South East Strategic Reservoir Option

Gate 2: Technical Annex C.
SESRO Water Quality Risk Assessment

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

1. Introduction

1.1 This technical note describes the development of the Gate 2 Water Quality Risk Assessment (WQRA) scoring spreadsheets for the South East Strategic Reservoir Option (SESRO) in Oxfordshire, along with key findings from the WQRA.

1.2 Release of water from SESRO, either via the River Thames, or directly from the reservoir, may change the water quality of several downstream intakes to treatment works operated by Thames Water, Affinity Water and Southern Water, each of which will have their particular treatment and distribution risks. The Scheme is currently in a concept design stage. An initial step, described in this note, has been the development of WQRA risk scores for the catchment and abstraction stages, which can then form the starting point for the further scoring in the 'catchment to tap' pathways. This follows the **Strategic WQ Risk Framework**[1] developed by Jacobs for the All Company Working Group (ACWG) and makes use of their guidance documentation and standardised scoring spreadsheets.

1.3 WQRA sheets have been developed for two scenarios each of which will have different water quality and risk scores:

- The **River WQRA** which describes the release of SESRO water to the river for downstream abstraction and treatment. In this scenario, the SESRO system includes the upstream catchment to the reservoir, abstraction to and release from the reservoir and transport along the River Thames to the Thames Water and Affinity intakes downstream.
- The **Reservoir WQRA** which describes the treatment, or abstraction for treatment directly from the reservoir. In this scenario, the SESRO system includes the upstream catchment to the reservoir and the reservoir from which water will be transferred, after treatment, directly to Southern Water.

1.4 The Gate 2 WQRA spreadsheets including Technical Appendix C1 (Strategic Water Quality Risk Assessment – Reservoir), Technical Appendix C2 (Strategic Water Quality Risk Assessment – River) and documents follow on from the Gate 1 WQRA work, with the addition of the following new information and data:

- Additional water quality sampling, undertaken by Atkins on behalf of Thames Water from the River Thames which forms part of the SESRO project work (December 2020 to February 2022)
- Water quality modelling work by Atkins (Infoworks model of the River Thames) and algal modelling by the Centre for Ecology and Hydrology (CEH, i.e., PROTECH Modelling on SESRO)
- Review of emerging substances, undertaken by Atkins on behalf of Thames Water

[1] Jacobs (2020). ACWG Strategic WQ Risk Framework. Released 16 Dec 2020.

2. Conceptualisation

2.1 Figure 2.1 shows the schematics that form part of the two WQRA scoring spreadsheets (river and reservoir).

2.2 In River WQRA – the reservoir and river release option, water is first released to the River Thames after which it travels between 70 and 130 km before reaching the river intakes – either to transfer water to a reservoir or directly to a water treatment works.

2.3 In Reservoir WQRA – the reservoir option, water is transferred directly from the reservoir to a nearby water treatment works then piped to Southern Water. This will, at times, operate alongside the reservoir and release option.

2.4 In developing the WQRA scoring, a number of key factors need to be considered.

- ***Residence time in the reservoir***: The average retention time in SESRO, based on the current design, is approximately seven years,2 although this can vary considerable depending on the sequence of hydrological conditions. Over this long retention period, considerable changes in water quality are likely to occur in the reservoir through processes of mixing, chemical degradation, sedimentation and chemical adsorption as well as biological activity including the growth of algae.
- ***Interaction with the River Thames***: SESRO will be used to augment flow in the River Thames when flows are low. Although SESRO will modify flows, the bulk of the river flow at most times will continue to be existing natural river flow (Figure 2.2).3 Even when fully operational, SESRO will rarely make up more than 50% of the flow immediately downstream of the outfall, and this proportion will diminish downstream as tributaries add more flow. Consequently, the water quality risk in the River Thames will for many chemicals remain much the same as before.4
- ***No new water sources***: For the purpose of this assessment, it has been assumed that when SESRO operates no new sources of water will be introduced, since all water will continue to be sourced from the River Thames (possible impacts of the Severn to Thames Transfer interconnector are not included in the WQRA). This limits the potential degree of change in relation drinking water risks when compared to other Strategic Resource Options.

2.5 In the WQRA scoring spreadsheets, the SESRO system, in its entirety, is included in the **Catchment** section of the WQRA spreadsheets. The **Abstraction** sector refers to the abstraction to water treatment works or raw water transfer pipe (not the abstraction to SESRO).

[2] The residence time is simply derived from the volume of 150MMl divided by the long-term average release of water from SESRO from the PYWR water resources model (55Ml/day) = 7.4 years

[3] Based on comparison between modelled river flow and SESRO releases from the PYWR water resources model

[4] See also the Gate 2 EAR chapter 7

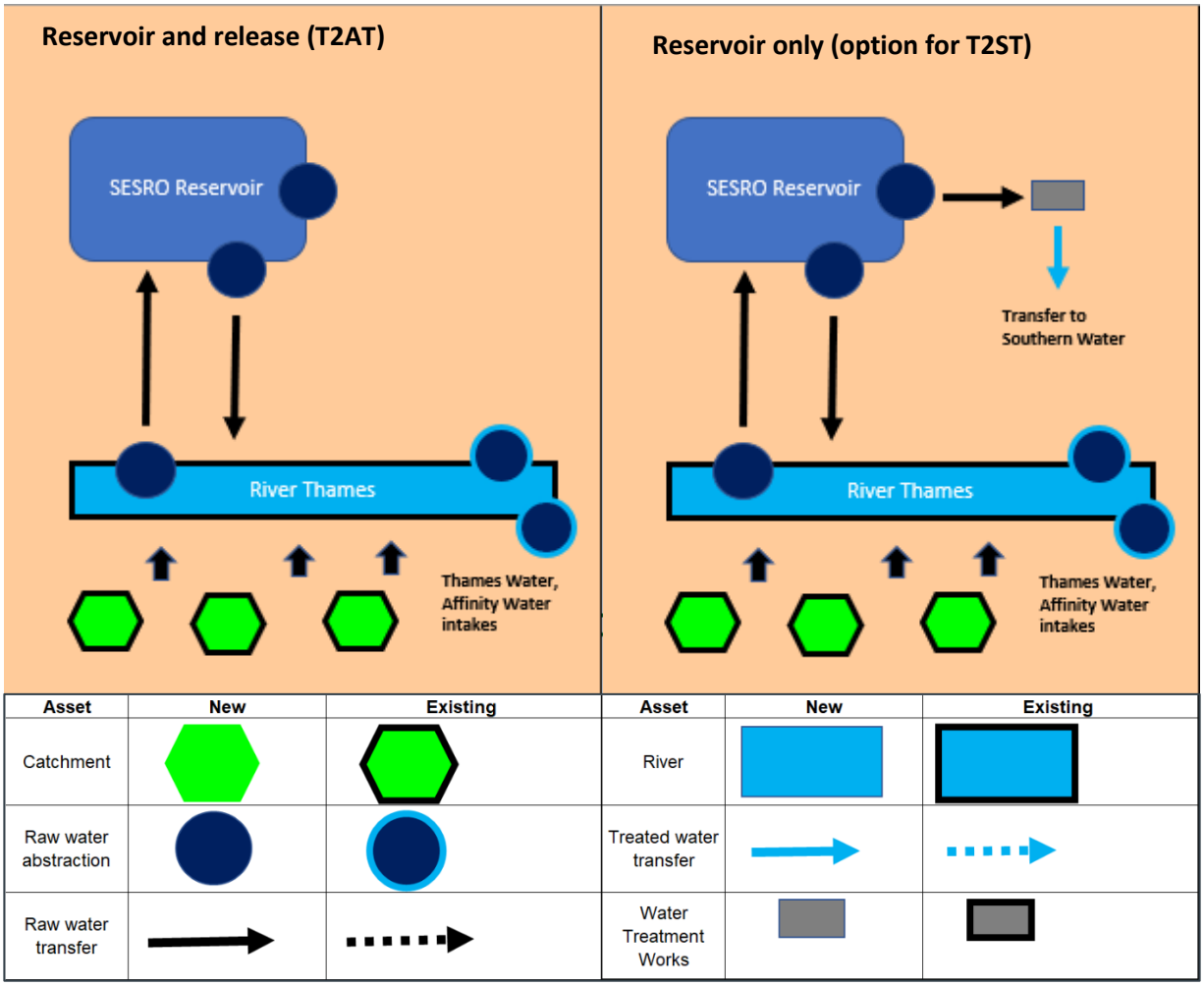

Figure 2.1 WQRA spreadsheet schematics for Thames to Affinity Transfer (T2AT) and Thames to Southern Transfer (T2ST)

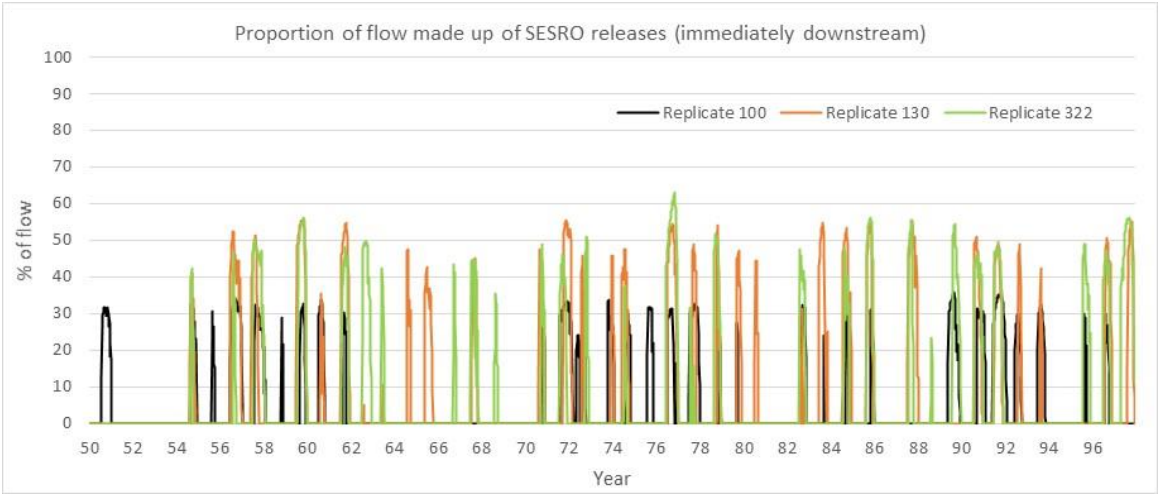

Figure 2.2 Proportion of river flow made up of SESRO releases (black) immediately downstream of the outfall[5]

[5] Based on comparison between modelled river flow and SESRO releases from the PYWR water resources model.

3. WQRA Risk Scoring

3.1 Gate 1 risk scoring

3.1 The primary source of the information feeding into the WQRA and the WQRA risk scores are Thames Water's existing Drinking Water Safety Plans (DWSPs) , in particular, those for the Farmoor and Datchet intakes. These DWSPs also contain information on existing control measures.

3.2 Modifications to this existing information were made in the Gate 1 WQRA, which formed the starting point of the Gate 2 assessment, as follows:

- Several of the substances listed in the WQRA spreadsheets, were not included in the pre-existing Thames Water DWSP spreadsheets.6 In this case, scores were based in observed water quality data or, in its absence, expert judgement.
- Additional substances were added that were not included in the WQRA or DWSP spreadsheets on the basis of being known risks in the context of SESRO (e.g., algal toxins). Again, for these, expert judgement was applied.
- Some inconsistencies were identified in the original Thames DWSP, such as similar substances (e.g., different pesticides) having different consequence scores which were changed to meet to ACWG methodology at the time.
- Risk scores were modified for SESRO based on the conceptual understanding of the reservoir and its influence on water quality in the River Thames.
- Where modifications were made to pre-existing DWSP scores, comments are provided in the WQRA spreadsheets explaining why changes were made.
- Where existing scores were not available and expert judgement was used, comments are provided in the WQRA spreadsheets to indicate this is the case.
- Some scores were modified following a WQRA workshop with Thames Water on 22 February 2021.

3.2 Gate 2 risk scoring

3.3 Several changes were made to the Gate 1 risk scores in Gate 2, based on additional information that has become available since Gate 1, which is detailed below.

3.2.2 Water quality data

3.4 Thames Water provided up-to-date observed raw water quality data for Farmoor and Wraysbury Reservoirs and their intakes on the River Thames at Farmoor, Datchet, Hythe End, Laleham, Surbiton and Walton.

3.5 Water quality monitoring data has been collected since December 2020 as part of the SESRO project[7] work to supplement pre-existing monitoring by Thames Water at their intakes, and

[6] This is due to the inclusion of emerging substances in the current assessment and additional substances included in the ACWG template.

[7] Atkins (2020). Thames Water Strategic Resource Options. Water Quality Monitoring 2020. Technical Note. Reference 5200973-ATK-WQ-TN-011-P02. issued 30/10/2020

Environment Agency routine monitoring along the River Thames. Monitoring data was collected at the following locations and data included, following suitable quality assurance, up to Feb 2022:

- At the proposed discharge/intake location on the River Thames at Culham – (Dec 2020 to Feb 2022)
- River Thames at Hambleden Lock (Jan 2021 to Feb 2022)
- River Thames at Cookham Bridge (Jan 2021 to Feb 2022)[8]
- River Thames at AfW Sunnymeads intake (Jan 2021 to Feb 2022)
- River Thames at AfW Egham intake (Jan 2021 to Feb 2022)
- River Thames at AfW Chertsey intake (Jan 2021 to Feb 2022)
- River Thames at AfW Walton intake (Jan 2021 to Feb 2022)
- River Thames at TWUL Walton intake (Jan 2021 to Feb 2022)
- River Thames at TWUL Hampton intake (Jan 2021 to Feb 2022)
- River Thames at TWUL Surbiton Intake (Jan 2021 to Feb 2022)
- River Thames at Kingston (Nov 2021 to Feb 2022)
- River Thames at Teddington Weir (Jan 2021 to Feb 2022)
- Thames Tideway at Kew Bridge (Jan 2021 to Feb 2022)

3.6 Analysis suites have been detailed in the Atkins 2020 Technical Note and comprise:

- For Culham, TWUL Walton and Teddington Weir, a Water Framework Directive (WFD), Environmental Quality Standards Directive (EQSD) and DWSP focused suites.
- For Hambleden Lock, Cookham, Sunnymeads, Egham, Chertsey, AfW Walton, TWUL Hampton – WFD and DWSP focused suites.
- For TWUL Surbiton, Kingston and Kew Bridge – WFD suite only.

3.7 Summary statistics for the monitoring data listed above are provided in Technical Appendix C3 (Summary statistics from SESRO water quality monitoring), in particular, the maximum recorded concentration over the monitoring period for each substance. For Culham, the mean and 95th percentile are also shown as these statistics provide a better representation of likely water quality in SESRO, because long term storage in the reservoir will even out the peaks and move concentrations toward the mean influent concentrations. Drinking Water PCVs (prescribed concentration or value) and WFD standards for each chemical are also shown in Technical Appendix C3 (Summary statistics from SESRO water quality monitoring), with entries labelled red where the maximum concentration exceeds the PCV and orange where it is above 50% of the PCV (grey entries are provided where the limit of detection does not allow an evaluation of exceedance). All locations are considered as a whole in determining these categories, apart from Culham where the monitoring data is directly relevant to the inputs to SESRO and therefore reservoir concentrations.

[8] This site is a proxy site for Thames Water's Datchet intake but located upstream of the Jubilee River. The site is in the process of being moved downstream nearer to Datchet.

3.8 Determinands that exceed or are at risk of exceeding the Drinking Water PCV in the River Thames and SESRO are listed in Table 3.1 below (as derived from Appendix C3 which included all monitored substances).

Table 3.1 Summary of chemical substances with risk of failure of the PCV (at any location from Technical Appendix C3).

Determinand	Unita	Max	Culham 95th %ile	PCV	Comments in relation to risk to drinking water
Metals					
Aluminium total	µg/l	600	370	200	Risk of exceedance in SESRO after refill although settlement likely to reduce risk in reservoir
Iron total	µg/l	1,000	454	200	Risk of exceedance in SESRO after refill although settlement likely to reduce risk in reservoir
Mercury total	µg/l	1	0.074	1	Risk low with mixing and settlement in reservoir
Nickel total	µg/l	81	2.92	20	Risk low with mixing and settlement in reservoir
Lead total	µg/l	9.1	1.52	10	Risk low with mixing and settlement in reservoir
Pathogens					
Coliform total	MPN/100 ml	2,420	2,420	absence	Continued risk despite settlement in reservoir
Clostridium perfringens veg & spores, confirmed	no/100 ml	100	100	absence	Continued risk despite settlement in reservoir
Escherichia coli (E.coli)	MPN/100 ml	2,420	2,420	absence	Continued risk despite settlement in reservoir
Cryptosporidium	no/litre	78	1	absence	Continued risk despite inactivation and settlement in reservoir
Enterococci confirmed	no/100 ml	100	100	absence	Continued risk despite settlement in reservoir
Pesticides					
Bentazone	µg/l	0.08	0.036	0.1	Unlikely to exceed standard in SESRO
Carbetamide	µg/l	0.17	0.05	0.1	Unlikely to exceed standard in SESRO
2,4-Dichlorophenoxyacetic acid (2,4 D)	µg/l	0.12	0.036	0.1	Unlikely to exceed standard in SESRO
Clopyralid	µg/l	0.14	0.014	0.1	Unlikely to exceed standard in SESRO
Dichlorodiphenyltrichloroethane (DDT) total	µg/l	0.175	0.0125	0.1	Unlikely to exceed standard in SESRO
Flufenacet	µg/l	0.19	0.092	0.1	Possible exceedance in reservoir
Glyphosate	µg/l	1.7	0.2	0.1	Possible exceedance in reservoir but this pesticide has a high decay rate
Hexachlorobenzene[9]	µg/l	0.09	0.01	0.1	Unlikely to exceed standard in SESRO
Dichlorodiphenyltrichloroethane (MCPA)	µg/l	0.15	0.005	0.1	Unlikely to exceed standard in SESRO
4-(4-Chloro-2-methylphenoxy) butanoic acid MCPB)	µg/l	0.18	0.022	0.1	Unlikely to exceed standard in SESRO
Mecoprop	µg/l	0.24	0.013	0.1	Unlikely to exceed standard in SESRO
Metaldehyde	µg/l	0.07	0.022	0.1	Unlikely to exceed standard in SESRO
Mancozeb[10]	µg/l	1.5	0.25	0.1	Possible exceedance in reservoir
Pendimethalin	µg/l	0.06	0.016	0.1	Unlikely to exceed standard in SESRO
Propyzamide	µg/l	0.29	0.092	0.1	Possible exceedance in reservoir

[9] Banned as a pesticide in the UK

[10] Thames Water provided information that there may be issues with sampling for Macozeb as there seems to be potential for background interference as it can only be sampled using a breakdown product. It is also likely that the substance will soon be banned.

Determinand	Unita	Max	Culham 95th %ile	PCV	Comments in relation to risk to drinking water
1,1,1-trichloro-2-(2-chlorophenyl) -2-(4-chlorophenyl)ethane	µg/l	0.18	0.01	0.1	Unlikely to exceed standard in SESRO
Polycyclic Aromatic Hydrocarbons (PAH)					
Benzo(a)pyrene	µg/l	0.157	0.0065	0.01	Risk of exceedance in SESRO after refill
Benzo(g,h,i)perylene	µg/l	0.107	0.0115	-[11]	Combines with other PAHs to determine exceedance
Benzo(k)fluoranthene	µg/l	0.088	0.0066		Combines with other PAHs to determine exceedance
Indeno(1,2,3-cd)pyrene	µg/l	0.117	0.014		Combines with other PAHs to determine exceedance
Fluoranthene	µg/l	0.094	0.0065		Combines with other PAHs to determine exceedance
PAH sum	µg/l	0.53	0.095	0.1	Combined sum of PAHs
Others					
Nitrite	mg/l	70	0.93	0.1	Possible exceedance in reservoir
Nitrate	mg/l	60	39	50	Possible exceedance in reservoir after refill but unlikely
Turbidity	NTU	7.4	17	4	
Alpha activity, total	Bq/l	0.04	0.032	0.04	
Beta activity, total	Bq/l	0.99	0.862	0.04	

3.2.3 Modelling

3.2.3.1 Gate 2 PROTECH Modelling by CEH

3.9 CEH have undertaken modelling of SESRO using the PROTECH model which simulates algal biomass. Detailed outputs from this modelling are provided in Technical Appendix A4.2 (Reservoir algae) but in summary the outputs predict relatively low algal biomass in SESRO, with the greatest biomass in the first half of the summer because, after this, nutrients that are input during refill in the autumn and early winter have largely been used up. Outputs for three simulation periods (moderately dry, drought and extreme drought) indicate that maximum chlorophyll-a concentrations will be 15–20 µg/l in this early summer period.

3.2.3.2 Gate 2 Eutrophication Risk Modelling by CEH

3.10 CEH's Eutrophication Risk Model is based on an empirical analysis of detailed long term data sets for algae in the River Thames compared to a range of environmental data, which aimed to identify the key controls or 'triggers' that determine algal growth. Using these triggers, the impact of SESRO releases on algal growth at Runnymede was investigated (Technical Appendix A5.6 (Phytoplankton Growth and Community Modelling)). When Thames and water temperature data were manipulated to simulate a SESRO scenario (i.e., discharging 321 Ml/d when the flow at Teddington was less than 3,000 Ml/d (based on a 10-day average), resulting in a 1°C cooling of river water temperature, the Eutrophication Risk Model predicted that chlorophyll would be relatively unaffected by this SESRO operation, and the period of diatom and nano chlorophyte growth may be slightly prolonged. Pico-chlorophytes were reduced slightly, but the cooling effect of the SESRO discharge caused a major reduction in the number of days of potentially harmful cyanobacterial (blue–green algae) growth.

[11] PCV for total PAHs, not individual substances

3.2.3.3 Gate 2 Infoworks modelling on the River Thames by Atkins

3.11 As part of the Gate 2 SESRO work, Atkins have run an Infoworks model of the River Thames, alongside a reservoir model (Intermediate Reservoir Water Quality model) to simulate changes in water quality in the River Thames that might result from the operation of SESRO (Section 4 in Technical Annex B1 (Environmental Assessment Report)). This modelling shows that for most chemicals, SESRO is likely to reduce concentrations downstream and is therefore likely to slightly reduce the risk to drinking water at the intakes. The modelling work includes a simulation of the input of a conservative tracer, added to the SESRO releases, which provides information on the dilution and attenuation of this conservative chemical downstream. The mean and 90th percentile simulated concentrations of the conservative tracer are shown in Figure 3.1 and Figure 3.2. This indicates that at the intakes at the lower end of the River Thames, there is a high degree of attenuation and dilution of any chemicals that are released from the reservoir.

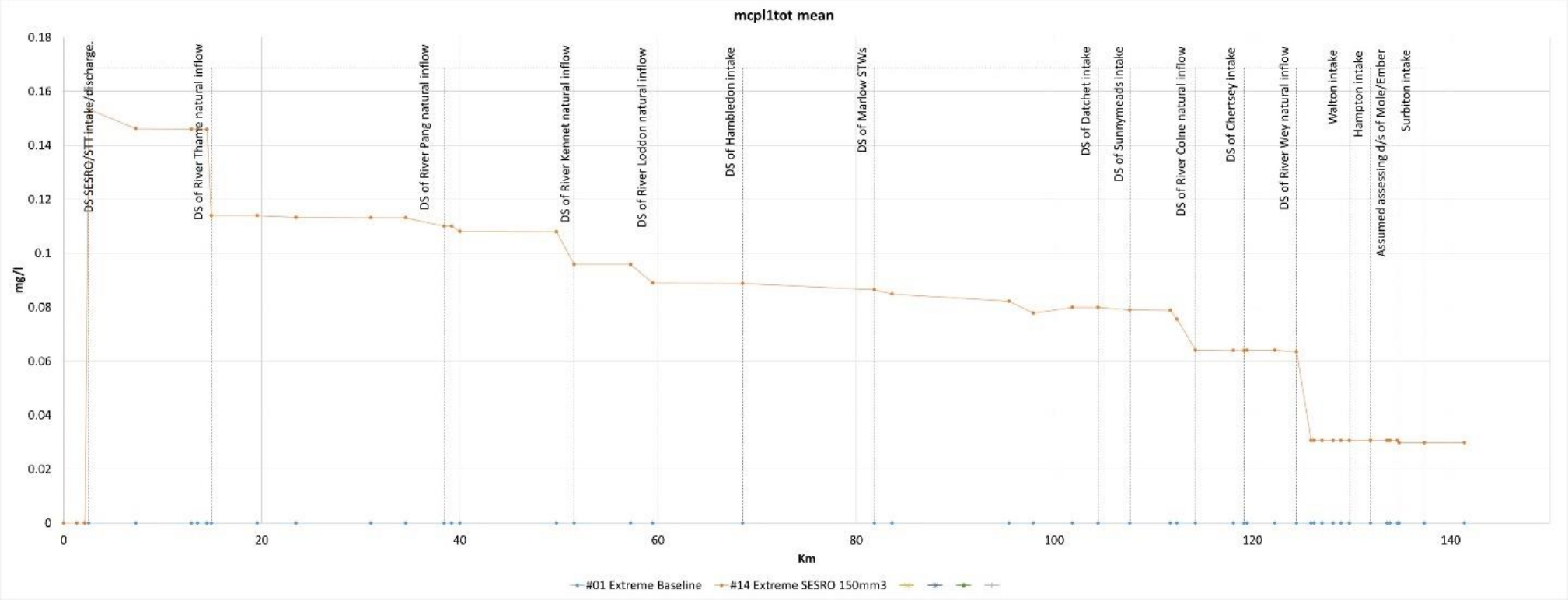

Figure 3.1 Mean concentration of a conservative tracer (input at 1 mg/l) downstream of the SESRO intake.

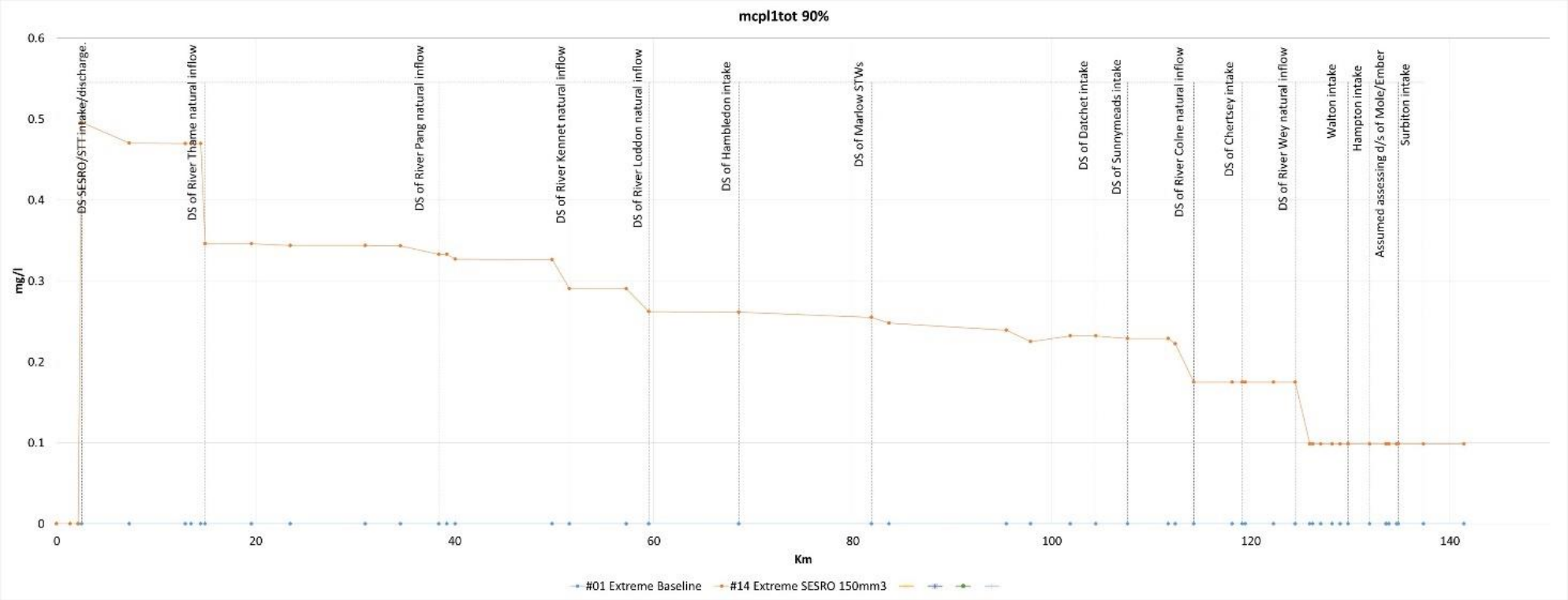

Figure 3.2 90th percentile concentration of a conservative tracer (input at 1 mg/l) downstream of the SESRO intake.

3.2.3.4 Emerging substances

3.12 A review was undertaken in Gate 2 of emerging substances that might be considered in subsequent project stages to be added to the monitoring suite. This included a review of outputs from the Environment Agency's Prioritisation and Early Warning System (PEWS) for emerging substances. Key substances identified from PEWS were Bisphenol, Fipronil, Metconazole, Propiconazole, Pyrene, Tri-(2-chloroethyl) phosphate and Triclocarban (1-(4-chlorophenyl)-3-(3,4- dichlorophenyl)-urea.

3.13 As per the requirements set out by the Drinking Water Inspectorate (DWI), 51 different Per- and polyfluoroalkyl substances ('PFAS51') were added to the SRO monitoring programme at current and future abstraction sites in June 2022.[12] The SESRO/T2AT/T2ST sites that monitoring of these parameters has been added to are as follows:

- Site 1: River Thames at Culham
- Site 3a: River Thames at Datchet intake
- Site 4: River Thames at Sunnymeads intake
- Site 38: River Thames at Mapledurham
- Site 48: Wraysbury Reservoir

3.14 These sites were chosen during a discussion with Marie Raffin (Thames Water) on 27 May 2022 and subsequent liaison with individual SRO Project Managers. The data have not been included as part of this assessment because suffcient data is not yet available and will feed into subsequent project stages.

3.2.3.5 Drinking Water Inspectorate Guidance on Consequence Scores

3.15 Since the Gate 1 WQRA, the DWI have issued guidance on consequence score, that form part of the risk scoring,[13] which have been adopted in a revised version of the WQRA spreadsheets and for this report.

3.2.3.6 Workshops and meetings

3.16 A Gate 2 workshop was held on 16 May 2022 in accordance with the ACWG methodology with Thames Water, Affinity Water and Southern Water. Minor amendments were made to the WQRA spreadsheet, mainly in the form of additional comments. The workshop was attended by Alice Elder from Affinity Water, Marrie Raffin from Thames Water and Pawlisz Maciej from Southern Water (a recording of the meeting was issued to Georgina Yates from Thames Water). Peter Daldorph and Mandy Lester attended on behalf of Atkins.

[12] This was a slightly larger suite than the 47 PFAS requested by the DWI to be monitored in 2021 (DWI Information Letter 05/2021: Requirements for Poly and Perfluorinated Alkyl Substances (PFAS) monitoring by water companies in England and Wales. Dated 1 October 2021)

[13] DWI-Compliance-Risk-Index-CRI-definition.pdf (ofwat.gov.uk)

4. High and moderate scoring hazards

4.1 The hazards listed below are those that scored high (score greater than 15) in the WQRA spreadsheet, using a 5×5 likelihood and consequence scoring matrix.

Table 4.1 High-scoring hazards

Hazard group	Hazards	Additional comments
Pathogens (faecal bacteria/viruses)	Enterococci *E.coli* Coliform bacteria Pathogens – bacteria, viruses and protozoa *Clostridium perfringens*	Faecal bacteria associated with sewage and livestock
Cryptosporidium		Faecal protozoa associated with sewage and livestock and wildlife.
Iron		Widespread in catchment but solubilisation in the reservoir can cause treatment problems
Manganese		Only high in WQRA for reservoir. Associated with solubilisation in the reservoir can cause treatment problems
Pesticides[14]	Total pesticides Pesticides Metaldehyde[15] Clopyralid	-
Taste and Odour	Taste Odour	-
Geosmin/ 2-methylisoborneol (MIB)		Can be caused by algal and non-algal sources
INNS		Risk to scheme as a whole rather than drinking water
Ammonia		
Hydrogen ion		High pH caused by high algal activity in the reservoir

[14] The pesticides are based on the recent SESRO monitoring so may differ from the Thames Water substances which are based on longer term data.
[15] Metaldehyde is now banned so should be a diminishing risk.

Hazard group	Hazards	Additional comments
Endocrine disrupting chemicals	Beta estradiol	Included because of likelihood of future PCV and general prevalence of these chemicals
PFAS	PFOS PFOA	Generally known to have widespread prevalence in environmental waters, therefore a potential risk.[16]
Turbidity	Turbidity Total suspended solids	Associated with high river flows
Algae	Algae Microcystin	Associated with reservoir eutrophication and high nutrient concentrations

4.2 The following medium-scoring hazards were also identified: Fluoride, Bromide, Nitrate, Cyanide,[17] Dirty/Discoloured Water, Alkalinity, Dissolved Organic Carbon, Orthophosphate, temperature, Total Organic Carbon, Nonylphenol, Bisphenol, Somatic coliphage

[16] Thames Water are currently undertaking a detailed catchment risk assessment and PFAS51 monitoring that will yield further information

[17] Recent monitoring by Thames Water has identified cyanide as a low risk

5. Limiting hazards

5.1 The WQRA process (ACWG) identifies key limiting hazards.[18] The basis of this is that although there are hundreds of pathogens and substances that affect water quality, a smaller number can be identified that determine the actions required to control the risks from catchment to tap.

5.2 The limiting hazards identified in the spreadsheets are listed below. The limiting hazards are the same for the **Reservoir WQRA** and **River WQRA** spreadsheets.

Table 5.1 Limiting hazards

Limiting Hazard	Comments
E.coli	Covers other pathogens including other bacteria and *Cryptosporidium* – i.e. provides an indicator of wider faecal pathogen hazards
Iron & Manganese	Associated with resuspension of dissolved metals from the reservoir – Manganese in the same group
Total pesticides	Covers all other monitored pesticides for this source
Taste	Associated with biological activity in the reservoir (algal and macrophyte growth). Added in Gate 2 following workshop discussion, as I was agreed that it was a significant and distinctive risk.
Algae	Covers other algal products including metabolites and toxins
Nitrite	Added in Gate 2 because of high observed values in SESRO monitoring[19]

[18] From Strategic Risk Assessment Guidance – The magnitude of risks and their required mitigation is limited by just one or a few pathogens and substances

[19] Its non inclusion in the Gate 1 scoring was an oversight as it is currently scored as a significant risk in the current Thames Water DWSP

6. Driving hazardous events

6.1 Driving hazardous events are those that result in a worsening of water quality that present an increased risk to drinking water. Although they generally occur for a small proportion of the time, they drive the control measures required to protect drinking water. The key driving hazardous events identified in the WQRA spreadsheets are listed below:

- Phytoplankton bloom in SESRO (at the same time when releases occur);
- Release of algal toxin by cyanobacteria in the reservoir;
- Release of taste and odour generated by biological activity in the reservoir (i.e. Geosmin and MIB);
- Storm-event related treatment plant challenges causing dirty/discoloured water and pathogen breakthrough. High pesticide concentrations can also occur during such events;
- Pollution events associated with industry upstream;
- Cryptosporidium risk associated with new source in the catchment such as an outbreak in livestock or human population upstream of a sewage works; and
- Activities in the immediate vicinity of the reservoir (recreation, vandalism etc.)

7. Control measures

7.1 The potential control measures listed below are those that can be applied in the catchment or at intake (raw water transfer or to a treatment works). Control measures that can be applied beyond this point between catchment and tap are not listed here. Control measures can be included in the design of the scheme or developed separately.

- Reservoir management controls:
  - Mixing and aeration;
  - Use of intakes at different depths;
  - Eutrophication management in upstream catchment
- Treatment of water before release back to river
- Invasive and Non-Native Species (INNS) controls (at the raw water intake to prevent the introduction of INNS, their seeds, juveniles or larval life stages)
- Controls on recreation at the reservoir to reduce pathogen and INNS risks (e.g., fencing)
- Water quality controls of input and release of water from reservoir (e.g., restrictions to abstraction when water quality is poor)
- Water quality controls on timing of abstraction from river to treatment works
- Upstream catchment control measures (e.g., sewage works and diffuse sources)
- Controls on chemicals at sources
- Water quality monitoring and pollution incident response
- Controls of activities in the immediate vicinity of the reservoir

7.2 Post control risk scores in the WQRA spreadsheets are based on the application of these control measures.

8. Next steps

8.1 Once the WQRA catchment spreadsheets have been reviewed and finalised in Gate 2, these can be integrated into the downstream stages of the catchment to tap pathway; raw water transfer, treatment and distribution scores by the companies receiving the raw water. Only once this is done, will the significance of the High and Medium risk scores be evident, since for many substances, water treatment will provide sufficient mitigation. For those with significant residual risk, control measures will need to be reviewed further during subsequent project stages.

8.2 There may also be a need to align the work with the Drinking Water Risk Assessment for the other linked SROs (e.g., Severn to Thames Transfer interconnector).

Appendix C1 Spreadsheet: Strategic Water Quality Risk Assessment_SESRO – Gate 2 Post Workshop Reservoir.xlsm

Appendix C2 Spreadsheet: Strategic Water Quality Risk Assessment_SESRO – Gate 2 Post Workshop River.xlsm

Appendix C3 Summary statistics from SESRO water quality monitoring

Orange shading indicates PCV exceedance, yellow shading indicates 50% of the PCV exceeded and grey shading indicates LoD>PCV.

Determinand		Culham			TWUL Walton	TWUL Hampton	TWUL Surbiton	Teddington	Kew Bridge	Kingston	Hambleden	Cookham	AfW Sunnymeads	AfW Egham	Chertsey	AfW Walton	Maple Durham	WFD EQS	PCV	LOD
	Units	Mean	95th %ile	Max	Mean															
fenoprop (2,4,5-TP)	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01			
BDE-28	µg/l	0.00025	0.00025	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025		0.00025	0.00025	0.0036	0.00025	0.00025	0.00025	0.00025			
BDE-47	µg/l	0.00025	0.00025	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025		0.00025	0.00025	0.0046	0.00025	0.00025	0.00025	0.00025			
BDE-99	µg/l	0.00025	0.00025	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025		0.00025	0.00025	0.0053	0.00025	0.00025	0.00025	0.00025			
BDE-100	µg/l	0.00025	0.00025	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025		0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025			
1,1,1-trichloroethane	µg/l	0.5	0.5	0.5	0.5	0.5		0.5			0.5	0.5	0.5	0.5	0.5	0.5	0.5		10 (total of Tetrachloroethene and Trichloroethene)	
1,1,2-trichloroethane	µg/l	0.5	0.5	0.5	0.5	0.5		0.5			0.5	0.5	0.5	0.5	0.5	0.5	0.5		10 (total of Tetrachloroethene and Trichloroethene)	
1,2-dibromoethane	µg/l	0.5	0.5	0.5													0.5		100 (total of chloroform, bromoform, dibromochloromethane, bromodichloromethane	
1,2-dichloroethane	µg/l	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	10.00		1.00
BDE-153	µg/l	0.00025	0.00025	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025		0.00025	0.00025	0.0062	0.00025	0.00025	0.00025	0.00025			
BDE-154	µg/l	0.00025	0.00025	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025		0.00025	0.00025	0.0059	0.00025	0.00025	0.00025	0.00025			
BDE-183	µg/l	0.00025	0.00025	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025		0.00025	0.00025	0.0066	0.00025	0.00025	0.00025	0.00025			
2,3,6-trichlorobenzoic acid (2,3,6-TBA)	µg/l	0.01	0.01	0.01													0.01		0.1 µg/l and 0.5 µg/l total pesticides	
2,4,5-trichlorophenol	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
2,4,5-trichlorophenoxyacetic acid (2,4,5-T)	µg/l	0.01	0.01	0.01	0.01	0.01		0.01			0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.1 µg/l and 0.5 µg/l total pesticides	
2,4,6-trichlorophenol	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
4-(2,4-dichlorophenoxy)butanoic acid (2,4-DB)	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
dichloprop	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
2,4-dichlorophenoxyacetic acid (2,4-D)	µg/l	0.01556	0.036	0.07	0.09	0.08	0.05	0.07	0.08		0.12	0.08	0.06	0.08	0.08	0.06	0.06	0.30	0.1 µg/l and 0.5 µg/l total pesticides	0.02
2,4-dimethylphenol (2,4-xylenol)	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
2,5-dimethylphenol (2,5-xylenol)	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
2-chlorophenol	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01			
2-methylphenol (o-cresol)	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.03			

Determinand		Culham			TWUL Walton	TWUL Hampton	TWUL Surbiton	Teddington	Kew Bridge	Kingston	Hambleden	Cookham	AfW Sunnymeads	AfW Egham	Chertsey	AfW Walton	Maple Durham	WFD EQS	PCV	LOD
	Units	Mean	95th %ile	Max	Mean															
3,5-dimethylphenol (3,5-xylenol)	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01			
3-methylphenol (m-cresol)	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.03			
4-chlorophenol	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01			
4-methylphenol (p-cresol)	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01			
octylphenols ((4-(1,1',3,3'-tetramethylbutyl)pheno	µg/l	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.10		0.01
acid neutralisation capacity (ANC, unfiltered)	mg/l	4139	4800	4800	4200	5300	4000	4000	4200		4600	4600	4900	4600	4600	4400	5400			5.00
abamectin	µg/l	2.5	2.5	2.5	2.5			2.5											0.1 µg/l and 0.5 µg/l total pesticides	
aclonifen	µg/l	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.1 µg/l and 0.5 µg/l total pesticides	0.10
silver dissolved	µg/l	0.5	0.5	0.5	0.5			0.5									0.5			
silver total	µg/l	0.5	0.5	0.5	0.5			0.5									0.5			
aluminium dissolved	µg/l	17.1765	46.2	91	49	42		110		48	73	56	170	56	56	67	57			
aluminium total	µg/l	145.882	370	490	410	440		600		510	310	210	340	210	210	550	380		200 µgA1/l	
alachor	µg/l	0.01056	0.0115	0.02	0.01	0.02	0.01	0.01	0.02		0.01	0.02	0.02	0.02	0.02	0.03	0.01	0.30	0.1 µg/l and 0.5 µg/l total pesticides	0.02
aldrin	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03 µg/l	0.02
alkalinity as CaC_{O3}	mg/l	206.111	240	240	210	270	200	200	210		230	230	240	230	230	220	250			5.00
alkalinity as HCO3	mg/l	251.118	293	293	256	329		244									305			
ammoniacal nitrogen	mg/l as N	0.17847	0.7155	0.86	0.4	0.24	0.99	0.2	0.6		1.1	1.1	0.48	1.1	1.1	1.8	0.16			
ammonia	mg/l as N	0.03029	0.05	0.05	0.17	0.15	0.05	0.13	0.99		0.05	0.05	0.05	0.05	0.05	0.05	0.05			
ametryne	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
total anions (sum of Br, Cl, F, NO_2, NO3, PO4, SO_4	mg/l	107.065	129.4	143													152			
arsenic dissolved	µg/l	0.985	1.445	1.7	1.4	1.3	1.2	2.9	1.6		1.1	1	1	1	1	1.2	1.6	50.00		0.16
arsenic total	µg/l	1.05778	1.67	1.67	1.81	1.59	1.76	2.94	1.71		1.22	1.04	1.15	1.04	1.04	1.29	1.67		10 µg/l	0.16
anthracene	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.09	0.01	0.01	0.01	0.01	0.10		0.02
atrazine	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.60	0.1 µg/l and 0.5 µg/l total pesticides	0.02
azinphos methyl, dissolved	µg/l	0.01	0.01	0.01	0.01			0.01												
azoxystrobin	µg/l	0.025	0.025	0.025													0.025		0.1 µg/l and 0.5 µg/l total pesticides	
benzyl butyl phthalate	µg/l	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1	0.1	0.1	7.50		0.20
boron dissolved	µg/l	48.6471	65.4	67	53	52		88			47	47	49	47	47	47	63		1 mg/l	
BOD (5 day)	mg/l	4.95556	8.43	12	12	11	8.2	6.7	8.3		8.9	6.3	11	6.3	6.3	13	11	4.00		1.00
BTEX (benzene, toluene, ethylbenzene & o,p-xylene	µg/l	0.30244	0.5	0.5	0.5	0.5		0.5									0.5		1 µg/l (benzene)	
boron total	µg/l	53.4706	73.8	85	55	55		52			61	50	52	50	50	52	70		1.0 mgB/1	
barium dissolved	µg/l	12.3294	16.6	19	27	25		24									16			

Determinand		Culham			TWUL Walton	TWUL Hampton	TWUL Surbiton	Teddington	Kew Bridge	Kingston	Hambleden	Cookham	AfW Sunnymeads	AfW Egham	Chertsey	AfW Walton	Maple Durham	WFD EQS	PCV	LOD
	Units	Mean	95th %ile	Max	Mean															
benzo(a)pyrene	µg/l	0.00292	0.00651	0.0111	0.101	0.103	0.102	0.0897	0.157		0.0233	0.0353	0.0162	0.0353	0.0353	0.0252	0.0136	0.00	0.01 µg/l	0.00
barium total	µg/l	13.1412	17	21	32	34		29									19			
benzo(b)fluoranthene	µg/l	0.00461	0.01167	0.0336	0.102	0.0931	0.096	0.0826	0.136		0.0157	0.0257	0.0122	0.0257	0.0257	0.0211	0.0098			0.00
bromodichloromethane	µg/l	0.5	0.5	0.5	0.5	0.5		0.5			0.5	0.5	0.5	0.5	0.5	0.5	0.5		Trihalomethanes 100 µg/l	
beryllium dissolved	µg/l	0.05	0.05	0.05													0.05			
beryllium total	µg/l	0.05294	0.06	0.1													0.05			
bifenox	µg/l	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006		0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.12	0.1 µg/l and 0.5 µg/l total pesticides	0.01
benzo(g,h,i)perylene	µg/l	0.00462	0.01158	0.0279	0.0706	0.07	0.0727	0.0655	0.107		0.0144	0.027	0.0121	0.027	0.027	0.0195	0.0102		0.1 µg/l (sum of 4 PAHs)	0.00
benzo(k)fluoranthene	µg/l	0.00263	0.00664	0.0182	0.0618	0.0597	0.0594	0.0527	0.0793		0.0088	0.0157	0.0081	0.0157	0.0157	0.0136	0.007		0.1 µg/l (sum of 4 PAHs)	0.00
bromoxynil	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
benzene	µg/l	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.05	10.00	1 µg/l	0.10
DHC benzene	µg/l	0.05	0.05	0.05	0.05	0.05		0.05									0.05		1 µg/l (benzene)	
biphenyl	µg/l	0.01	0.01	0.01	0.01			0.01												
bromide	mg/l	0.74941	2.4	10													10			
bromate	µg/l	1	1	1	1	1		1			1	1	1	1	1	1	1		10 µg/l	
bromine – total residual oxidant	mg/l	0.09294	0.242	0.29	0.68			1.09												
bromoform	µg/l	0.5	0.5	0.5	0.5	0.5		0.5			0.5	0.5	0.5	0.5	0.5	0.5	0.5		Trihalomethanes 100 µg/l	
bentazone	µg/l	0.01471	0.036	0.06	0.08	0.07		0.06									0.1		0.1 µg/l and 0.5 µg/l total pesticides	
benazolin	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
number of Crypto-like bodies 3-4 µm	/10L	0	0	0	0	0		0			0	0	0	0	0	0				
number of Crypto-like bodies 4-6 µm	/10L	0.11765	1	1	0	0		0			0	1	1	1	1	1	1		0 Counts/l	
4-chloro-3-methyl phenol	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01			
chloronitrotoluenes	µg/l	0.01	0.01	0.01	0.01			0.01												
cyanide total	µg/l	20	20	20	20	20	20	20	20		20	20	20	20	20	20	190	1.00		40.00
cyanide, free (easily liberable)	µg/l	11.1765	20	20	20	20		20									10		50 µg/l	
chemical oxygen demand (COD)	mg/l	13.5	27	27													26			
C10-13 chloroalkanes (total)	µg/l	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.40		0.40
calcium dissolved	mg/l	102.353	112	120	110	110		110									120			
calcium total	mg/l	108.118	132	140	130	110		110									150			
carbetamide	µg/l	0.01824	0.05	0.21	0.03	0.03		0.02			0.11	0.08	0.04	0.08	0.08	0.02	0.17		0.1 µg/l and 0.5 µg/l total pesticides	
carbendazim	µg/l	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.15	0.1 µg/l and 0.5 µg/l total pesticides	0.10
cadmium dissolved	µg/l	0.01611	0.0375	0.08	0.05	0.01	0.03	0.03	0.03		0.02	0.01	0.01	0.01	0.01	0.03	0.03			0.02
cadmium total	µg/l	0.03	0.1	0.1	0.12	0.05	0.08	0.06	0.14		0.13	0.03	0.03	0.03	0.03	0.09	0.03		5 µg/l	0.02

Determinand		Culham			TWUL Walton	TWUL Hampton	TWUL Surbiton	Teddington	Kew Bridge	Kingston	Hambleden	Cookham	AfW Sunnymeads	AfW Egham	Chertsey	AfW Walton	Maple Durham	WFD EQS	PCV	LOD
	Units	Mean	95th %ile	Max	Mean															
chlordane	µg/l	0.01	0.01	0.01													0.01		0.1 µg/l and 0.5 µg/l total pesticides	
chlorfenvinphos	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.10	0.1 µg/l and 0.5 µg/l total pesticides	0.02
chloride	mg/l	35	53.6	100	60	55		54			42	52	55	52	52	50	43		250 mg/l	
chlorine free	mg/l	0.07059	0.1	0.1	0.3	0.3	0.3	0.3	7		0.1	0.1	0.2	0.1	0.1	0.4	0.3			
chlorite	mg/l	1.58824	1.8	3													3			
chlorine total	mg/l	0.08056	0.115	0.2	0.3	0.3	0.3	0.3	7		0.1	0.2	0.3	0.2	0.2	0.1	0.2	2.00		0.10
chloroform	µg/l	0.5	0.5	0.5	0.5	0.5		0.5			0.5	0.5	0.5	0.5	0.5	0.5	0.5		Trihalomethanes 100 µg/l	
Coliform total	MPN/100 ml	2420	2420	2420	2420	2420		2420			2420	2420	2420	2420	2420	2420	2420		0 Count/100 ml	
C. perfringens veg & spores, confirmed	no/100 ml	100	100	100	100	100		100			100	100	100	100	100	291	100		0 Count/100 ml	
chlorophyll	µg/l	11.2353	14.2	31	33	33		162			81	82	116	82	82	77	56			
cobalt dissolved	µg/l	0.36824	1.084	1.9	0.35	0.4		0.38		0.46							0.23			
cobalt total	µg/l	0.44088	1.144	2	1.1	0.85		1		1							0.3			
colour	mg/lPt/Co	8.64706	16	16	19	21		21			16	30	15	30	30	19	14		20 mg/1 Pt/Co	
E. coli	MPN/100 ml	1614.41	2420	2420	2420	2420		2420			2420	2420	2420	2420	2420	2420	2420		0 Count/100/l	
conductivity @ 20øC	µS/cm	610.111	718.05	741	805	678	679	698	807		723	715	741	715	715	696	770		2500 µS/cm at 20°C	
coumaphos	µg/l	0.01	0.01	0.01	0.01			0.01											0.1 µg/l and 0.5 µg/l total pesticides	
clopyralid	µg/l	0.01118	0.014	0.03	0.14	0.14		0.05			0.01	0.01	0.02	0.01	0.01	0.1	0.03		0.1 µg/l and 0.5 µg/l total pesticides	
chlorpyrifos (chlorpyrifos-ethyl)	µg/l	0.01	0.01	0.01	0.03	0.01	0.03	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.1 µg/l and 0.5 µg/l total pesticides	0.02
carbophenothion	µg/l	0.01	0.01	0.01						0.01							0.01		0.1 µg/l and 0.5 µg/l total pesticides	
chlorpropham	µg/l	0.05	0.05	0.05	0.05			0.05											0.1 µg/l and 0.5 µg/l total pesticides	
chromium (III) dissolved	µg/l	1.41667	5.03	12	4.2	4.8	7.4	1.9	1.2	0.5	1.5	2.2	4.1	2.2	2.2	1.8	4.8	4.70		0.25
chromium (VI) dissolved	µg/l	3.5	3.5	3.5	3.5	3.5	3.5	3.5	16	3.5	3.5	3.5	3.5	3.5	3.5	3.5	23	3.40		3.40
chromium dissolved	µg/l	1.28611	5.03	12	4.2	4.8	7.4	1.9	1.2	0.31	1.5	2.2	4.1	2.2	2.2	1.8	4.8			
chromium total	µg/l	2.00333	6.485	20	7.5	5.3	8.3	1.9	15	1.6	2.5	3.1	11	3.1	3.1	18	5.3		50.00000	
Cryptosporidium	no/litre	0.11765	1	1	0	0		78			0	1	1	1	1	1	1		0 Count/100 ml	
chlorothalonil	µg/l	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175		0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.04	0.1 µg/l and 0.5 µg/l total pesticides	0.04
carbon tetrachloride	µg/l	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	12.00		1.00
chlorotoluron	µg/l	0.025	0.025	0.025	0.025	0.025		0.025		0.025							0.025		0.1 µg/l and 0.5 µg/l total pesticides	
copper dissolved	µg/l	1.43333	2.295	3.4	2.6	2.6	3	3.3	3.2		2.1	2.5	3.7	2.5	2.5	3.1	2.6	1.00		0.40
copper total	µg/l	1.75556	2.74	4.1	5.8	4.8	6	7.6	10		2.9	2.7	3.7	2.7	2.7	4.2	4.2		2 mg/l	0.40
DHC cumene	µg/l	0.05	0.05	0.05	0.05	0.05		0.05									0.05			
cybutryne (Irgarol)	µg/l	0.00125	0.00125	0.0013	0.00125	0.00125	0.00125	0.00125	0.00125		0.00125	0.00125	0.00125	0.00125	0.00125	0.00125	0.00125	0.01	0.1 µg/l and 0.5 µg/l total pesticides	0.00
cyfluthrin	µg/l	0.05	0.05	0.05	0.05			0.05		0.05							0.05		0.1 µg/l and 0.5 µg/l total pesticides	

Determinand		Culham			TWUL Walton	TWUL Hampton	TWUL Surbiton	Teddington	Kew Bridge	Kingston	Hambleden	Cookham	AfW Sunnymeads	AfW Egham	Chertsey	AfW Walton	Maple Durham	WFD EQS	PCV	LOD
	Units	Mean	95th %ile	Max	Mean															
cypermethrin	µg/l	5.3E-05	0.0001025	0.0002	0.00026	0.00019	0.00019	0.00014	0.00093		0.00023	0.00004	0.00008	0.00004	0.00004	0.00011	0.0001	0.00	0.1 µg/l and 0.5 µg/l total pesticides	0.00
cyanazine	µg/l	0.01	0.01	0.01													0.01		0.1 µg/l and 0.5 µg/l total pesticides	
dichloromethane	µg/l	0.80556	2.725	4	2.5	2.5	3	5	2.5		2.5	3	5	3	3	2.5	5	20.00		1.00
DDT total	µg/l	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.068	0.092		0.175	0.03	0.114	0.03	0.03	0.087	0.0125	0.03	0.1 µg/l and 0.5 µg/l total pesticides	0.03
di(2-ethylhexyl)phthalate (DEHP)	µg/l	0.075	0.075	0.075	0.17	0.075	0.075	0.075	0.27		0.33	0.075	0.075	0.075	0.075	0.075	0.075	1.30		0.15
dissolved organic carbon	mg/l	3.20556	4.615	4.7	4.8	11	8.3	7.9	8.1		4.8	5	5.4	5	5	5.4	4.6		No abnormal change	0.50
dalapon	µg/l	0.01	0.01	0.01													0.01		0.1 µg/l and 0.5 µg/l total pesticides	
dibromochloromethane	µg/l	0.5	0.5	0.5	0.5	0.5		0.5									0.5		Trihalomethanes 100 µg/l	
dichlobenil	µg/l	0.01	0.01	0.01													0.01		Trihalomethanes 100 µg/l	
dibutyl phthalate	µg/l	0.02824	0.12	0.16	0.17			0.11												
3,4-dichloroaniline	µg/l	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.20	0.1 µg/l and 0.5 µg/l total pesticides	1.00
dicamba	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
dicofol	µg/l	0.00069	0.0007475	0.0013	0.00065	0.0015	0.00065	0.00065	0.0014		0.00065	0.00065	0.00065	0.00065	0.00065	0.0016	0.00065	0.03	0.1 µg/l and 0.5 µg/l total pesticides	0.00
2,4-dichlorophenol	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	4.20		0.02
dichlorvos	µg/l	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00	0.1 µg/l and 0.5 µg/l total pesticides	0.00
dichlorobenzene, total isomers	µg/l	0.10294	0.5	0.5	0.5			0.5									0.05			
DHC decane	µg/l	0.05	0.05	0.05	0.05	0.05		0.05									0.05			
demeton	µg/l	0.01	0.01	0.01	0.01			0.01											0.1 µg/l and 0.5 µg/l total pesticides	
diethyl phthalate	µg/l	0.01529	0.042	0.05	0.18			0.29												
diflubenzuron	µg/l	0.0005	0.0005	0.0005	0.0005			0.0005									0.0005		0.1 µg/l and 0.5 µg/l total pesticides	
diflufenican	µg/l	0.05	0.05	0.05													0.05		0.1 µg/l and 0.5 µg/l total pesticides	
1,2-dichloroethane	µg/l	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	10.00		1.00
diuron	µg/l	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025		0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.20	0.1 µg/l and 0.5 µg/l total pesticides	0.05
dieldrin	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.03 µg/l	0.02
dimethyl phthalate	µg/l	0.01059	0.012	0.02	0.1			0.09												
dimethoate	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.48	0.1 µg/l and 0.5 µg/l total pesticides	0.02
dioctyl phthalate	µg/l	0.01	0.01	0.01	0.03			0.01												
doramectin	µg/l	2.5	2.5	2.5	2.5			2.5												
desethyl atrazine	µg/l	0.01	0.01	0.01	0.01	0.01		0.01			0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.1 µg/l and 0.5 µg/l total pesticides	
diazinon	µg/l	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.1 µg/l and 0.5 µg/l total pesticides	0.01
2-EDD	µg/l	0.05	0.05	0.05	0.05	0.05		0.05									0.05			

Determinand		Culham			TWUL Walton	TWUL Hampton	TWUL Surbiton	Teddington	Kew Bridge	Kingston	Hambleden	Cookham	AfW Sunnymeads	AfW Egham	Chertsey	AfW Walton	Maple Durham	WFD EQS	PCV	LOD
	Units	Mean	95th %ile	Max	Mean															
EDTA	µg/l	50	50	50	50			50												
2-EMD	µg/l	0.05	0.05	0.05	0.05	0.05		0.05									0.05			
ethofumesate	µg/l	0.025	0.025	0.025													0.025		0.1 µg/l and 0.5 µg/l total pesticides	
endrin	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.1 µg/l and 0.5 µg/l total pesticides	0.02
Enterococci, confirmed	no/100 ml	98.1176	100	100	100	100		100			100	100	100	100	100	100	100		0 Count/100 ml	
endosulfan	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.1 µg/l and 0.5 µg/l total pesticides	0.02
BTEX (benzene, toluene, ethylbenzene & o,p-xylene	µg/l	0.30244	0.5	0.5	0.5	0.5		0.5									0.5		1 µg/l (benzene)	
DHC ethyl benzene	µg/l	0.05	0.05	0.05	0.05	0.05		0.05									0.05			
fluoride	mg/l	0.15706	0.192	0.2	0.23	0.22		0.22			0.19	0.2	132	0.2	0.2	0.17	0.2		1.5 mgF/l	
flucofuron	µg/l	0.025	0.025	0.025	0.025			0.025		0.025									0.1 µg/l and 0.5 µg/l total pesticides	
iron dissolved	µg/l	25.7139	61.3	63	110	90	160	450	98		73	40	150	40	40	250	38			5.50
iron total	µg/l	197.5	454	590	580	480	480	830	1000		420	410	340	410	410	850	490	1000.00	200 µgFe/l	5.50
flufenacet	µg/l	0.02412	0.092	0.14	0.08	0.08		0.08									0.19		0.1 µg/l and 0.5 µg/l total pesticides	
fluoranthene	µg/l	0.00346	0.006475	0.0069	0.0794	0.0764	0.0641	0.0798	0.0938		0.0182	0.0254	0.0123	0.0254	0.0254	0.0369	0.0109	0.01		0.00
formaldehyde	µg/l	36.7647	125	125	125			125									125			
fenchlorphos	µg/l	0.01	0.01	0.01	0.01			0.01											0.1 µg/l and 0.5 µg/l total pesticides	
fenitrothion	µg/l	0.005	0.005	0.005	0.005			0.005		0.005									0.1 µg/l and 0.5 µg/l total pesticides	
fluroxypyr	µg/l	0.01118	0.014	0.03	0.01	0.01		0.01									0.04		0.1 µg/l and 0.5 µg/l total pesticides	
Giardia	no/litre	2.82353	9.6	20													3		0 Count	
glyphosate	µg/l	0.10556	0.204	0.34	0.22	0.22	0.56	0.31	0.78		1.4	1.7	0.19	1.7	1.7	0.22	0.6	196.00	0.1 µg/l and 0.5 µg/l total pesticides	0.10
hexabromocyclododecane (HBCDD)	µg/l	0.00026	0.0005865	0.002	0.00058	0.00035	0.0008	0.00043	0.00124		0.00027	0.00016	0.00044	0.00016	0.00016	0.00048	0.00017	0.00		0.00014 total and 0.00004 individual isomers
hexachlorobutadiene	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.60		0.02
hexachlorobenzene	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.01		0.09	0.03	0.07	0.03	0.03	0.06	0.01	0.05	0.1 µg/l and 0.5 µg/l total pesticides	0.02
hexachlorocyclohexane	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.1 µg/l and 0.5 µg/l total pesticides	0.02
heptachlor and heptachlor epoxide	µg/l	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005		0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00	0.1 µg/l and 0.5 µg/l total pesticides	0.00
DHC heptane	µg/l	0.05	0.05	0.05	0.05	0.05		0.05									0.05			
mercury dissolved	µg/l	0.00919	0.03675	0.041	0.038	0.047	0.028	0.051	0.014		0.11	0.042	0.047	0.042	0.042	0.055	0.036	0.07		0.00
mercury total	µg/l	0.02125	0.07375	0.18	0.044	0.049	0.17	0.055	0.046		1	0.082	0.052	0.082	0.082	0.21	0.043	0.07	1.0 µgHg/l	0.00
hardness as CaCO3	mg/l	275.056	301.7	317	293	288	286	292	297		331	335	323	335	335	311	318			0.10
hardness, total as Ca	mg/l Ca	109.771	121.4	127	117	115		117									127			

Determinand		Culham			TWUL Walton	TWUL Hampton	TWUL Surbiton	Teddington	Kew Bridge	Kingston	Hambleden	Cookham	AfW Sunnymeads	AfW Egham	Chertsey	AfW Walton	Maple Durham	WFD EQS	PCV	LOD
	Units	Mean	95th %ile	Max	Mean															
indeno(1,2,3-cd)pyrene	µg/l	0.00524	0.014435	0.0322	0.117	0.11	0.103	0.0881	0.144		0.0189	0.0335	0.0179	0.0335	0.0335	0.0287	0.0135		0.1 µg/l (sum of 4 PAHs)	0.00
ioxynil	µg/l	0.01	0.01	0.01	0.01			0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
isoproturon	µg/l	0.00106	0.00115	0.002	0.002	0.001	0.001	0.002	0.002		0.001	0.003	0.003	0.003	0.003	0.003	0.003	0.30	0.1 µg/l and 0.5 µg/l total pesticides	0.00
isodrin	µg/l	0.01	0.01	0.01	0.01	0.03	0.01	0.05	0.05		0.09	0.03	0.07	0.03	0.03	0.06	0.01			0.02
ivermectin	µg/l	2.5	2.5	2.5	2.5			2.5												
potassium dissolved	mg/l	4.98824	8.46	9.5	8.2	7.7		18									9.7			
kjeldahl nitrogen	mg/l as N	0.1	0.1	0.1	0.1	0.1	0.1	0	0		0.1	0.1	0.1	0.1	0.1	0.1				
potassium total	mg/l	5.11765	8.58	9.7	9.6	8.9		9.5									9.6			
linuron	µg/l	0.005	0.005	0.005	0.12	0.12	0.12	0.15	0.06		0.005	0.005	0.005	0.005	0.005	0.14	0.005	0.50	0.1 µg/l and 0.5 µg/l total pesticides	0.01
MCPA	µg/l	0.01235	0.022	0.03	0.02	0.03		0.03									0.18		0.1 µg/l and 0.5 µg/l total pesticides	
MCPB	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
MTBE	µg/l	0.5	0.5	0.5													0.5			
malathion	µg/l	0.01	0.01	0.01	0.01			0.01		0.01							0.01		0.1 µg/l and 0.5 µg/l total pesticides	
metribuzin	µg/l	0.025	0.025	0.025													0.025		0.1 µg/l and 0.5 µg/l total pesticides	
mecoprop	µg/l	0.01111	0.013	0.03	0.08	0.06	0.14	0.07	0.05		0.05	0.03	0.04	0.03	0.03	0.24	0.17	18.00	0.1 µg/l and 0.5 µg/l total pesticides	0.02
mevinphos	µg/l	0.01	0.01	0.01	0.01			0.01											0.1 µg/l and 0.5 µg/l total pesticides	
magnesium dissolved	mg/l	4.23529	5.28	5.6	5.2	4.9		8.2									4.9			
magnesium total	mg/l	4.37647	5.32	5.4	5.3	4.8		5.1									5.2			
metaldehyde	µg/l	0.01353	0.022	0.07	0.01	0.01		0.01			0.04	0.03	0.02	0.03	0.03	0.01	0.06		0.1 µg/l and 0.5 µg/l total pesticides	
malachite green	µg/l	0.5	0.5	0.5	0.5			0.5												
manganese dissolved	µg/l	6.99444	10.75	15	18	22	23	24	28		8	11	8.8	11	11	23	6.4	123.00		0.22
manganese total	µg/l	12.2056	17.8	28	80	70	97	76	54		25	18	28	18	18	32	15		50 µgMn/l	10.00
maneb	µg/l CS2	0.09706	0.25	0.25	0.5			0.25											0.1 µg/l and 0.5 µg/l total pesticides	
molybdenum dissolved	µg/l	1.71471	5.92	6.4													1.5			
molybdenum total	µg/l	2.29412	6.64	6.8													1.7			
monuron	µg/l	0.025	0.025	0.025	0.025	0.025		0.025		0.025							0.025		0.1 µg/l and 0.5 µg/l total pesticides	
methoxychlor	µg/l	0.01	0.01	0.01													0.01		0.1 µg/l and 0.5 µg/l total pesticides	
mancozeb	µg/l CS2	0.09118	0.25	0.25	3.2			1.5											0.1 µg/l and 0.5 µg/l total pesticides	
metazachlor	µg/l	0.05	0.05	0.05	0.05	0.05		0.05			0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.1 µg/l and 0.5 µg/l total pesticides	
ammonium as NH4	mg/l as NH4	0.14588	0.61	0.87	0.25	0.145		0.32			0.7	0.7	0.3	0.7	0.7	2.28	0.095			
nitrite	mg/l NO_2	0.31541	0.93	1.1	70	1.2	1.2	1.4	1.7		0.7	0.8	1.2	0.8	0.8	2.5	2.2		0.1 0 mg NO_2/l at works	0.10
nitrite	mg/l N	0.31541	0.93	1.1	70	1.2	1.2	1.4	1.7		0.7	0.8	1.2	0.8	0.8	2.5	2.2			0.10

Determinand		Culham			TWUL Walton	TWUL Hampton	TWUL Surbiton	Teddington	Kew Bridge	Kingston	Hambleden	Cookham	AfW Sunnymeads	AfW Egham	Chertsey	AfW Walton	Maple Durham	WFD EQS	PCV	LOD
	Units	Mean	95th %ile	Max	Mean															
nitrate	mg/l NO3	19.8571	39	60	34	33	35	39	45		34	37	53	37	37	35	40		50 mgNO3/l	0.10
nitrate	mg/l N	19.8571	39	60	34	33	35	39	45		34	37	53	37	37	35	40			0.10
nonylphenols (4-nonylphenol technical mix)	µg/l	0.02	0.02	0.02	0.05	0.04	0.05	0.08	0.16		0.04	0.06	0.05	0.06	0.06	0.05	0.02	0.30		0.04
nitrilotriacetic acid (NTA)	µg/l	53.7059	62.6	113	50			50												
sodium dissolved	mg/l	19	29.8	33	31	31		76			31	30	32	30	30	34	34			
sodium total	mg/l	20.4118	32.2	33	38	44		39			31	30	33	30	30	34	34		200 mgNa/l	
naphthalene	µg/l	0.01111	0.013	0.03	0.03	0.03	0.02	0.03	0.03		0.01	0.01	0.11	0.01	0.01	0.02	0.01	2.00		0.02
DHC naphthalene	µg/l	0.05	0.05	0.05	0.05	0.05		0.05									0.05			
nickel dissolved	µg/l	1.36944	2.675	3.1	2.6	2.4	3.2	3	2.9		2.4	2.2	2	2.2	2.2	2.5	1.9	4.00		0.50
nickel total	µg/l	1.68889	2.92	3.6	5.2	5.5	81	5.5	5.4		2.5	3.7	9.5	3.7	3.7	13	2.3	4.00	20 µgNi/l	0.50
nitrite & nitrate calculation	mg/l N	7.38176	11.28	13.6	27.6	7.49		8.88									9.3			
organic nitrogen	mg/l as N	2.5	2.5	2.5	2.5	2.5	5	2.5	2.5		2.5	2.5	5	2.5	2.5	2.5	2.5			
ORP	mV	172.317	241.895	243	266	266	267	266	270		242.2	244	242.5	244	244	242	230			
DHC octane	µg/l	0.05	0.05	0.05	0.05	0.05		0.05									0.05			
odour	coded	0.17647	1.2	2	4	1		2			3	2	2	2	2	1	0			
omethoate	µg/l	0.005	0.005	0.005	0.005			0.005											0.1 µg/l and 0.5 µg/l total pesticides	
oocyst count	Number	1.29412	5.2	6													6			
oxadixyl	µg/l	0.025	0.025	0.025													0.025		0.1 µg/l and 0.5 µg/l total pesticides	
polycyclic aromatic hydrocarbons (PAH) sum	µg/l	0.03583	0.0945	0.12	0.53	0.51	0.5	0.46	0.66		0.13	0.16	0.25	0.16	0.16	0.16	0.1		0.1 µg/l (sum of 4 PAHs)	
22C plate count, neat	no/ml	300	300	300	300	300		300									300		0 Count/100 ml	
37C plate count, neat	no/ml	286.059	300	300	300	300		300									300		0 Count/100/ml	
pentachlorophenol	µg/l	0.01111	0.02	0.02	0.02	0.01	0.01	0.01	0.01		0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.40	0.1 µg/l and 0.5 µg/l total pesticides	0.02
polychloro chloromethyl sulphonamido diphenyl ethe	µg/l	0.12353	0.18	0.5	0.5			0.5											0.1 µg/l and 0.5 µg/l total pesticides	
perfluorooctane sulfonic acid and its derivatives	µg/l	0.00651	0.009385	0.011	0.0074	0.0085	0.0108	0.0085	0.0102		0.0086	0.0121	0.0078	0.0121	0.0121	0.0083	0.0155	0.00		0.00
orthophosphate as PO4	mg/l	0.48235	0.788	0.98													1.13			
particulate organic carbon (calculated from TOC an	µg/l	0.46176	1.1	1.9													1.3			
parathion	µg/l	0.01	0.01	0.01						0.01							0.01		0.1 µg/l and 0.5 µg/l total pesticides	
lead dissolved	µg/l	0.27028	0.8605	1.6	0.46	0.37	0.6	0.47	0.39		0.19	0.35	0.29	0.35	0.35	0.87	0.12	1.20		0.09
lead total	µg/l	0.63306	1.52	2.2	4.2	3.3	4.3	4.3	9.4		1.1	1.6	1.2	1.6	1.6	1.8	0.91	1.20	10 µgPb/l	0.09
pirimicarb	µg/l	0.5	0.5	0.5	0.5			0.5		0.5									0.1 µg/l and 0.5 µg/l total pesticides	
pentachlorobenzene	µg/l	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.01	0.0035		0.015	0.0035	0.013	0.0035	0.0035	0.011		0.01		0.01
prochloraz	µg/l	0.05	0.05	0.05	0.05			0.05											0.1 µg/l and 0.5 µg/l total pesticides	

Determinand		Culham			TWUL Walton	TWUL Hampton	TWUL Surbiton	Teddington	Kew Bridge	Kingston	Hambleden	Cookham	AfW Sunnymeads	AfW Egham	Chertsey	AfW Walton	Maple Durham	WFD EQS	PCV	LOD
	Units	Mean	95th %ile	Max	Mean															
phenol	µg/l	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	7.70		1.00
pirimiphos-methyl	µg/l	0.005	0.005	0.005	0.005			0.005											0.1 µg/l and 0.5 µg/l total pesticides	
picloram	µg/l	0.01	0.01	0.01	0.05	0.04		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
prometryn	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
pendimethalin	µg/l	0.01222	0.016	0.05	0.08	0.08	0.1	0.01	0.01		0.06	0.01	0.1	0.01	0.01	0.1	0.01	0.30	0.1 µg/l and 0.5 µg/l total pesticides	0.02
DHC phenanthrene	µg/l	0.05	0.05	0.05	0.05	0.2		0.05									0.05			
propetamphos	µg/l	0.01	0.01	0.01	0.01			0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
propyzamide	µg/l	0.02059	0.092	0.14	0.1	0.11		0.1			0.14	0.21	0.16	0.21	0.21	0.11	0.29		0.1 µg/l and 0.5 µg/l total pesticides	
permethrin	µg/l	0.00069	0.00115	0.002	0.002	0.001	0.002	0.002	0.003		0.002	0.002	0.004	0.002	0.002	0.002	0.001	0.00	0.1 µg/l and 0.5 µg/l total pesticides	0.00
Pseudomonas, confirmed	no/100 ml	100	100	100													100			
propazine	µg/l	0.01	0.01	0.01	0.01	0.01		0.01			0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.1 µg/l and 0.5 µg/l total pesticides	
quimerac	µg/l	0.01118	0.014	0.03	0.01	0.01		0.01			0.02	0.01	0.01	0.01	0.01	0.01	0.04		0.1 µg/l and 0.5 µg/l total pesticides	
quinoxyfen	µg/l	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.1 µg/l and 0.5 µg/l total pesticides	0.10
radon	Bq/l	5	5	5	5	5		5			5	5	5	5	5	5	5		100 Bq/l	
sulphide or hydrogen sulphide	µg/l	11.6471	21.2	22	29	270		16									20			
sulphate	mg/l SO_4	48.1176	60	68	52	51		54			55	53	53	53	53	55	74		250 mgSO4/l	
soluble reactive phosphorus	mg/l	0.15444	0.2605	0.32	0.33	0.32	0.46	0.39	1.1		0.27	0.27	0.29	0.27	0.27	0.31	0.37			0.01
salinity @ 20øC	%	0.30556	0.4	0.4	0.4	0.3	0.3	0.3	0.4		0.4	0.4	0.4	0.4	0.4	0.4	0.4			1.00
antimony dissolved	µg/l	0.29029	0.592	0.8	0.52	0.45		0.9			0.39	0.41	0.39	0.41	0.41	0.44	0.5			
antimony total	µg/l	0.28853	0.632	0.8	0.52	0.45		0.9			0.39	0.42	0.39	0.42	0.42	0.5	0.5		5.0 µgSb/l	
sulcofuron	µg/l	0.025	0.025	0.025	0.025			0.025		0.025									0.1 µg/l and 0.5 µg/l total pesticides	
selenium dissolved	µg/l	0.64265	1.94	2.1	1.2	0.82		0.67		0.55	1	0.75	0.68	0.75	0.75	0.54	0.54			
selenium total	µg/l	0.71676	2.02	2.1	1.7	0.88		0.67		0.58	1	0.75	0.87	0.75	0.75	0.72	0.74		10 µgSe/l	
silica, reactive (SiO2)	mg/l	5.32941	7.46	8.1													10			
simazine	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00	0.1 µg/l and 0.5 µg/l total pesticides	0.02
tin dissolved	µg/l	0.2	0.2	0.2	0.2			1.3									0.2			
tin total	µg/l	0.24706	0.6	0.6	0.5			1.3									0.2			
strontium dissolved	mg/l	0.20294	0.21	0.25	0.2	0.2		0.4									0.36			
strontium total	mg/l	0.20294	0.21	0.25	0.2	0.2		0.4									0.4			
styrene	µg/l	0.10588	0.5	0.5	0.5			0.5									0.05			
tert-amyl methyl ether	µg/l	0.25	0.25	0.25													0.25			
tributyltin compounds (as tributyltin cation)	µg/l	0.00013	0.0003225	0.0013	0.00015	0.00016	0.00022	0.0002	0.00028		0.00009	0.00013	0.00015	0.00013	0.00013	0.00015	0.00008	0.00		0.00

Determinand		Culham			TWUL Walton	TWUL Hampton	TWUL Surbiton	Teddington	Kew Bridge	Kingston	Hambleden	Cookham	AfW Sunnymeads	AfW Egham	Chertsey	AfW Walton	Maple Durham	WFD EQS	PCV	LOD
	Units	Mean	95th %ile	Max	Mean															
tetrachloroethane	µg/l	0.11111	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.25	140.00		0.10
tetrachloroethylene	µg/l	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	10.00		1.00
total dry solids (180øC)	mg/l	491.765	740	740													3500			
THM total	µg/l	2	2	2	2	2		2			2	2	2	2	2	2	2			
total organic carbon	mg/l	3.60556	5.165	6.1	8.7	27	11	10	8.8		6.5	6.8	6.5	6.8	6.8	7.1	4.8			0.50
total oxidised nitrogen	mg/l as N	7.315	11.135	13.6	27.6	7.49	8.12	8.88	10.4		7.71	8.39	12	8.39	8.39	7.94	9.3			5.00
triphenyltin compounds (as tryphenyltin cation)	µg/l TPT	0.001	0.001	0.001	0.001			0.001											0.1 µg/l and 0.5 µg/l total pesticides	
total phosphorus	mg/l	0.37944	0.6585	0.99	0.65	0.63	0.65	0.64	1.5		0.61	0.61	0.74	0.61	0.61	0.77	0.99			0.01
suspended solids @ 105øC	mg/l	10.3235	23.2	28													44			
tritium	Bq/l	4.70588	5	5	5	5		5			5	5	5	5	5	5	5		100 Bq/l	
triallate	µg/l	0.01294	0.026	0.05	0.01			0.01											0.1 µg/l and 0.5 µg/l total pesticides	
triazophos	µg/l	0.01	0.01	0.01	0.01			0.01											0.1 µg/l and 0.5 µg/l total pesticides	
tebuconazole	µg/l	0.025	0.025	0.025													0.025		0.1 µg/l and 0.5 µg/l total pesticides	
tributyl phosphate	µg/l	0.01	0.01	0.01	0.03			0.09											0.1 µg/l and 0.5 µg/l total pesticides	
terbutryn	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00		0.02
tetra & trichloroethane total	µg/l	0.5	0.5	0.5	0.5	0.5		0.5			0.5	0.5	0.5	0.5	0.5	0.5	0.5			
tecnazene	µg/l	0.01	0.01	0.01	0.01			0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
tebuthiuron	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
trifluralin	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	2.50	0.1 µg/l and 0.5 µg/l total pesticides	0.02
thiobendazole	µg/l	0.05	0.05	0.05	0.05			0.05												
trichlorobenzenes	µg/l	0.23333	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.2			0.40
trichloroethylene	µg/l	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	10.00		1.00
trichloromethane (chloroform)	µg/l	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.40	100 µg/1 (1 of 4 THMs)	1.00
titanium dissolved	µg/l	0.75	2	2.4													2			
titanium total	µg/l	4	11	11													9.6			
toluene	µg/l	0.12778	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	13.6	0.5	0.5	0.5	0.05	74.00		0.10
DHC toluene	µg/l	0.05294	0.06	0.1	0.05	0.1		0.2									0.05			
triclopyr	µg/l	0.01	0.01	0.01	0.02	0.01		0.03									0.01		0.1 µg/l and 0.5 µg/l total pesticides	
triclosan	µg/l	0.005	0.005	0.005	0.005	0.005	0.01	0.005	0.005		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.10		0.01
DHC tetradecane	µg/l	0.05	0.05	0.05	0.05	0.05		0.05									0.05			
turbidity	NTU	7.41176	17	17	39	19		64			24	13	20	13	13	23	19		4 NTU	
uranium total	µg/l	5	5	5													5			
vanadium dissolved	µg/l	5	5	5	5			5									5			
vanadium total	µg/l	5	5	5	5			5									5			

Determinand		Culham			TWUL Walton	TWUL Hampton	TWUL Surbiton	Teddington	Kew Bridge	Kingston	Hambleden	Cookham	AfW Sunnymeads	AfW Egham	Chertsey	AfW Walton	Maple Durham	WFD EQS	PCV	LOD
	Units	Mean	95th %ile	Max	Mean															
tungsten dissolved	µg/l	5	5	5	5	5		5									5			
tungsten total	µg/l	5	5	5	5	5		5									5			
zinc dissolved	µg/l	3.425	7.8	7.8	29	15	10	49	14		6.7	15	38	15	15	40	4.7	10.90		0.50
zinc total	µg/l	7.77778	17.8	28	58	37	52	54	47		12	44	78	44	44	47	9.8			0.50
alpha activity, total	Bq/l	0.01353	0.032	0.04	0.1	0.03		0.03			0.03	0.03	0.03	0.03	0.03	0.01	0.03		gross alpha activity 0.1 Bq/1	
alpha-HCH	µg/l	0.01	0.01	0.01													0.01		0.1 µg/l and 0.5 µg/l total pesticides	
beta activity, total	Bq/l	0.26059	0.862	0.99	0.42	0.45		0.31			0.14	0.28	0.29	0.28	0.28	0.42	0.45		gross beta activity 1 Bq/1	
beta-HCH	µg/l	0.01	0.01	0.01													0.01		0.1 µg/l and 0.5 µg/l total pesticides	
delta-HCH	µg/l	0.01	0.01	0.01													0.01		0.1 µg/l and 0.5 µg/l total pesticides	
gamma-HCH	µg/l	0.01	0.01	0.01	0.01	0.01		0.01									0.01			
BTEX (benzene, toluene, ethylbenzene & o,p-xylene	µg/l	0.30244	0.5	0.5	0.5	0.5		0.5									0.5			
BTEX (benzene, toluene, ethylbenzene & o,p-xylene	µg/l	0.30244	0.5	0.5	0.5	0.5		0.5									0.5		1 µg/l (benzene)	
o,p'-DDD	µg/l	0.005	0.005	0.005	0.005	0.005		0.005			0.005	0.005	0.005	0.005	0.005	0.005	0.005			
o,p'-DDE	µg/l	0.01	0.01	0.01	0.01	0.01		0.01			0.01	0.01	0.01	0.01	0.01	0.01	0			
1,1,1-trichloro-2-(2-chlorophenyl)-2-(4-chlorophenyl)ethane	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.07	0.09		0.18	0.03	0.11	0.03	0.03	0.09	0.01		0.1 µg/l and 0.5 µg/l total pesticides	0.02
pH	pH units	8.07778	8.23	8.4	8.4	8.3	8.4	8.3	8.4		8.2	8.3	8.4	8.3	8.3	8.4	8.5	6 to 9		0.1 pH unit
1,1-dichloro-2,2-bis(4-chlorophenyl)ethane	µg/l	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005		0.005	0.005	0.005	0.005	0.005	0.005	0.005		0.1 µg/l and 0.5 µg/l total pesticides	0.02
p,p'-DDE	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01
1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane	µg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01		0.01		0.1 µg/l and 0.5 µg/l total pesticides	0.02


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