessment Macrophyte sampling using multiple grapnel throws 3-minute macroinvertebrate sampling using sweeps, scrapes and manual searching eDNA sampling 						
	River Thames upstream of Affinity Sunnymeads intake	Thames (Cookham to Egham)	SU9845575603	U/S Reach A	Spring & summer	Bi-annual
	River Thames upstream of Affinity Egham intake	Thames (Cookham to Egham)	TQ0186672009	U/S Reach A		
	River Thames upstream of Affinity Chertsey intake	Thames (Egham to Teddington)	TQ0499968345	U/S Reach A		
	River Thames upstream of Affinity Walton intake	Thames (Egham to Teddington)	TQ0863766703	Reach A		

	River Thames discharge location for Mogden South Sewer / Mogden reuse options, upstream of Thames Water Hampton intake	Thames (Egham to Teddington)	TQ1187369039	Reach C		
T7	River Thames: at Hampton intake	Thames (Egham to Teddington)	TQ1318169115	Reach C		
T8	River Thames: upstream of Teddington Weir	Thames (Egham to Teddington)	TQ1722171306	Reach C		
T9	Thames Tideway: d/s Teddington Weir	THAMES UPPER	TQ1641771731	Reach D		
T10	Thames Tideway: u/s Richmond Sluice	THAMES UPPER	TQ1705174991	Reach D		
T11	Thames Tideway: Isleworth Ait/Brentford	THAMES UPPER	TQ1842677610	Reach D		
T12	Thames Tideway: Kew	THAMES UPPER	TQ1935077695	Reach D		
T13	Thames Tideway: Chiswick	THAMES UPPER	TQ2172777782	Reach D		
LV1	River Lee, upstream of Thames Water King George V reservoir intake	Lea Navigation Enfield Lock to Tottenham Locks	TQ3736097993	Reach G		
T8	River Thames: upstream of Teddington Weir	Thames (Egham to Teddington)	TQ1722171306	Reach C		
LV2	King George V Reservoir		TQ3717195946	Reach G		
LV3	William Girling Reservoir		TQ3682594503	Reach G		
LV4	Banbury Reservoir		TQ3627491497	Reach H		
LV5	Lockwood Reservoir		TQ3529490352	Reach H		
LV6	High Maynard Reservoir		TQ3552789876	Reach H		
LV7	Low Maynard Reservoir		TQ3517189472	Reach H		
LV8	East Warwick Reservoir		TQ3480388537	Reach H		
LV9	West Warwick Reservoir		TQ3465088147	Reach H		
LV10	Walthamstow 1 Reservoir		TQ3539689080	Reach H		
LV11	Walthamstow 2/3 Reservoir		TQ3518288862	Reach H		
LV12	Walthamstow 4 Reservoir		TQ3543488768	Reach H		
LV13	Reservoir Walthamstow 5		TQ3492488880	Reach H		

A2.5 Estuarine Ecology

A2.5.1 Macroalgae

2020 Site No.	Survey Site	Water body ID / Area	NGRs* upstream / downstream	Study Area Reach	Survey Timing	Frequency / no. surveys
Macroalgae						
<ul style="list-style-type: none"> The Thames Water 2020/2021 pan-SRO monitoring programmes includes four additional macroalgae sites, which will be used to further the assessment in Gate 2. 						
	Isleworth Ait	Upper Thames	Vicinity of Mogden STW outfall* TQ 16760 76023	Reach D	June – September (WFD macroalgae recommendation)	Single survey per site to support existing EA data
	Tidal River Roding	Middle Thames	Downstream section near Beckton STW* TQ 45674 81730	Reach F		
	Tidal River Thames	Middle Thames	Approx 2km d/s of the Beckton STW outfall* TQ 47235 82051	Reach F		
	Tidal River Lee / Bow Creek	Pymmes Brook	Approx 9km d/s of Deephams STW outfall* TQ 38555 81744	Reach I		

A2.6 Phytoplankton

2020 Site No.	Survey Site	Water body ID / Area	NGRs* upstream / downstream	Study Area Reach	Survey Timing	Frequency / no. surveys
Phytoplankton						
<ul style="list-style-type: none"> Scoping stage to include regulatory engagement / liaison with environmental contractor to confirm sites 						
	Richmond Pound	TBC	Specific locations to be confirmed through regulatory engagement and liaison with environmental contractor.	Reach D	Specific timing to be confirmed through regulatory engagement and liaison with environmental contractor.	Single survey
	d/s Richmond pound	TBC		Reach D		
	Between Battersea and Tower Bridge	TBC		Reach E		
	Between Tower Bridge and Beckton STW	TBC		Reach F		

A2.7 Habitat Surveys

A2.7.1 UK HAB

2020 Site No.	Survey Site	Site info	NGRs* upstream / downstream	Survey Timing	Frequency / no. surveys
UK HAB walkover surveys of construction areas					
<ul style="list-style-type: none"> specific walkover sites to be determined through desk review 					
	Hydes Field site	Single site	TQ 12307 69918	Summer	Once
	Beckton effluent reuse treatment facility site	Single site	TQ 44559 82783		
	Tertiary treatment plant site at Mogden STW	Single site	TQ 15733 75151		
	Beckton tunnel shaft locations	Assume 10 sites	Specific walkover sites to be determined through desk review and liaison with the Environmental Assessment and Engineering teams. To include significant areas of priority habitat and samples of broad habitat types.		
	Beckton pipeline route	Assume survey 20% of 30 km route			
	Mogden / South Sewer conveyance routes	Assume survey 20% of 13 km route			
	Teddington DRA conveyance routes	Assume survey 20% of 7 km route			
	Mogden Discharge locations	Preferred Walkton Bridge location plus, potential alternative	TQ 08514 66791 TQ 09272 66554		
	Lower Thames areas of marginal habitat	Sunbury Creek River Ember Confluence Trowlock Island back channel Teddington DRA intake/outfall	TQ 10093 67650 TQ 15656 68227 TQ 17602 70930 TQ 17602 70930		
	Selected key high sensitivity habitats around River Roding / Creekmouth	5 locations intertidal mudflats, coastal saltmarsh and intertidal shingle/cobble beach	TQ 45570 81837 TQ 45115 82727 TQ 44636 82809 TQ 44725 82915 TQ 44118 83195		
	Net Gain opportunity areas	Assume 4 sites around Beckton STW and conveyance route Assume 4 sites around Mogden STW and Mogden/South Sewer conveyance route	Specific walkover sites to be determined through stakeholder engagement and review of Local Authority BNG plans.		
	Ham Lands LNR	N/A	Whole site	Summer	Once
	Isleworth Ait LNR	N/A	Whole site		
	Syon Park SSSI	N/A	Whole site		

A2.7.2 River MoRPh

2020 Site No.	Survey Site	Site info	NGRs* upstream / downstream	Survey Timing	Frequency / no. surveys
River MoRPh surveys					
	Mogden Discharge locations	2 locations	TQ 08514 66791 TQ 09272 66554	During low flows – May - September	Once
	Lower Thames areas of marginal habitat	4 locations	TQ 10093 67650 TQ 15656 68227 TQ 17602 70930 TQ 17602 70930		
	Selected key high sensitivity habitats around River Roding / Creekmouth	5 locations intertidal mudflats, coastal saltmarsh and intertidal shingle/cobble beach	TQ 45570 81837 TQ 45115 82727 TQ 44636 82809 TQ 44725 82915 TQ 44118 83195		



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