Thames to Affinity Transfer SRO

Technical Supporting Document Cb

Drinking Water Quality Risk Assessment Report

Beckton Reuse Indirect Option

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 and Affinity Water in the ongoing development of the proposed SROs. The intention of 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 and future funding requirements.
- Should a scheme be selected and confirmed in the companies' final Water Resources Management Plan, 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 and Affinity 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 and consideration should be given to that when reviewing the proposals. They are for the purposes of allocating further funding not seeking permission.

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 and Affinity Water's statutory duties. The information presented relates to material or data which is still in the course of completion. Should the solution presented in this document be taken forward, Thames Water and Affinity 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.

Contents

Figures and Tables

Executive summary

The Drinking Water Quality Assessment Report is a technical supporting document prepared to support the Gate 2 submission report to the Regulator's Alliance for Progressing Infrastructure Development (RAPID) for the Thames to Affinity Transfer (T2AT) Strategic Regional Option (SRO) scheme.

Technical Supporting Document Cb covers the water quality considerations of the T2AT Beckton Reuse Indirect (BRI) option. Limiting hazards and their associated risk scores have been considered for this option in the form of a Water Quality Risk Assessment (WQRA). This WQRA has been drafted in a dedicated All Companies Working Group (ACWG) approved spreadsheet tool and reviewed in a collaborative strategic WQRA workshop.

Limiting hazards are defined as any parameter that is likely to drive the development of the SRO option. Throughout the WQRA process, the list of limiting hazards for each option has been reviewed and refined to give a representative, high-level view of the parameters which are likely to need treatment at this early stage of design. The WQRA process has also identified data gaps and residual risk considerations that can now be addressed moving forward into Gate 3. This will ensure a more detailed overview of the water quality risks associated with each option and therefore enable a more informed treatment process design.

Results from the Gate 2 water quality risk assessment has confirmed the engineering concept design of this option at this stage. Key Gate 1 workshop outcomes have been incorporated into the Gate 2 WQRA process and concept design. Data from the SRO water quality monitoring programme should continue to be gathered for use in the Gate 3 WQRA process. Alongside this, guidance from the upcoming SRO Emerging Hazards technical note and results from the Affinity Water and Thames Water customer engagement surveys will provide valuable insight for completion of the Gate 3 drinking water quality risk assessment.

1. Introduction

1.1 This technical supporting document accompanies the Gate 2 submission to RAPID for the Thames to Affinity Transfer (T2AT) SRO Beckton Reuse Indirect transfer option (BRI). The report covers the water quality considerations of the scheme, which have been analysed in the form of a Water Quality Risk Assessment (WQRA).

1.2 A full description of the option is provided in Technical Supporting Document A2a of the Gate 2 submission, the Concept Design Report (CDR). A schematic diagram is provided within the WQRA outputs in Appendix A of this technical supporting document.

1.3 The WQRA process has been developed by the All Companies Working Group (ACWG) as a strategic semi-quantitative water quality risk assessment from source to supply to determine the impact of new Strategic Regional Option (SRO) schemes on drinking water quality. More specifically to this SRO, the BRI WQRA has been completed to assess the treated water quality risks associated with transfer of raw water from a Thames Water donor zone to an Affinity Water recipient supply zone. This risk assessment would therefore help inform the design and development of the option and ensure no deterioration in the water quality of the supply zone. The Gate 2 water treatment design for the BRI option has been updated from the Gate 1 design by considering the outputs from the WQRA process, as detailed in the Gate 2 CDR.

1.4 The purpose of this technical supporting document is to summarise the Gate 2 WQRA process from methodology through to results. The ACWG Water Quality Risk Framework Report[1] has been used to guide the risk assessment and splits the WQRA process into 5 stages, as seen in Figure 1.1.

Figure 1.1: ACWG water quality risk process approach

Source: ACWG Strategic WQ Risk Framework Report

1.5 For Gate 1, relevant data was collected in the form of Drinking Water Safety Plans (DWSPs) and Environment Agency (EA) water quality monitoring catchment data. This information was built upon in Gate 2 with the inclusion of water quality data from the SRO water quality monitoring programme. This updated data set was used to populate the WQRA spreadsheet tool for the BRI option and helped determine the relevant hazards. Following this, the risks of these hazards to drinking water safety

[1] B19589BJ-DOC-001 Rev 06 ACWG WQ Risk Framework Report – Final (Strategic WQ Risk Framework FINAL Report) | 19/01/21 |

were analysed and a draft WQRA for the BRI option was produced. An assessment team for reviewing the draft WQRA was then assembled, consisting of water quality representatives and project stakeholders from both Affinity Water and Thames Water. The draft was assessed in a collaborative strategic WQRA workshop where option-specific hazards, their risk ratings and associated mitigation techniques were discussed and agreed upon. The outputs of the workshop included identification of any data gaps, residual risk considerations and a fully populated WQRA spreadsheet.

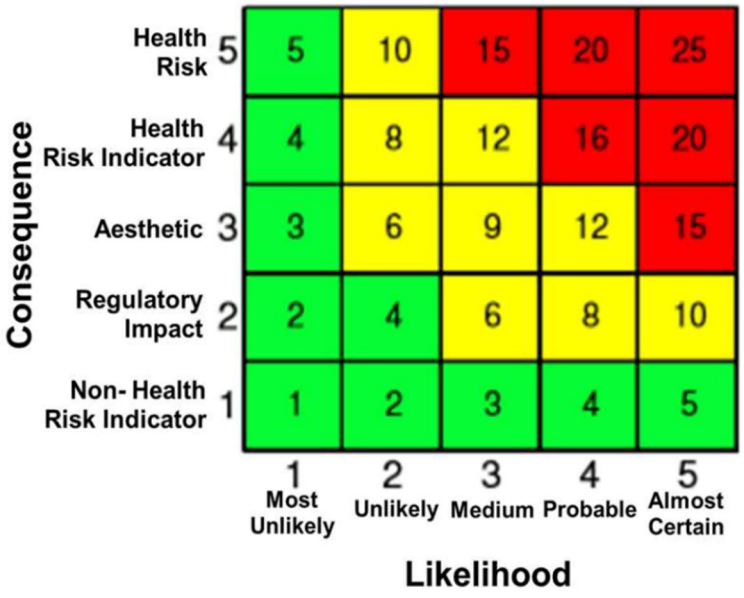
1.6 Sections 3 and 4 detail the actions to be completed for Gate 3 that will allow for a more comprehensive understanding of the water quality risks going forward. The WQRA is an iterative process and as further information becomes available, it is expected that the option and associated risk assessment will be developed in greater detail.

2. Methodology (ACWG WQRA)

2.1 The process of undertaking the steps outlined in Figure 1.1 is detailed in sections 2.1–2.6. The steps taken to complete the BRI WQRA have been guided and organised by the responsible lead technical author, Mott MacDonald. As suggested in the ACWG WQ Risk Framework Report, this party is responsible for collecting, collating, and analysing water quality risk data to provide an initial draft of the WQRA for each defined option within the SRO. The party is also responsible for convening the Strategic Water Quality Risk Assessment workshop to review and develop the risk assessment. This review must be completed to the agreement of all Water Companies affected by the SRO. The framework states a WQRA should be completed for each materially different option at each RAPID stage gate, with the resulting risk assessment remaining a live document to eventually be overtaken by the development of a drinking water safety plan (DWSP) in line with DWI regulations.

2.2 The WQ Risk Framework provides a strategy for completing the assessment of water quality risks based on existing water company risk assessment techniques. This has allowed for an easier integration of existing risk assessment data into the WQRAs. For example, the approach outlined adopts a 5 x 5 matrix of hazard likelihoods and consequences, seen in Figure 2.1, that aligns with the scoring system used by water companies.

Figure 2.1: WQ Risk Framework 5 x 5 matrix



Source: ACWG Strategic WQ Risk Framework Report - Jacobs

2.3 A key consideration in the methodology recommends focusing on only the limiting hazards likely to affect the development of an option design. These limiting hazards are defined within the WQ Framework as:

"Hazards and hazardous events which are most likely to drive the development and/or acceptability and/or viability of the SRO or water supply scheme"

2.4 This definition has been produced in recognition of the need to complete strategic, high level WQRAs appropriate for the conceptual development of options. As there are numerous waterborne pathogens and chemicals that could affect drinking water wholesomeness, as defined in the England and Wales Water Supply Regulations 2016 Part 3[2], the practical suggestion is to consider the few that are limiting. That is, where the magnitude of risks and their required mitigation determines the design of treatment. This allows for a more focussed assessment of risks, better aligned with the design development and data types and availability at early stages of RAPID gate analysis.

2.5 The methodology undertaken for this SRO therefore closely follows that set out in the Framework Report. There were however a few deviations adopted during the T2AT WQRAs:

- **Standardising consequence ratings** - described in section 2.3.1
- **Water quality assessment team** - at this high-level stage, it did not seem appropriate to request full engagement of all SRO stakeholders in the workshop. The workshop consisted of Affinity Water and Thames Water representatives and only key Mott MacDonald consultants from the project team. However, it is understood full engagement of all stakeholders including regulatory bodies is required moving forward to fulfil the ACWG requirements.

2.6 It is anticipated that moving through future gates, the WQRAs will continue to follow ACWG methodology as further information becomes available and the BRI option is developed.

2.7 To complete the risk assessment, a strategic WQRA spreadsheet tool was used to capture the risks associated with hazards across seven stages from catchment through to consumer. Each stage contains a pre-mitigated risk section and post-mitigated risk section, with space for suggested controls, residual risk considerations and actions. Each stage also contains a data capture section to list the sources and certainty of data utilised. The results of the BRI workshop can be seen in Appendix A.

[2] The Water Supply (Water Quality) Regulations 2016 | 2016 No.614 | 26/05/16 | UK GOV

2.1 Data Collection

2.8 To best inform the BRI WQRA and therefore support option design considerations, data relevant to the option catchment, abstraction location, distribution networks and consumer regions were collected. The primary data source used for analysis of water quality in the River Lee was from the SRO water quality monitoring programme Site 15 data set, taken from the River Lee upstream of the King George V (KGV) reservoir intake. This was supplemented with Thames Water DWSP risk ratings for the River Lee & New Gauge Intake and Girling Lee.

2.9 A list of required data was produced and distributed to Affinity Water and Thames Water. Where possible, updated versions of the DWSPs collected in Gate 1 were requested to inform risk ratings across all stages in conjunction with water quality monitoring data sets. The appropriateness of the data selected to represent each BRI option stage was reviewed and confirmed during the WQRA workshop, and their certainty assessment reflected in the WQRA spreadsheet function. A summary of the data collected for the Gate 2 WQRAs can be seen in Table 2.1, including where assumptions and inferences were made.

2.10 For the catchment and abstraction stages, DWSP data was used in conjunction with water quality monitoring data collected as part of the multi-SRO monitoring programme. Two water quality data sets taken from the River Lee were available for analysis including Site 15 upstream of the King George V (KGV) reservoir intake and Site 16 at the Chingford Supply Channel. Site 15 was chosen due its proximity to the proposed surface water abstraction location, approximately 1km upstream. The multi-SRO water quality monitoring programme includes extensive water quality monitoring at locations relevant to SROs, as agreed by the EA and Natural England.

2.11 The DWSP data sets used for the BRI drinking water quality assessment had the advantage of reflecting hazard level trends from at least the last five years. This would account for seasonal parameter concentration changes and negate the effects of acute pollution events on risk rating averages. However, these data sets do not cover all the drinking water quality parameters highlighted for study in the WQRA and so have been supplemented by the SRO water quality monitoring programme Site 15 data.

2.12 The BRI option contains treated water storage at Brookman's Park service reservoir with and ongoing treated water connection to the North Mymms service Reservoir. To represent the water quality consideration at these stages, the existing Potters Bar West DWSP for distribution around the North Mymms area was analysed. This was assumed to be representative of the water quality risks involved in distribution for the networks connected to both North Mymms and Brookman's Park service reservoirs.

Table 2.1: Summary of risk data collected in Gate 2, as used to inform the drinking water risk assessment

	Catchment	Abstraction	Raw Water Conveyance	Treatment	Storage	Distribution	Consumer
Beckton Reuse Indirect	1. Thames Water Girling Lee Intake Catchment DWSP 2. Thames Water River Lee and New Gauge Intake DWSP 3. Atkins Suite 5 monitoring at Site 15 (River Lee upstream KGV Reservoir intake)	1. Thames Water Girling Lee Intake Catchment DWSP 2. Thames Water River Lee and New Gauge Intake DWSP 3. Atkins Suite 5 monitoring at Site 15 (River Lee upstream KGV Reservoir intake)	>	Inferences drawn from the Affinity Water Iver Treatment DWSP Iver Treatment is considered to be similar to the plant envisaged in this scheme	>	Affinity Water - DWSP Potters Bar West (Supply system: North Mymms)	Affinity Water - DWSP Potters Bar West (Supply system: North Mymms)
Notes	1. DWSP updated with new data since Gate 1 analysis 2. DWSP updated with new data since Gate 1 analysis 3. New data collected for Gate 2	1. DWSP updated with new data since Gate 1 analysis 2. DWSP updated with new data since Gate 1 analysis 3. New data collected for Gate 2	Risk ratings carried forward from previous stage	Maintained from Gate 1	Risk ratings carried forward from previous stage	Maintained from Gate 1	Maintained from Gate 1

2.2 Develop assessment team

2.13 The ACWG Risk Framework report states that an assessment team should be convened to include representatives from any water company affected by the SRO. Therefore, staff who provided information during data collection; had experience in water quality risk assessments or were involved in the conceptual design and intended operation of the SRO were invited to participate in reviewing the WQRAs. Appropriate representatives from water quality teams were included in the workshop, as seen in Table 2.2, to ensure valuable insight was contributed.

Table 2.2: Workshop attendees and roles

Organisation	Attendee Role
Affinity Water	Strategic asset manager for non-infra and water quality
Thames Water	Lead scientist
Thames Water	Water quality strategy and assurance manager
Mott MacDonald	T2AT technical lead
Mott MacDonald	Senior process engineer
Mott MacDonald	Process engineer

2.2.1 Engagement and liaison to Gate 2

2.14 Specific engagement activities undertaken for Gate 2 can be seen in Table 2.3. It should be noted the WQRA process for the BRI option was completed in conjunction with the T2AT Lower Thames Reservoir option WQRA and therefore many engagement activities covered both options.

Table 2.3: Engagement activities to Gate 2

Activity	Date	Organisations involved	Purpose
Water quality data requests	31/01/22	Affinity Water, Thames Water	Updated DWSP water quality data was requested to inform the WQRA draft risk ratings.
Pre-workshop meeting	31/01/22	Affinity Water, Thames Water, Mott MacDonald	To outline the WQRA process and workshop expectations.
London Reuse SRO Beckton Reuse interaction	17/02/22	Jacobs, Mott MacDonald	To discuss London Reuse SRO Beckton Effluent Re-use option configuration and how the T2AT BRI Gate 2 water quality risk assessment is impacted by discharge of Beckton Advanced Water Recycling Plant (AWRP) effluent into the River Lee
BRI pre-workshop correspondence including a workshop preparation PowerPoint	25/02/22	Affinity Water, Thames Water, Mott MacDonald	To prepare for the WQRA workshop by providing: • An introduction to WQRAs • An overview of the transfer options progressed from Gate 1 • A summary of the data collated in Gate 2

			• A methodology for the WQRA draft • A workshop plan.
BRI WQRA workshop	04/03/22	Affinity Water, Thames Water, Mott MacDonald	To conduct a review of the drafted WQRA for the BRI SRO option.
Liaison with water quality teams	Ongoing	Affinity Water, Thames Water, Mott MacDonald	To ensure changes to design are deemed appropriate by the Water Quality teams at both Thames Water and Affinity Water.
Liaison with DWI	Ongoing	Drinking Water Inspectorate, Affinity Water, Thames Water, Mott MacDonald	To provide an early draft of the Drinking Water Quality technical supporting document for comment, before formal submission of the Gate 2 report.

2.3 WQRA draft

2.15 Drafting the BRI water quality risk assessment consisted of several stages and revisions to prepare it adequately for review in the workshop. The initial stage involved collecting and processing the water quality data, then inputting the draft likelihood ratings and finally ensuring the risk scores flowed appropriately across all seven WQRA stages from catchment through to consumer.

2.3.1 Consequence ratings

2.16 To ensure consistency across all stages and options in Gate 1, a list was produced that standardised the consequence ratings of each hazardous parameter. The ratings were based on information sourced from the WHO Guidelines for Drinking Water Quality[3] and followed the 5x5 risk matrix system of grading consequences.

2.17 The ratings were built on the assumption that the hazards were present above the limits set by the Water Safety Regulations 2016 (WSR2016) and the effects would therefore range from “non-health risk indicator” to “aesthetic” impacts to “health impacts”. Where no WSR2016 limits were available, the consequence ratings were chosen assuming the hazard was present at a concentration high enough to attain the most severe consequence category possible, as seen in Figure 2.1. For example, dissolved organic carbon (DOC) has no WSR2016 limit, but can cause the production of disinfection by-products and therefore earns a consequence rating of 4. This rating is for health risk indicators, even though DOC does not inherently classify as a ‘health risk’, nor does it cause purely ‘aesthetic’ consequences. The consequence ratings standardised in Gate 1 were maintained and input into the BRI WQRA for Gate 2.

[3] Guidelines for drinking-water quality: fourth edition incorporating the first addendum | 2017 | Geneva: World Health Organization | Licence: CC BY-NC-SA 3.0 IGO.

2.3.2 Likelihood ratings

2.18 Following the consequence ratings, the draft likelihood ratings were determined based on the water quality data and DWSP data listed in Table 2.1 and input into the spreadsheets.

2.19 For the catchment stage and abstraction stages, water quality data from the multi-SRO monitoring programme at the River Lee upstream of the KGV intake was reviewed and expert judgment used to assess the likelihood of a parameter breaching the WSR2016 limits. The likelihood scoring was based on how often the parameter historically breached the WSR2016 limits on an annual basis, as outlined in Figure 2.2, taken from the ACWG WQ Risk Framework.

Figure 2.2: Likelihood scoring according to breaches on an annual basis

Level	Likelihood *during SRO operation* – example definitions	Consequence
1	Very unlikely / rare	No impact, >50% PCV, insignificant
2	Unlikely / possibly within 5 years	Low impact, single PCV, DWI event level1,2, minor compliance
3	Moderate / possibly within 3 years	High impact, multiple PCV, DWI event level 3, aesthetic impact
4	Likely to occur once per year	Serious impact, precautionary advice, DWI event 4, major regulatory
5	Almost certain / Likely to occur > once this year	Major impact, precautionary advice, DWI event 5, water unpotable, health impact

Source: ACWG Strategic WQ Risk Framework Report

2.20 This draft likelihood score was then combined with the fixed consequence rating to produce a final risk score, which was reviewed against the DWSP score from the Thames Water 'Girling Lee Intake Catchment' and 'River Lee and New Gauge Intake' DWSPs. If these did not match, they were highlighted for discussion in the WQRA workshop, and the outcome of these discussions is seen in section 3.10. For the remainder of the stages, risk ratings were drafted based on the relevant DWSPs.

2.21 For certain parameters where no data was available, but the hazard was deemed limiting, assumptions were made as to likelihoods based on expert opinion. An example of this is the “Trihalomethane formation potential” parameter that was deemed high risk until the treatment stage where the likelihood would fall once mitigated through organics removal. Other parameters in the catchment that

required expert opinion to score as no data was available included odour, taste and viruses.

2.22 Where possible, likelihood ratings in the treatment stage were reduced between pre and post mitigation using expert opinion and the hazard reduction capacity at the existing Iver WTW for guidance. Although the proposed BRI-WTW is not in the same geographical area as the existing Iver WTW, it was assumed the treatment stage data sourced from the Iver WTW DWSP would be like that of a new, similar surface water treatment works and were therefore used as guideline values. However, a point raised in the Gate 1 pre-workshop meeting suggested that using the existing Iver WTW DWSP to infer hazard reduction capacity in the treatment stage was not truly reflective of standard reduction capacity due to operational constraints at the time. Therefore, expert opinion was mainly used to determine the effectiveness of control measures on hazard reduction with the DWSP values used for guidance. These assumptions were also applied during the WQRA drafting stage of Gate 2, with the knowledge they would be reviewed and agreed upon in the WQRA collaborative workshop.

2.23 Combined with the standardised consequence ratings, the likelihood ratings populated the WQRA spreadsheet with overall risk scores for each parameter at every stage.

2.3.3 Data flow

2.24 Having populated the risk assessment with risk scores, gaps in data for certain stages or variations in scores between adjacent stages were evident. Therefore, to ensure a sensible flow of risk scores from catchment through to consumer, the data available was merged according to the following rules:

- Where no data was available for a particular stage of the WQRA, the risk rating was carried forward from an upstream stage where this data was available. This was particularly relevant during the raw water conveyance stage where no data was available, but it was anticipated that risk scores would not vary from the abstraction stages.
- For certain parameters where the risk rating increased unexpectedly from an upstream to a downstream stage, this transition was retained and discussed in the workshop. For example, the distribution network surrounding North Mymms has occasionally shown historic trends of depositing iron into the water supply due to pipe corrosion and so the parameter likelihood increased post-treatment in the distribution stage.

2.3.4 Limiting hazards

2.25 An initial review of the BRI option indicated that at a minimum, the hazardous parameters that should be considered for analysis in the WQRA included pathogens, cryptosporidium, turbidity, pesticides, and metals as these parameters are key to developing the design of a water treatment works.

2.26 Following this, the ACWG Water Quality Risk Framework Report recommends including limiting hazards from the following groups associated with raw water transfers, seen in Figure 2.3:

- Pathogens
- Acceptability due to change in chemistry
- Acceptability due to taste and odour
- Pesticides
- Nitrate/nitrite
- Change in metal types and form
- Disinfection by-product formation potential

Figure 2.3: WQ risk framework limiting hazard categories

Type of SRO -> Likely limiting hazards	Reservoir source	Ground water source	Influence of sewage	Raw water transfer	Treated water transfer
Pathogens – e.g. Cryptosporidium, viruses	✓	✓	✓	✓	✓
Emerging hazards – e.g. nitrosamines, 1,4-dioxane, PFAS	✓	✓	✓		
Acceptability due to change in chemistry – e.g. alkalinity	✓	✓	✓	✓	✓
Acceptability - taste and odour	✓	✓	✓	✓	✓
Pesticides – e.g. metaldehyde	✓		✓	✓	
Nitrate/Nitrite		✓	✓	✓	
Corrosion potential					✓
Change in metal types and form	✓	✓		✓	
Disinfection byproduct formation potential	✓		✓	✓	✓

Source: ACWG Strategic WQ Risk Framework Report

2.27 Taking at least one limiting hazard from each of these categories, the list of applicable limiting hazards seen in Table 2.4 was produced.

Table 2.4: Limiting hazards

Limiting hazard	Limiting hazard category	Limiting hazard justification
Escherida Coli	Pathogens	E. Coli to be standard limiting hazard covering pathogens and is considered the most suitable indicator of faecal contamination. E. Coli is likely to drive the development of the water supply scheme due to being an indicator of health risks.
Cryptosporidium	Pathogens	Limiting hazard because the parameter is a microbiological contaminant uniquely treated. Cryptosporidium is likely to drive the development of the water supply scheme due to associated high health risks. Traditional methods of pathogen treatment are not effective against cryptosporidium.
Iron	Change in metal types and form	Naturally occurring limiting hazard requiring removal. Iron is likely to drive the development of the water supply scheme due to natural abundance.
Manganese	Change in metal types and form	Naturally occurring limiting hazard requiring removal. Manganese is likely to drive the development of the water supply scheme due to natural abundance.
Sulphate	Acceptability	Limiting hazard because sulphate is likely to drive the acceptability of the water supply scheme by consumers due to its effect on taste. Possibility of sulphate concentrations changing and impacting on water perception when water is supplied from a new catchment. Due to the close control of Larson-Skold index required as a corrosivity indicator, a combination of sulphate, chloride and alkalinity should be assessed as limiting hazards.
Trihalomethanes (THM)/THM Formation Potential	Disinfection by-product formation potential	Limiting hazard because parameter is likely to drive the viability of the water supply scheme due to introduction of disinfection by-product (DBP) health risks. DBPs would be formed through the disinfection process at the new water treatment works.
Nitrate	Nitrate/nitrite	Limiting hazard requiring removal as nitrate is likely to drive the development/viability of the water supply scheme due to increasing formational potential of nitrite and associated health risks.
Nitrite	Nitrate/nitrite	Limiting hazard requiring removal as nitrite is likely to drive the development/viability of the water supply scheme due to associated health risks.
Pesticides: total	Pesticides	Limiting agricultural chemical hazard requiring removal. Pesticides are likely to drive the development/viability of the water supply scheme due to associated high health risks.
Benzo(a)pyrene	Chemical hazard	Limiting hazard as likely to drive the development of the water supply scheme due to associated high health risks.
Dirty/discoloured water	Acceptability	Limiting hazard because parameter is likely to drive acceptability of water supply scheme by consumers and therefore requires removal.

Odour	Acceptability	Limiting hazard because parameter is likely to drive acceptability of water supply scheme by consumers and therefore requires removal. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that odour is a key factor in the requirement for final water conditioning to Affinity Water standards.
Taste	Acceptability	Limiting hazard because parameter is likely to drive acceptability of water supply scheme by consumers and therefore requires removal. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that taste is a key factor in the requirement for final water conditioning to Affinity Water standards.
Change in hardness/alkalinity	Acceptability due to a change in chemistry	Limiting hazard because parameter is likely to drive the acceptability of the water supply scheme by consumers. Catchment hardness and alkalinity may be different to that in the consumer region and therefore water supply may require conditioning. Due to the close control of Larson-Skold index required as a corrosivity indicator, a combination of sulphate, chloride and alkalinity should be assessed as limiting hazards.
Change in source type (e.g. surface - groundwater)	Acceptability	Limiting hazard because parameter is likely to drive the acceptability of the water supply scheme by consumers. Assumption that reliance on groundwater supplies in Affinity Water zones will have to reduce in future and therefore reliance on surface water (via transfers) will increase, making this hazard a relevant consideration. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that this parameter is a key factor in the requirement for final water conditioning to Affinity Water standards.
Pathogens - Bacteria, Viruses, Protozoa	Pathogens	This parameter is to be a standard limiting hazard covering viruses and therefore requiring disinfection. Viruses are likely to drive viability of water supply scheme due to associated health risks.
Dissolved organic carbon	Disinfection by-product formation potential	Limiting hazard because parameter is likely to drive the development/viability of the water supply scheme and therefore requires removal (e.g. activated carbon). Organic carbon increases the formational potential of DBPs and therefore introduces associated health risks.
Chloride	Acceptability	Limiting hazard because chloride is likely to drive the acceptability of the water supply scheme by consumers due to its effect on taste. Possibility of chloride concentrations changing and impacting on water perception when water is supplied from a new catchment. Due to the close control of Larson-Skold index required as a corrosivity indicator, a combination of sulphate, chloride and alkalinity should be assessed as limiting hazards.
Turbidity	Acceptability	Turbidity is likely to drive the development of the water supply scheme, specifically plant design and operability. It is likely to reduce the acceptability of the water supply scheme by consumers and therefore requires removal.

2.28 Any further BRI-specific water quality hazards deemed likely to drive the development and/or acceptability and/or viability of the SRO or water supply scheme were then assessed. These limiting hazards were determined using existing DWSPs and the water quality monitoring data sets. By choosing parameters that were either high risk in existing DWSPs; above WSR2016 limits or could not be mitigated by the treatment technology required for another limiting hazard, a list of the key parameters for the BRI option was produced. These additional limiting hazards are shown in Table 2.5. The key parameters were reviewed and confirmed during the collaborative WQRA workshop, utilising the expert knowledge of water quality representatives from both Affinity Water and Thames Water. The 'hydrocarbons' limiting hazard was highlighted in the workshop as an additional parameter for inclusion in the WQRAs going forward.

Table 2.5: Additional BRI limiting hazards

Limiting hazard	Limiting hazard justification
Bromate	Discussed in Gate 2 workshop that there is historic pollution from industrial site close to Hatfield. This pollution is currently managed, but there is a risk to the River Lee catchment sources. Due to the unknowns of how the pollution will move in the future, bromate should be considered as a limiting hazard.
Lead	Limiting hazard requiring control as lead is likely to drive the development/viability of the water supply scheme due to associated health risks. Distribution/consumer zone identified as being at risk from lead so currently receives orthophosphate dosed water.
Ammonium	Limiting hazard as likely to drive the development/viability of the water supply scheme and therefore requiring review of chlorine dosing.
Aluminium	Limiting hazard as likely to drive acceptability of water supply scheme by consumers.
Metaldehyde	High risk rating in catchment and is assumed to be a limiting agricultural chemical to be considered in the WQRA process. However, metaldehyde use is set to be outlawed from the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.
Perfluoroalkyl substances (PFAS)	Identified during Gate 2 pre-workshop meeting as emerging hazard of concern.
Hydrocarbons	To be standard limiting hazard covering hydrocarbons and requiring removal. Hydrocarbons are likely to drive the development/viability of the water supply scheme due to associated high health risks.

2.4 Strategic WQRA draft

2.29 The ACWG guidance states a collaborative workshop between all SRO stakeholders must be completed to fulfil the recommendation outlined in section 7 of the DWI Guidance Note on Long Term Planning for the Quality of Drinking Water Supplies[4]. The first iteration of this workshop contained high level analysis of the risks associated with each option and the Gate 2 iteration built upon this with more detailed analysis, using updated data sets and a team of experts with a more developed understanding of the BRI option.

2.30 The workshop began with an introduction to Water Quality Risk Assessments and a

[4] Guidance note: Long term planning for the quality of drinking water supplies | Guidance to water companies | June 2020 | Drinking Water Inspectorate

summary of the BRI option. The WQRA draft methodology and updates since Gate 1 were then discussed before moving onto the BRI WQRA, reviewed using the spreadsheet tool. The first step of the WQRA involved a data review to confirm if the data collected for each option was representative of the actual hazards present.

2.31 Next, the spreadsheet was filtered to show limiting hazards chosen during drafting. The list of limiting hazards was discussed and agreed to be representative of the water quality risks faced by the BRI option. However, it was agreed benzo(a)pyrene was not representative of other hydrocarbon hazards and so an extra 'Hydrocarbons' limiting hazard was added to this list. Hydrocarbons and benzo(a)pyrene were deemed by those present to be likely to drive the development of an option and therefore both were retained as limiting hazards.

2.32 Having identified the relevant limiting hazards, the drafted likelihood scores of all parameters were then reviewed across all stages. Where necessary, scores were updated based on attendees' expert opinions. During this likelihood review, appropriate control measures were discussed for each limiting hazard and updated accordingly. Where applicable, residual risk considerations were noted, and actions listed. These actions detailed the treatment technologies to be included in the option design and where further information was required for WQRA analysis in Gate 3.

2.4.1 Key workshop conclusions:

- Site 15 monitoring at the River Lee upstream of the KGV intake as part of the multi-SRO water quality monitoring programme should continue. A longer data set will capture seasonal fluctuations in water quality and provide a better indication of parameter concentration trends going forward. An upcoming SRO technical note on emerging hazards will suggest which emerging parameters can and should be monitored for in the multi-SRO water quality monitoring programme going forward
- Bromate pollution is present in the River Lee, however a decision was made to not add in bespoke treatment to the BRI-WTW Gate 2 concept design as there are existing management techniques in place. This management should continue to be effective and if it is no longer possible, it is expected more comprehensive abstraction/river management would be an appropriate response due to the large-scale impact the contamination would have on other sites
- Customer engagement would be key in reducing the risk of acceptability issues. Consumer research for changes in source type is ongoing and the results will tie into the next RAPID gated stage of the drinking water quality assessment process
- Chloride, sulphate, and alkalinity need to be considered in the risk analyses as they are foundational in understanding the Larson-Skold index
- 4-log removal or inactivation of cryptosporidium must be considered in the BRI option treatment design. A direct surface water abstraction to WTW design will not provide an opportunity for attenuation of cryptosporidium before treatment. Therefore, UV treatment in conjunction with the conventional treatment process outlined in the Gate 2 concept design should be included

- According to the distribution DWSPs around the North Mymms area, risks associated with iron, lead, benzo(a)pyrene and aluminium increase in the distribution network. These existing risks are currently monitored and managed and would not change with the addition of the BRI option. They are reflected in the raised scores given in the pre-mitigated distribution stage but reduce post-mitigation due to existing management techniques. These include routine sampling and flushing; orthophosphate dosing and replacement of piping where appropriate

2.5 Key assumptions and uncertainties

2.33 In order to progress the WQRA through Gate 2, several assumptions had to be made. These assumptions are summarised below.

2.34 It has been assumed that the discharge of water from the Thames Lee Tunnel (TLT) extension proposed as part of the London Reuse SRO Beckton Reuse option will cause no deterioration to the water quality in the River Lee. This is partly due to the knowledge the Beckton STW effluent would be treated to a high degree by the proposed Advanced Water Recycling Plant (AWRP). It is also assumed any water conveyed from the River Thames to the River Lee through the extension of the TLT will cause no deterioration of the water. This assumption must be further reviewed in Gate 3.

2.35 It has been assumed the DWSP data collected in the initial stages of WQRA drafting are a good representation of the current water quality risks in the associated BRI option stages. As discussed in section 2.3.1, the consequence ratings taken from the DWSP information were standardised to control variations in ratings between water companies and stages. Where the DWSP data was altered to standardise consequence ratings, this method was checked with both Thames Water and Affinity Water and deemed to be appropriate. It is also assumed the SRO water quality monitoring programme data collected from the River Lee upstream of the KGV intake is a good basis for approximating the future water quality risks in these locations.

2.36 Having assumed the data collected was reflective of the water quality risks, it was then presented during the collaborative strategic workshop for review. It was assumed that the suggestions made by the water quality experts present were accurate and the WQRA scorings were updated accordingly. Where possible, these updates were noted in the comments section of the WQRA spreadsheet tool.

2.37 When undergoing the WQRA workshop, opportunity was given for the water quality experts present to highlight any further limiting hazards of concern for the BRI option, on top of those listed in Table 2.4 and Table 2.5. This final list of limiting hazards therefore incorporates the limiting hazard assessment requirements outlined in the ACWG WQ Framework as stated in section 2.3.4 and is assumed to also include most drinking water quality parameters of relevance to the BRI option. The only known parameter group that has not been fully analysed in Gate 2 is the 'emerging hazards' category, which is discussed further in section 3.9.

2.38 Metaldehyde was included in the Gate 2 analysis as a limiting hazard due to it

currently being a high-risk agricultural chemical. However, it has been outlawed from the end of March 2022 and so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.

2.39 The bromate, nitrates/nitrites and PFAS parameters were all highlighted as limiting hazards of particular interest in both the Gate 1 and Gate 2 WQRA workshops. It is therefore imperative they continue to be monitored and analysed in future WQRAs, as discussed in section 3.

2.6 Check outputs

2.40 The ACWG methodology indicates consistency checks should be performed on the WQRA outputs. The first is a check that all available data sources have been drawn into the assessment. By reviewing and agreeing on data sources in the strategic WQRA workshop, it is assumed that all the appropriate and available water quality risk information has been identified. Where data is yet to be drawn into the assessment or information critical to the development of future WQRAs is yet to be available, this has been noted in section 3.11 with the aim of filling the identified information gaps for Gate 3

2.41 The next check is a review of whether risks output from the process align with those reflected in work to date and to show the assessment has been utilised. The Gate 1 BRI WQRA has been built upon and refined in Gate 2 using additional data and has been cross-checked against existing DWSP risk ratings. The updated WQRA spreadsheet was used in the BRI WQRA Gate 2 workshop to facilitate discussion on water quality hazards relevant to the proposed BRI scheme. The workshop also provided an opportunity to discuss mitigation measures of water quality hazards such as the BRI-WTW treatment process and the necessity for customer engagement.

2.42 The final cross-check listed is that mitigation measures and data gaps agreed by the collaborative assessment team align with RAPID gate documents developed, conceptual designs and existing deliverables. The data gaps highlighted in the Gate 1 BRI WQRA were largely addressed by using the Site 15 SRO water quality monitoring programme data, with any further information requirements listed in section 3.11. The BRI WQRA Gate 2 workshop outputs have been used to drive the concept design of the BRI-WTW.

3. Discussion of initial assessment results

3.1 General

3.1 Water quality risks highlighted in the Gate 2 BRI WQRA have supported the need for concept treatment design proposed in Gate 1. The only modification identified is the requirement for a UV process to adequately treat cryptosporidium. From the data available, the WQRA has identified no drinking water quality parameters that pose a risk to consumers in the Affinity Water region once treatment has occurred. However, building on the key workshop conclusions listed in section 2.4.1, several considerations need to be made as options are progressed through the RAPID Gated process. These, along with other workshop outcomes, are discussed in sections 3.1 - 3.11.

3.2 A PDF summary of the BRI WQRA spreadsheet reviewed during the strategic workshop can be found in Appendix A. This document summarises the flow of risks from catchment through to consumer and highlights the limiting hazards that should be researched as the treatment design progresses through the RAPID stage gates.

3.2 Larson-Skold index

3.3 In the Gate 1 and Gate 2 workshops, Affinity Water representatives indicated that chloride, sulphate, and alkalinity need to be considered in the risk analyses as they are foundational in understanding the Larson-Skold index. This index is used by Affinity Water as an indicator of corrosivity in the network and therefore tracing these three parameters is an important aspect of the treatment design for the options. Where the Larson-Skold index is found to be such that corrosion is likely, water conditioning may be appropriate at the treatment works. This requirement would be confirmed in detailed design, but following further design development in Gate 2, pH control at the outlet of the concept BRI-WTW design has been added for close control of the Larson-Skold index.

3.3 Cryptosporidium

3.4 Due to water quality events highlighted during the Gate 1 workshop, it was suggested that 4-log removal or inactivation of cryptosporidium must be achieved between abstraction and the consumer. This could be accomplished using a combination of conventional treatment and bankside storage or enhanced treatment (e.g. UV or membrane filtration). It was discussed and agreed that as raw water storage between the abstraction and BRI-WTW is not in the current BRI option design, an ultraviolet (UV) treatment process should instead be added to achieve 4-log removal. Inclusion of bankside storage to attenuate cryptosporidium in the design may negate the necessity for enhanced treatment and may also provide additional benefits to the SRO option above that provided by UV treatment.

3.4 Bromate

3.5 Data analysed in the Gate 2 BRI WQRA indicated low concentrations of bromate were present in the River Lee. However, in the WQRA workshop it was agreed that the short data set was not indicative of the known bromate risk. As discussed in both the Gate 1 and Gate 2 WQRA workshops, historic pollution from an industrial contamination site close to Hatfield has caused bromate issues in the Affinity Water zone. As the River Lee sources water from Affinity Water ground water, bromate contamination is possible and was therefore considered a limiting hazard. It is suggested bromide levels are further investigated in Gate 3 due to the potential of bromide to convert in to bromate in the water treatment process.

3.6 An Affinity water representative confirmed there are existing management techniques in place, but that bromate pollution should be retained as a medium risk limiting hazard due to the uncertainty of how the pollution issue will evolve over time. The main management technique raised was abstraction at Hatfield treatment works for discharge into the sewer network. If management is no longer possible however due to movement of the pollution plume, it is expected further abstraction/river management procedures would be required due to the large-scale impact the contamination would have on other water assets in the area.

3.7 It should also be noted that dilution of bromate concentrations in the River Lee could be achieved by utilising the discharge flows from the extension of the TLT as part of the London Reuse SRO Beckton Reuse option. As further information becomes available on the expected discharge flows from the London Reuse option, high-level mass balances could be undertaken to confirm dilution feasibility. As the London Reuse SRO option is not currently implemented, accurately sampling for bromate levels in the TLT extension discharge is not possible. However, modelling based on existing data for bromate levels in the River Lee and current Thames-Lee Tunnel flows could provide a basis for preliminary mass balance calculations.

3.8 Following the Gate 2 WQRA workshop, the agreed response to bromate risks was to retain the parameter as a medium risk limiting hazard going forward into Gate 3 to ensure the evolving pollution issue is considered in future WQRAs. It was concluded that with existing management techniques, potential management techniques proposed for AMP8 and the impact the pollution plume could have on other strategic water resources, the issue would be managed sufficiently to not require bespoke treatment by the time the BRI option would be implemented. Workshop consensus was that further feasibility studies would determine whether dilution could work to mitigate the bromate risk to a level where a monitoring regime would be sufficient without additional treatment requirements. However, if after further investigation it is shown dilution is not a sufficient control measure, catalytic GAC could be considered in the design development at a subsequent stage gate.

3.5 Nitrates and nitrites

3.9 Nitrate and nitrite levels in the River Lee were considered in the workshop and the need for treatment in the BRI-WTW was reviewed. Thames Water indicated that

although both parameters are present at elevated levels in the catchment, there is a team currently investigating sources of nitrate in the River Lee and implementing catchment management techniques to reduce input from farmers in the area. It is understood that the majority of the input of nitrates into the River Lee is currently from Rye Meads STW. To address this, it was confirmed AMP7/8 plans are in place to reduce the level of nitrates discharged by the STW.

3.10 It was also raised in the WQRA workshop that dilution of nitrates in the River Lee may be possible with discharge flows from the TLT extension. A Thames Water representative indicated the AWRP effluent may contain a small amount of nitrite due to transformation of a nitrogen-containing chemical in the AWRP advanced oxidation process. Both points should be further investigated for their impact on nitrate/nitrite levels at the abstraction location going forward into Gate 3.

3.11 It was raised in the BRI WQRA workshop that it would be unusual to have nitrate treatment at a surface water treatment works. Therefore, in combination with the AMP7/8 investigation and reduction schemes and the possibility of dilution from the TLT extension, a decision was made to not include bespoke nitrate treatment in the concept design. It was agreed a medium risk rating up to the storage stage in the WQRA spreadsheet should be retained, where blending in the Brookmans Park service reservoir would reduce this risk to an acceptable level for consumers.

3.6 Hydrocarbons

3.12 In the Gate 2 workshop, the use of benzo(a)pyrene as a limiting hazard covering hydrocarbons was reviewed. It was raised that benzo(a)pyrene is not representative of the hydrocarbons that would often be found in surface water catchment or abstraction stages because it is a polycyclic aromatic hydrocarbon which is mainly derived from coal-tar pitch lining on water mains. Therefore, it was agreed that a new limiting hazard for hydrocarbons should be included and a separate limiting hazard for benzo(a)pyrene should be retained. The hydrocarbons limiting hazard was assessed as medium risk for the catchment and pre-mitigated section of the abstraction stages to represent the likelihood of fuel leakages from boating activities and industrial contamination in the River Lee. Raw water quality monitoring at the surface water intake is the mitigation measure proposed to result in a low hydrocarbons risk from the abstraction stage onwards.

3.7 Parameters affecting distribution and customer acceptability

3.13 Dirty/discoloured water; odour; taste; changes in hardness/alkalinity and changes in source type are all included in the WQRA as limiting hazards which mainly impact customer acceptability. In the workshop, the Affinity Water representative agreed that the WQRA should reflect the existing risks in the network and therefore iron, lead and aluminium all show increased risk ratings in the pre-mitigated distribution stages. The Potters Bar West DWSP lists existing mitigation measures to reduce the impact of these parameters causing dirty/discoloured water in the network and therefore the colour risk rating was reduced to low in the distribution to consumer stages. ‘Change in source type’ (e.g. ground to surface water) is captured as a

medium risk up to the pre-mitigated consumer stage to reflect the risk that consumers may challenge the wholesomeness of their supply due to changes in the characteristics of the water they receive. Customer engagement was listed as a mitigation measure to reduce the final consumer stage score to a low risk. It was confirmed in the workshop that Affinity Water and Thames Water customer engagement studies were ongoing to capture public opinion on the possible change in water introduced by the T2AT SRO.

3.8 Perfluoroalkyl substances (PFAS)

3.14 Perfluoroalkyl substances (PFAS) are a large group of manufactured organofluorine chemicals that have a wide range of industrial applications. Two examples of PFAS chemicals are PFOS (perfluorooctane sulphonate) and PFOA (perfluorooctanoic acid). They are widely used and break down slowly in the environment. PFAS have therefore been highlighted as a particularly significant emerging hazard and regulatory guidance from the DWI has emerged. In a pre-workshop consultation, Thames Water recommended the WQRA assess PFAS levels in the BRI option stages against the DWI Tier 3 Regulation 4 (2) (wholesomeness) guidance value for PFOS and PFOA of 0.1µg/l[5]. Any PFAS parameters present above this level should be highlighted as drinking water quality risks to wholesomeness of consumers' supply. Although analysis of multi-SRO water quality monitoring programme data from the River Lee upstream of KGV intake indicated PFAS levels were on average below the DWI Tier 3 guidance value, it was agreed in the workshop to retain PFAS as a high risk rating up to the treatment stage of the WQRA. This is because in the opinion of the water quality experts present, the data sets available were not yet extensive enough to provide confidence PFAS is a low-risk parameter. Once a long-term data set is established, this should be used as the basis for the PFAS assessment.

3.15 It was also discussed whether dedicated PFAS treatment should be added into the BRI-WTW concept design. It was agreed at this stage of the design process that dedicated treatment should not be added to the baseline concept design, but a costed risk item has instead been captured in case further monitoring data indicates dedicated PFAS treatment is required. It was also noted that the granular activated carbon filter (GAC) already in the Gate 2 WTW design may be effective at removing PFAS. As more data becomes available, it essential the requirement for dedicated PFAS treatment is reviewed.

3.9 Emerging hazards

3.16 Data from the multi-SRO water quality monitoring programme at Site 15 has captured many parameters that could be considered emerging hazards. However, detailed guidance was not available in Gate 2 on which emerging hazards are of particular concern to surface water abstraction options and at what levels these parameters pose a risk to drinking water quality. Therefore, most parameters have

[5] Guidance on the Water Supply (Water Quality) Regulations 2016 specific to PFOS (perfluorooctane sulphonate) and PFOA (perfluorooctanoic acid) concentrations in drinking water | 2021 | Drinking Water Inspectorate (DWI)

not been analysed for the BRI option, with the exception of PFAS. It has been confirmed however that an SRO technical note on emerging hazards has been commissioned by Thames Water and will be available in summer 2022. This technical note lists substances that are under potential/foreseeable protection measures and regulator (DWI) watching briefs and will be used to develop the strategy for analysing emerging hazards in the SRO RAPID gated reviews. Inspection of the draft hazards list has indicated that data sets for a number of the parameters listed are currently available in the BRI catchment/abstraction stages, but that there are also some missing. The SRO technical note will indicate which of these missing parameters could be monitored under an extension to the current SRO monitoring programme.

3.10 Differences in risk ratings

3.17 During the drafting of the catchment and abstraction stages risk scoring, several limiting hazards were highlighted for discussion in the WQRA workshop. These limiting hazards were highlighted due to a difference between the risk ratings in the DWSP at that stage and the risk ratings determined from available monitoring data, according to the method outlined in section 2.3.2. Table 3.1 details the outcome of these discussions for the catchment and abstraction stages respectively. Using water quality data, draft likelihood scores were determined based on likelihood of breaching WSR2016 limits at consumers' taps on an annual basis as shown in Figure 2.2. This scoring method was discussed and agreed in the WQRA workshop and forms the justification for many of the final risk score decisions listed below.

Table 3.1: Draft risk ratings – catchment & abstraction stages

Parameter	Based on water quality data	Based on DWSP	Decided upon in workshop	Justification
Cryptosporidium	Low	High	High	Expert judgment and the relevant DWSP indicated cryptosporidium is a high risk in the River Lee. As a conservative approach, a high-risk rating was chosen
Dissolved organic carbon (DOC)	High	Low	High	Expert judgment indicated high levels of DOC in the River Lee provide a risk of disinfection by-product formation potential in the BRI-WTW
Aluminium	High	Medium	High	Breached WSR2016 limits at consumers' taps 1no. times since Jan 2021 = likelihood of 4 = high risk score
Metaldehyde	Medium	High	Medium	Metaldehyde will be outlawed from the end of March 2022. It is assumed that by the time BRI is implemented, metaldehyde will be a less relevant hazard.

3.11 Additional data collection

3.18 Considering the iterative nature of the risk assessment, supplementary data may reveal updated risks from limiting hazards and this would feed into updated design considerations. Therefore, a key outcome from the Gate 2 assessment is that the SRO water quality monitoring programme continue to monitor at the River Lee upstream of the KGV Reservoir intake location to capture long-term trends in raw

water quality. Analysis of emerging hazards is also imperative moving forward to Gate 3 and is discussed further in section 3.9.

3.19 The only further data collection recommended is for the 'Viruses' parameter. A strategy for monitoring emerging hazards will be outlined in the SRO emerging hazards technical note and this may require further data collection or modifications to the existing monitoring suite going forward. Results from the Affinity Water and Thames Water customer engagement surveys will also provide valuable insight for completion of the Gate 3 drinking water quality risk assessment with regards to the parameters impacting customer acceptability.

4. Further work plan

4.1 Water quality monitoring activities

4.1 The SRO water quality monitoring program, undertaken in agreement with the EA and Natural England, has been arranged to capture key water quality data required for progression of the SRO options. It has been agreed that the Site 15 monitoring suite at the River Lee upstream of the KGV reservoir intake is suitable to represent the water quality risk in the abstraction location of the BRI option. This monitoring suite will continue to collect data going forward into Gate 3, which can be used to facilitate future drinking water quality assessments of the BRI WQRA catchment and abstraction stages. With the additions discussed in section 3.11, this comprehensive data set provides information for analysis of most limiting hazards identified in the WQRA process.

4.2 Future engagement

4.2 As options are further developed and a greater understanding of water quality risks is available, it will become appropriate to undertake further WQRA workshops where additional SRO stakeholders may be invited to attend for their input on option development. As stated in section 2, the Gate 2 WQRA workshop included only key members of the project development team, and this will be expanded as necessary moving forward.

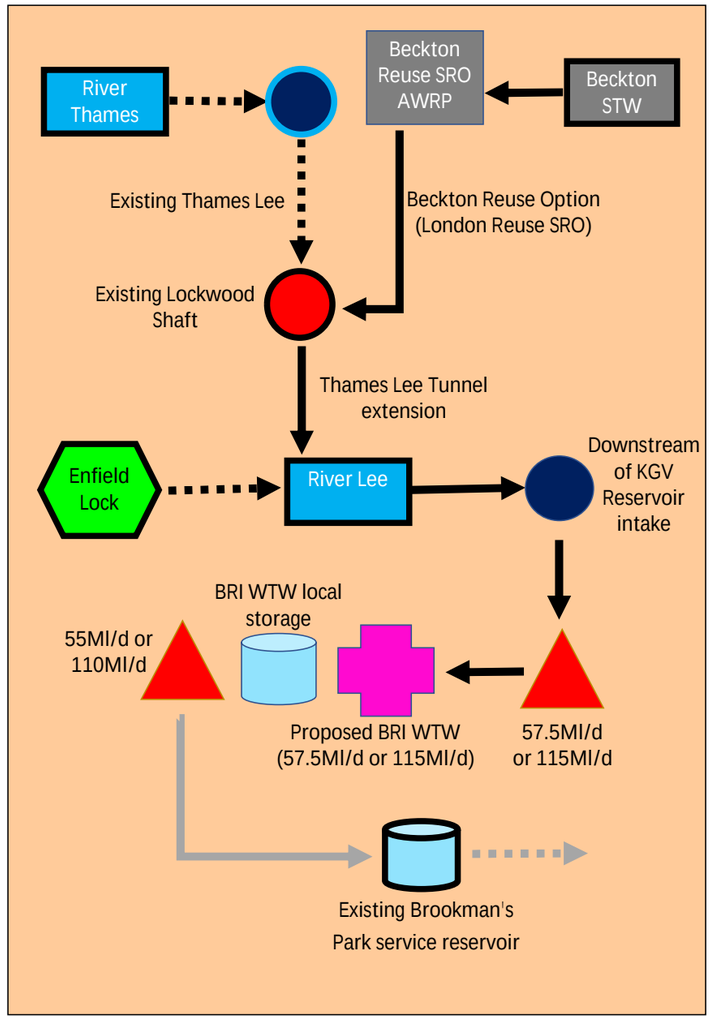
4.3 In addition, as the SRO is developed, engagement with both Affinity Water and Thames Water will be facilitated by the SRO team. Water quality representatives will continue to be included to ensure that the design is developed in line with their expert knowledge and latest updates to Water Company policies.

Appendix A WQRA Outputs

A summary of the BRI WQRA spreadsheet is provided in this Appendix. The risk assessment table shows the progression of risks through the supply stages from catchment to consumer for each of the limiting hazards identified.

Thames to Affinity Transfer Beckton Re-use Indirect , Gate 2

SRO Schematic



Key

Asset	New	Existing
Booster chlorination		
Catchment		
Canal		
Final Effluent Discharge		
Potable distribution		
Pumping Station		
Raw water abstraction		
Raw Water Conditioning Plant		
Raw water transfer		
River		
Treated water storage		
Treated water transfer		
Existing tie-in point		
Wastewater Treatment Works		
Water Treatment Works		

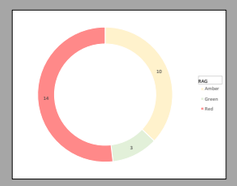
Thames to Affinity Transfer **Beckton Re-use Indirect , Gate 2**

Export to PDF

Note to user
Graphs do not auto colour to red, amber and green. Please right click each segment of the doughnut chart to manually change the colours.

Summary of SRO Risks

Catchment

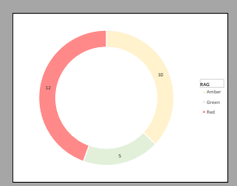


RAG	Risk score	Hazard
Red	15	Dirty/discoloured water
Red	15	Iron
Red	15	Nitrate
Red	15	Nitrite
Red	15	Perfluoroalkyl substances (PFAS)
Red	15	THM Formation Potential
Red	16	Aluminium
Red	16	Dissolved organic carbon
Red	20	Benzo(a)pyrene
Red	20	Pathogens - bacteria, viruses, protozoa
Red	20	Turbidity
Red	25	Cryptosporidium
Red	25	Escherida Coli
Red	25	Pesticides: total
Amber	6	Change in source type (e.g. surface groundwater)
Amber	6	Manganese
Amber	9	Ammonium
Amber	9	Change in hardness/alkalinity
Amber	9	Odour
Amber	9	Taste
Amber	10	Hydrocarbons
Amber	10	Lead
Amber	10	Metaldehyde
Amber	12	Bromate

Abstraction

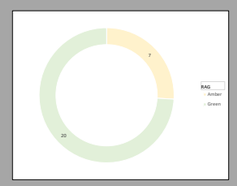
RAG	Risk score	Hazard
Red	15	Dirty/discoloured water
Red	15	Iron
Red	15	Perfluoroalkyl substances (PFAS)
Red	15	THM Formation Potential
Red	16	Aluminium
Red	16	Dissolved organic carbon
Red	20	Benzo(a)pyrene
Red	20	Pathogens - bacteria, viruses, protozoa
Red	20	Turbidity
Red	25	Cryptosporidium
Red	25	Escherida Coli
Red	25	Pesticides: total
Amber	6	Change in source type (e.g. surface groundwater)
Amber	6	Manganese
Amber	9	Ammonium
Amber	9	Change in hardness/alkalinity
Amber	9	Odour
Amber	9	Taste
Amber	10	Lead
Amber	10	Metaldehyde
Amber	10	Nitrate
Amber	10	Nitrite

Raw Water Conveyance



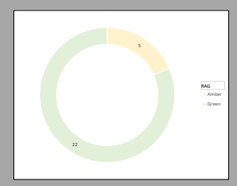
RAG	Risk score	Hazard
Red	15	Dirty/discoloured water
Red	15	Iron
Red	15	Perfluoroalkyl substances (PFAS)
Red	15	THM Formation Potential
Red	16	Aluminium
Red	16	Dissolved organic carbon
Red	20	Benzo(a)pyrene
Red	20	Pathogens - bacteria, viruses, protozoa
Red	20	Turbidity
Red	25	Cryptosporidium
Red	25	Escherida Coli
Red	25	Pesticides: total
Amber	6	Change in source type (e.g. surface groundwater)
Amber	6	Manganese
Amber	9	Ammonium
Amber	9	Change in hardness/alkalinity
Amber	9	Odour
Amber	9	Taste
Amber	10	Lead
Amber	10	Metaldehyde
Amber	10	Nitrate
Amber	10	Nitrite

Treatment



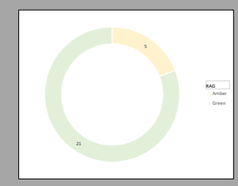
RAG	Risk Score	Hazard
Amber	6	Change in hardness/alkalinity
Amber	6	Change in source type (e.g. surface groundwater)
Amber	6	Odour
Amber	6	Taste
Amber	10	Metaldehyde
Amber	10	Nitrate
Amber	10	Nitrite

Storage



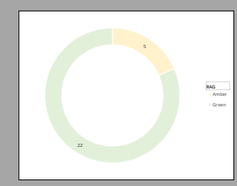
RAG	Risk score	Hazard
Amber	6	Change in hardness/alkalinity
Amber	6	Change in source type (e.g. surface groundwater)
Amber	6	Odour
Amber	6	Taste
Amber	10	Metaldehyde

Distribution



RAG	Risk score	Hazard
Amber	6	Change in source type (e.g. surface groundwater)
Amber	6	Iron
Amber	8	Aluminium
Amber	9	Dirty/discoloured water
Amber	10	Metaldehyde

Consumer



RAG	Risk Score	Hazard
Amber	6	Change in hardness/alkalinity
Amber	6	Change in source type (e.g. surface groundwater)
Amber	6	Odour
Amber	6	Taste
Amber	10	Metaldehyde

Thames to Affinity Transfer — **Beckton Re-use Indirect , Gate 2**

Catchment

Data source and certainty input	Limiting Hazard	Parameter details and commentary	Pre-mitigated Likelihood	Pre-mitigated Consequences	Pre-mitigated Risk	Risk Commentary	Control	Post mitigated Likelihood	Post mitigated Consequences	Residual risk	Residual risk considerations	Actions
Escherida Coli	Y	E.Coli to be standard limiting hazard covering pathogens and requiring disinfection. E.Coli is likely to drive the development of the water supply scheme due to being an indicator of health risks. Escherichia coli (or, alternatively, thermotolerant coliforms) is the first organism of choice in monitoring programmes for verification, including surveillance of drinking-water quality. It is considered the most suitable indicator of faecal contamination (WHO GDWQ).	5	5	25	Likelihood value raised from Gate 1 score of 4 to 5, WSR2016 limits 0no./100ml, avg 500no./ml - (River Lee & New Gauge Intake/Girling Lee DWSP gives red risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	5	5	25	Parameter will be treated by disinfection (e.g. chlorine) at the new BRI-WTW (see Treatment section of this WQRA).	-
Cryptosporidium	Y	Limiting hazard as microbiological contaminant uniquely treated (e.g. through RGF, UV, or membrane filtration). Cryptosporidium is likely to drive the development of the water supply scheme due to associated high health risks. Traditional methods of pathogen treatment are not effective against cryptosporidium.	5	5	25	No change from Gate 1, no detections since Jan 2021, WSR2016 limits at consumers' taps = 0no./l - (River Lee & New Gauge Intake/Girling Lee DWSP gives red risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	5	5	25	Parameter will be treated at the new BRI-WTW (see Treatment section of this WQRA).	-
Iron	Y	Naturally occurring limiting hazard requiring removal (e.g. through clarification and RGF). Iron is likely to drive the development of the water supply scheme due to natural abundance.	5	3	15	No change from Gate 1, WSR2016 limit 200ug/l, max 470ug/l, avg = 170ug/l - (River Lee & New Gauge Intake/Girling Lee DWSP gives red risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	5	3	15	Parameter will be removed (e.g. through clarification and RGF) at the new BRI-WTW (see Treatment section of this WQRA).	-
Manganese	Y	Naturally occurring limiting hazard requiring removal (e.g. through clarification and RGF). Manganese is likely to drive the development of the water supply scheme due to natural abundance.	2	3	6	Likelihood value reduced from 3 to 2 as WSR2016 limit 50ug/l, max 30ug/l, avg = 13ug/l - (River Lee & New Gauge Intake gives green risk after control, Girling Lee DWSP gives amber risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	2	3	6	Parameter will be removed (e.g. through clarification and RGF) at the new BRI-WTW (see Treatment section of this WQRA).	-
Sulphate	Y	Limiting hazard as sulphate is likely to drive the acceptability of the water supply scheme by consumers due to its effect on taste. Possibility of sulphate concentrations changing and impacting on water perception when water is supplied from a new catchment. A combination of sulphate, chloride and alkalinity is used to determine the Larson-Skold index corrosivity indicator. Close control of Larson-Skold index is therefore required.	1	3	3	No change from Gate 1, WSR2016 limit 250mg/l, avg = 54mg/l - (River Lee & New Gauge Intake/Girling Lee DWSP gives green risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	1	3	3	Parameter used as indication of corrosion potential in the network. It is therefore used to dictate alkalinity dosing.	-
Bromate	Y	Discussed in Gate 2 workshop that there is historic pollution from industrial site close to Hatfield. This pollution is currently managed, but there is a risk to the River Lee catchment sources. Due to the unknowns of how the pollution will move in the future, bromate should be considered as a limiting hazard.	3	4	12	Likelihood value raised from Gate 1 score of 2 to 3 due to unknown risks associated with future movements of bromate pollution in the area. WSR2016 limit 10ug/l, all results 1ug/l possible LOD (2ug/l) however this is a short data set - (River Lee & New Gauge Intake gives amber risk after control, Girling Lee DWSP gives green risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	3	4	12	2021 sampling data indicates low levels of bromate in the River Lee. Gate 1 workshop discussion that levels can be up to 6µg/l (not over PCV but approaching alert level) (TW water quality expert). Gate 2 workshop discussion that due to historic pollution, there is a risk to River Lee catchment sources. This is currently managed, but the nature of the contamination movement in the future is unknown and therefore an amber risk rating is appropriate.	-
Lead	Y	Limiting hazard requiring control as lead is likely to drive the development/viability of the water supply scheme due to associated health risks. Distribution/consumer zone identified as being at risk from lead so currently receives orthophosphate dosed water. Consumer likelihood/consequence values taken from "Lead pipes" ratings - Ickenham/Denham consumer DWSP.	2	5	10	No change from Gate 1, WSR2016 limit 10ug/l, max 17ug/l (occurred once in 2021), avg = 1.9ug/l - (River Lee & New Gauge Intake gives green risk after control, Girling Lee DWSP gives amber risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	2	5	10	Parameter will be controlled to mitigate distribution risks from lead piping (e.g. through orthophosphate dosing) (see treatment/distribution/consumer sections of this WQRA).	-
THM Formation Potential	Y	This parameter is to be a standard limiting hazard covering THM formation potential only. Limiting hazard as likely to drive the viability of the water supply scheme due to introduction of disinfection by-product (DBP) health risks. DBPs would be formed through the disinfection process at the new water treatment works. Formation potential can be reduced by adhering to disinfection standards and ensuring online monitoring/water quality control.	3	5	15	Likelihood value raised from Gate 1 score of 1 to 3 as high organic carbon in catchment to treatment stages - (River Lee & New Gauge Intake/Girling Lee DWSP gives green risk after control for THM total). Risk score agreed in BRI WQRA workshop 04/03/22.	-	3	5	15	Parameter will be controlled through Affinity Water standard disinfection procedure at the new BRI-WTW (see Treatment section of this WQRA).	-
Nitrate	Y	Limiting hazard requiring removal as nitrate is likely to drive the development/viability of the water supply scheme due to increasing formational potential of nitrite and associated health risks.	5	5	25	No change from Gate 1 pre-control score, WSR2016 limit 50mg/l, max 120mg/l (occurred once in 2021), avg = 27.5mg/l, 95%ile = 48.2mg/l - (River Lee & New Gauge Intake/Girling Lee DWSP gives red risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	TW has a team investigating sources of nitrate in the River Lee (majority input from Rye Meads) - AMP7/8 plan to improve STW to reduce nitrates into the River Lee, and also work to look at catchment management to reduce input from farmers in the area.	3	5	15	If required, parameter will be treated by ion exchange, biological denitrification or membrane processes at BRI-WTW (see Treatment section of this WQRA). Nitrate levels should continue to be closely monitored and the impact of catchment management techniques investigated going forward.	Continue to closely monitor nitrates and effectiveness of management techniques going forward. Retain as a limiting hazard in future WQRAs.
Nitrite	Y	Limiting hazard requiring removal as nitrite is likely to drive the development/viability of the water supply scheme due to associated health risks.	5	5	25	No change from Gate 1 pre-control score, WSR2016 limit 0.5mg/l, max 4mg/l (occurred once in 2021), avg = 0.6mg/l, 95%ile = 1.4mg/l - (River Lee & New Gauge Intake/Girling Lee DWSP gives red risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	TW has a team investigating sources of nitrate in the River Lee (majority input from Rye Meads) - AMP7/8 plan to improve STW to reduce nitrates into the River Lee, and also work to look at catchment management to reduce input from farmers in the area.	3	5	15	If required, parameter will be treated by ion exchange, biological denitrification or membrane processes at BRI-WTW (see Treatment section of this WQRA). Nitrite levels should continue to be closely monitored and the impact of catchment management techniques investigated going forward.	Continue to closely monitor nitrites and effectiveness of management techniques going forward. Retain as a limiting hazard in future WQRAs.
Pesticides: total	Y	Limiting agricultural chemical hazard requiring removal (e.g. through activated carbon or membrane filtration). Pesticides are likely to drive the development/viability of the water supply scheme due to associated high health risks.	5	5	25	No change from Gate 1, (River Lee & New Gauge Intake/Girling Lee DWSP gives red risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	5	5	25	Parameter will be removed (e.g. through activated carbon or membrane filtration) at the new BRI-WTW (see Treatment section of this WQRA).	-
Benzo(a)pyrene	Y	Limiting hazard as likely to drive the development of the water supply scheme due to associated high health risks.	4	5	20	No change from Gate 1, WSR2016 limit 0.010ug/l, max 0.040ug/l, avg = 0.008ug/l, 95%ile = 0.022g/l - (River Lee & New Gauge Intake gives red risk after control, Girling Lee DWSP gives amber risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	4	5	20	Parameter will be removed (e.g. through clarification and RGF) at the new BRI-WTW (see Treatment section of this WQRA).	-
Dirty/discoloured water	Y	Limiting hazard as likely to drive the acceptability of the water supply scheme by consumers and therefore requiring removal (e.g. through clarification and RGF).	5	3	15	No change from Gate 1, WSR2016 limit 20hazen, max 21hazen - (River Lee & New Gauge Intake/Girling Lee DWSP gives red risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	5	3	15	Parameter will be removed (e.g. through clarification and RGF) at the new BRI-WTW (see Treatment section of this WQRA).	-
Odour	Y	Limiting hazard as likely to drive acceptability of water supply scheme by consumers and therefore requiring removal. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that odour is a key factor in the requirement for final water conditioning to Affinity Water standards.	3	3	9	No change from Gate 1 - (River Lee & New Gauge Intake/Girling Lee DWSP gives green risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	3	3	9	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Taste	Y	Limiting hazard as likely to drive acceptability of water supply scheme by consumers and therefore requiring removal. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that taste is a key factor in the requirement for final water conditioning to Affinity Water standards.	3	3	9	Risk score agreed in BRI WQRA workshop 04/03/22.	-	3	3	9	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Change in hardness/alkalinity	Y	Limiting hazard as likely to drive the acceptability of the water supply scheme by consumers. Catchment hardness and alkalinity may be different to that in the consumer region and therefore water supply may require conditioning. A combination of sulphate, chloride and alkalinity is used to determine the Larson-Skold index corrosivity indicator. Close control of Larson-Skold index is therefore required.	3	3	9	Risk score agreed in BRI WQRA workshop 04/03/22.	-	3	3	9	If required, parameter could be treated by alkalinity/pH correction (see Treatment section of this WQRA). Beckton re-use/Thames Lee Tunnel discharges may change the alkalinity seen at the intake of Beckton re-use indirect option. Therefore, this option may require chemical dosing in treatment stage depending on blend levels.	-
Change in source type (e.g. surface - groundwater)	Y	Limiting hazard as likely to drive the acceptability of the water supply scheme by consumers. Assumption that reliance on groundwater supplies in Affinity zones will have to reduce in future and therefore reliance on surface water (via transfers) will increase, making this hazard a relevant consideration. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that this parameter is a key factor in the requirement for final water conditioning to Affinity Water standards.	2	3	6	Risk score agreed in BRI WQRA workshop 04/03/22.	-	2	3	6	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Pathogens - *bacteria, viruses, protozoa*	Y	This parameter is to be a standard limiting hazard covering viruses and therefore requiring disinfection. Viruses are likely to drive viability of water supply scheme due to associated health risks.	4	5	20	Risk score agreed in BRI WQRA workshop 04/03/22.	-	4	5	20	Parameter will be treated by disinfection (e.g. chlorine) at the new BRI-WTW (see Treatment section of this WQRA).	-
Dissolved organic carbon	Y	Limiting hazard as likely to drive the development/viability of the water supply scheme and therefore requiring removal (e.g. activated carbon or membrane filtration). Organic carbon increases the formational potential of DBPs and therefore introduces associated health risks.	4	4	16	No change from Gate 1, max 16mg/l, avg 5.25mg/l - (River Lee & New Gauge Intake/Girling Lee DWSP gives green risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	4	4	16	Parameter will be removed (e.g. through activated carbon or membrane filtration) at the new BRI-WTW (see Treatment section of this WQRA).	-
Ammonium	Y	Limiting hazard as likely to drive the development/viability of the water supply scheme and therefore requiring review of chlorine dosing.	3	3	9	Likelihood value raised from Gate 1 score of 2 to 3 as WSR2016 limit 0.5mg/l, max 1.36mg/l, avg = 0.16mg/l - (River Lee & New Gauge Intake/Girling Lee DWSP gives amber risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	3	3	9	If required, additional chlorine dosing (breakpoint chlorination) will achieve ammonium conversion.	-
Chloride	Y	Limiting hazard as chloride is likely to drive the acceptability of the water supply scheme by consumers due to its effect on taste. Possibility of chloride concentrations changing and impacting on water perception when water is supplied from a new catchment. A combination of sulphate, chloride and alkalinity is used to determine the Larson-Skold index corrosivity indicator. Close control of Larson-Skold index is therefore required.	1	3	3	No change from Gate 1, WSR2016 limit 250mg/l, max 440mg/l (occurred once in 2021), avg = 90mg/l - (River Lee & New Gauge Intake/Girling Lee DWSP gives green risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	1	3	3	May see seasonal changes in results due to wash-off from salted roads. Parameter used as indication of corrosion potential in the network. It is therefore used to dictate alkalinity dosing.	-
Radioactivity (Alpha, Beta, Tritium)	Y	Limiting hazard as radionuclides are likely to drive the viability of the water supply scheme due to associated high health risks and there are radioactive sites in the area. Control of human-made radionuclides should be focused on prevention at entry to water supply point. Natural radiological risks are best controlled through a preventive risk management approach following the framework for safe drinking-water (WHO GDWQ chapter 2) and the water safety plan approach (WHO GDWQ chapter 4).	1	4	4	No change from Gate 1, WSR2016 limit gross alpha 0.1 Bq/l, gross beta 1 Bq/l, max 0.03Bq/l and 0.3Bq/l respectively - (River Lee & New Gauge Intake/Girling Lee DWSP gives green risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	There are radioactive sites in the catchment, none are RIFE listed sites. Water quality monitoring indicates no significant contamination from this source [Thames Water Combined 'Girling Lee Intake Catchment' & 'River Lee and New Gauge Intake' DWSPs - Catchment and intake stages]	1	4	4	Water quality monitoring indicates no significant radioactive contamination from sources in and around the catchment.	-
Turbidity	Y	Limiting hazard as likely to drive the acceptability of the water supply scheme by consumers and therefore requiring removal (e.g. through clarification and RGF).	5	4	20	No change from Gate 1, WSR2016 limit 1NTU, max 29NTU, avg = 6.3NTU - (River Lee & New Gauge Intake/Girling Lee DWSP gives red risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	5	4	20	Parameter will be removed (e.g. through clarification and RGF) at the new BRI-WTW (see Treatment section of this WQRA).	-
Metaldehyde	Y	High risk rating in catchment and is assumed to be a limiting agricultural chemical to be considered in the WQRA process. However, metaldehyde use has been outlawed since the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.	2	5	10	No change from Gate 1, WSR2016 limit 0.1ug/l, max 0.04ug/l, avg = 0.016ug/l - (River Lee & New Gauge Intake/Girling Lee DWSP gives red risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	2	5	10	Metaldehyde will be outlawed from the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.	-
Aluminium	Y	Limiting hazard as likely to drive acceptability of water supply scheme by consumers.	4	4	16	Likelihood value of 4 as WSR2016 limit 200ug/l, max 330ug/l, avg = 87.2ug/l - (River Lee & New Gauge Intake/Girling Lee DWSP gives amber risk after control). Risk score agreed in BRI WQRA workshop 04/03/22.	-	4	4	16	Parameter concentration will be controlled via careful monitoring and optimisation of coagulation and filtration at the new BRI-WTW (see Treatment section of this WQRA).	-
Perfluoroalkyl substances (PFAS)	Y	Identified during the Gate 2 pre-workshop meeting as an emerging hazard of concern. The DWI Tier 3 Regulation 4 (2) (wholesomeness) guidance value for PFOS and PFOA of 0.1µg/l has been used to assess the risk of PFAS present where data is available.	3	5	15	Likelihood low as water quality monitoring results are under 'EU directive 2020/2184 on the quality of water intended for human consumption' Annex 1 Part B limits for human consumption = 0.5ug/l PFAS total, 0.1ug/l sum of PFAS and under TW Tier 3: Regulation 4(2) level of 0.1ug/l PFOS/PFOA - data indicates all results below these values, avg. 0.0083ug/l - however, due to uncertainty in future levls of PFAS and classification as an emerging hazard, risk has been raised to red. Risk score agreed in BRI WQRA workshop 04/03/22.	-	3	5	15	If required, parameter will be treated (e.g. GAC) at the new BRI-WTW (see Treatment section of this WQRA). PFAS substances are an emerging hazard and should continue to be monitored.	-
Hydrocarbons	Y	To be standard limiting hazard covering hydrocarbons (e.g. benzene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene) and requiring management. Hydrocarbons are likely to drive the development/viability of the water supply scheme due to associated high health risks.	2	5	10	Risk score agreed in BRI WQRA workshop 04/03/22.	-	2	5	10	Parameter will be monitored in raw water abstraction and if detected to be out of limits, raw water abstraction will stop.	-

Affinity Water

Taking care of your water

Thames Water