# Revised Draft Water Resources Management Plan

## Technical Appendix R – Scheme Dossiers

# Contents

## Figures



## Tables

# Background and Introduction

This document is an appendix to Section 7 of the WRMP documents. The document provides a summary of each constrained list option. A summary is also provided for network reinforcement and raw water network elements which are required to support a constrained list option. The second part of this appendix provides a summary of demand options.

Appendix R Scheme Dossiers provide:

- List of Constrained List options, these are options which passed:
  - Feasibility Assessment Stages 1, 2, 3, and Validation
  - Further Screening
- A summary of each option on the Constrained List
- A summary of each demand option

All Constrained List options and demand options were included in the WRSE investment model.

### Structure of Appendix

This appendix provides a high-level description of the options that have been included in the Constrained List for our 2024 Water Resources Management Plan. The appendix is in two sections; the first section describes our options to provide additional water resources and the second section describes our options to reduce demand for water.

### Changes between draft WRMP24 and revised draft WRMP24:

Following feedback from Environment agency, we have included Drought Permit Scheme Dossiers.

R.1 *Note on terminology:*

- At WRMP19 the terminology 'Reuse' was used, the terminology at WRMP24 has moved on to be 'Water Recycling'. The WRMP documents refer to options as recycling options however WRSE IDs refer to reuse as these were defined before this change in terminology. The terms Reuse and Recycling can be considered interchangeably.
- At WRMP19 the terminology Abingdon Reservoir was used, this has been further developed and is now referred to as South East Strategic Reservoir Option (SESRO). When referring to different reports and information it is necessary to refer to both these names. In reading the WRMP documents Abingdon Reservoir and SESRO are used interchangeably and refer to the same option.

# Supply options: Scheme dossiers

## Introduction

R.2 Appendix R – Scheme Dossiers should be read in conjunction with the following reports as detailed in Figure R-1.

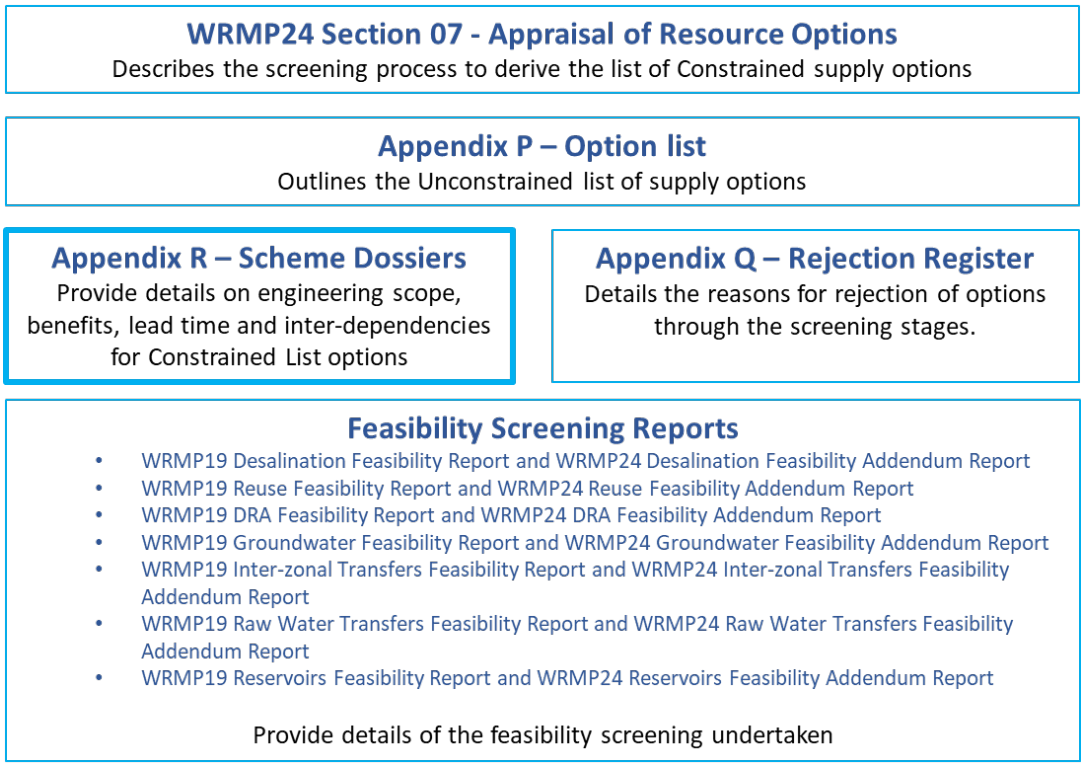



Figure R-1: Overview of draft WRMP24 Supply options reports

R.3 This section provides a high level description of the elements that form our water resource options that have been included in the Constrained List for our draft Water Resources Management Plan 2024.

R.4 Firstly, resource elements are described, followed by the system elements that are required for delivering the additional resource into the distribution network. Following this introduction, the structure of this section is as follows:

- Overview of Constrained List Elements
- Desalination
- Raw water transfers
- Water Recycling
- Direct River Abstraction
- Raw Water Purchase
- Inter-company transfers
- Inter-zonal transfers
- Groundwater
- Reservoirs
- Raw water conveyance
- Catchment management
- Water treatment works
- Network reinforcement

## Overview of Constrained List Elements

R.5 An overview of the elements included in the Constrained List and how they can be combined to provide water resources options is shown in Table R-1 for the London Water Resources Zone (WRZ). Table R-2 show the elements required for reinforcement of the London raw water system and the London transmission network depending upon whether resources are supplied from the east of London or the west of London. Selection of these elements is dependent of which combination of resource elements are selected and if water is supplied into the east or west of London. Once resource elements are selected by the WRSE investment model, Table R-2 and Table R-3 are used to define which raw water network and network reinforcement elements are required.

R.6 Table R-4 shows the elements included in the Constrained List for Thames Valley WRZs covering:

- Guildford WRZ
- Henley WRZ
- Kennet Valley WRZ
- Slough Wycombe and Aylesbury (SWA) WRZ
- Swindon and Oxfordshire (SWOX) WRZ

R.7 Options included in the Best Value Plan are presented in revised draft WRMP24, Section 11.

| Option Type | Resource Element | | Conveyance Element | | Raw Water System | Treatment Element | Network Element |
|---|---|---|---|---|---|---|---|
| | Location | DO DYAA Ml/d | Location | Nominal Capacity Ml/d | | Location | |
| Water reuse | Deephams | 42 | Deephams to KGV | 60 | See raw water system matrix | East London | See network reinforcement matrix |
| | | | Deephams to TLT extension | | | | |
| | Beckton 50 Ml/d | 46 | Beckton to Lockwood shaft | 800 | | East London | |
| | Beckton 100 Ml/d | 89 | | | | | |
| | Beckton 150 Ml/d | 130 | | | | | |
| | Beckton 200 Ml/d | 172 | | | | | |
| | Beckton 300 Ml/d | 252 | | | | | |
| | Reuse Mogden - 150 Ml/d | 130 | Mogden to Walton | 150 | | Kempton | |
| | Reuse Mogden - 100 Ml/d | 88 | | | | | |
| | Reuse Mogden - 50 Ml/d | 46 | | | | | |
| | Reuse Mogden S Sewer - 25 Ml/d | 23 | N/A | | | Kempton | |
| DRA | Teddington DRA – 50 Ml/d | 46 | Teddington Outfall | 75 | See raw water system matrix | Kempton & East London | See network reinforcement matrix |
| | Teddington DRA – 75 Ml/d | 67 | Teddington to Thames Lee Tunnel | 75 | | | |
| Raw Water Transfer | Vyrnwy | 29/43/57/78/86/103 | Deerhurst to Culham | 300/400/500 | See raw water system matrix | Kempton | See network reinforcement matrix |
| | Netheridge to River Severn | 24 | | | | | |
| | Minworth (Phase 1 and 2) | 70 | | | | | |
| | Oxford Canal | 10.3 | N/A | | | | |
| Desalination | Beckton Desalination - 150 Ml/d | 133 | N/A | | N/A | N/A | See matrix plus Beckton to Coppermills |
| | Beckton Desalination – 100 Ml/d | 89 | | | | | |
| | Beckton Desalination – 50 Ml/d | 44 | | | | | |
| | Crossness Desalination (Blended) – 300 Ml/d | 267 | N/A | | Beckton-Crossness | N/A | As above plus Crossness to Beckton |
| | Crossness Desalination (Blended) – 250 Ml/d | 222 | | | | | |
| | Crossness Desalination (Blended) – 200 Ml/d | 178 | | | | | |
| | Crossness Desalination (Blended) – 150 Ml/d | 133 | | | | | |
| | Crossness Desalination (Blended) – 100 Ml/d | 89 | | | | | |
| | Crossness Desalination (Blended) –50 Ml/d | 44 | | | | | |
| New Reservoir | SESRO / Abingdon Reservoir - 150 Mm³ | 271 | N/A | | See raw water system matrix | Kempton | See network reinforcement matrix |
| | SESRO / Abingdon Reservoir - 125 Mm³ | 230 | | | | | |
| | SESRO / Abingdon Reservoir - 100 Mm³ | 185 | | | | | |
| | SESRO / Abingdon Reservoir - 75 Mm³ | 149 | | | | | |
| | SESRO / Abingdon Reservoir Phased - 80 + 42 Mm³ | 224 Ml/d (155.1 + 68.9) | | | | | |
| | SESRO / Abingdon Reservoir Phased – 30 + 100 Mm³ | 238 Ml/d (65.5 + 173.1) | | | | | |
| | Chinnor Reservoir 30 Mm3 | 66 | | | | Kempton | |
| | Marsh Gibbon Reservoir - 75 Mm³ | 149 | | | | Kempton | |
| | Marsh Gibbon Reservoir - 50 Mm³ | 103 | | | | | |
| | Marsh Gibbon Reservoir - 30 Mm³ | 66 | | | | | |
| Aquifer Recharge | AR/SLARS - Kidbrooke (SLARS1) | 8 | N/A | | N/A | N/A | N/A |
| | AR Merton (SLARS3) | 6 | | | | | |
| | AR Streatham (SLARS2) | 7 | | | | | |
| Aquifer Storage and Recovery | ASR South East London (Addington) | 3 | N/A | | N/A | N/A | N/A |
| | ASR Thames Valley/Thames Central | 3 | | | | | |
| | ASR Horton Kirby | 5 | | | | | |
| Groundwater | GW - Addington | 2.7 | N/A | | N/A | N/A | N/A |
| | GW - London Confined Chalk (north) | 2 | | | | | |
| | GW - Southfleet/Greenhithe (new WTW) | 8.8 | | | | | |
| | GW - New River Head Removal of Constraints | 3 | | | | | |
| | GW - Honor Oak | 1.4 | | | | | |
| | Honor Oak Increase DO | 1.7 | | | | | |
| Raw Water Purchase | Didcot Raw Water Purchase | 22.6 | N/A | | See raw water system matrix | Kempton | See network reinforcement matrix |
| | Lower Thames Licence Trade | 50 | N/A | | | | |
| Catchment Management | Bean Wellfield (Groundwater) | 0.1 | N/A | | N/A | N/A | N/A |
| | Green Street Green (Groundwater) | 0.3 | | | | | |
| | Wilmington (Groundwater) | 0.2 | | | | | |
| Inter-co. transfers | | | Cheam to Murton | 15 | N/A | N/A | N/A |
| | | | Woodmansterne WTW to Epsom Downs | 10 | | | |

Table R-1: Constrained List Elements – London WRZ

| Additional Raw Water Resource in West (Ml/d) | Additional raw Water Resource in East (Ml/d) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| 0 | - | 3 | 1,3,5 | 1-3,5,6 | 1-3, 5, 6 | 1-3, 5, 6 | 1-3, 5, 6 | 1-3, 5, 6 | 1-3, 5, 6 |
| 100 | - | 3 | 1,3,5 | 1-3,5,6 | 1-3, 5, 6 | 1-3, 5, 6 | 1-3, 5, 6 | 1-3, 5, 6 | |
| 200 | | 3 | 1,3,5 | 1-3,5,6 | 1-3, 5,6 | 1-3, 5, 6 | 1-3, 5, 6 | | |
| 300 | | 3 | 1,3,5 | 1-3,5,6 | 1-3, 5, 6 | 1-3, 5, 6 | | | |
| 400 | 7 | 3,7 | 1,3,5,7 | 1-3,5-7 | 1-3, 5-7 | | | | |
| 500 | 7/8,10 | 3,7/8,10 | 1,3,5,7/8,10 | 1-3,5-7/8,10 | | | | | |
| 600 | 7/8,10 | 3, 7/8,10 | 1,3,5,7/8,10 | | | | | | |
| 700 | 7/8,10 | 3, 7/8,10 | | | | | | | |
| 800 | 7/8,10 | | | | | | | | |

Table R-2: Raw water system reinforcement requirements for additional water resources in East or West London

East London

1) King George V Reservoir intake capacity increase
2) Chingford South (above Chingford Mill) intake capacity increase
3) TLT extension from Lockwood PS to King George V Reservoir intake
4) TLT upgrade to remove existing constraints to maximise transfer capacity (not shown in table)
5) Additional conveyance from King George V Reservoir to break tank
6) Second Spine Tunnel from break tank to Reservoir 5 upstream of Coppermills WTW

West London

7) Datchet intake capacity increase with transfer to Queen Mother and Wraysbury Reservoirs
8) Littleton intake capacity increase with transfer to Queen Mary
9) Surbiton intake capacity increase with transfer to Walton inlet channel (not shown in table)
10) Additional conveyance from Queen Mary Reservoir to Kempton WTW

| West (Ml/d) | East (Ml/d) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| 0 | - | - | 5 | 4,5 | 4,5 | 4,5 | 4,5 | 1,4,5 | 1,4,5 |
| 100 | 1 | 1 | 3,4,5 | 3,4,5 | 3,4,5 | 3,4,5 | 4,5 | 1,4,5 | |
| 200 | 1,3 | 1,3 | 3,4 | 3,4,5 | 3,4,5 | 3,4,5 | 3,4,5 | | |
| 300 | 1,3 | 1,3 | 1,3,4 | 3,4,5 | 3,4,5 | 3,4,5 | | | |
| 400 | 1,3 | 1,3 | 1,3,5 | 3,4,5 | 3,4,5 | | | | |
| 500 | 1,3,5,6 | 1,3,5,6 | 1,3,5 | 1,3,5 | | | | | |
| 600 | 1,2,3,5,6 | 1,3,5,6 | 1,3,5,6 | | | | | | |
| 700 | 1,2,3,5,6 | 1,2,3,5,6 | | | | | | | |
| 800 | 1,2,3,5,6 | | | | | | | | |

Table R-3: Network reinforcement requirements for additional water resources treated in East or West London

R.8 The network reinforcement requirements identified are:

1) Replace New River Head Pump 4
2) Replace Barrow Hill Pump 6
3) TWRM extension – Hampton to Battersea
4) TWRM level controlled by new header tank at Coppermills WTW and pumping station
5) TWRM extension – Coppermills to Honor Oak
6) Resolve issues with supply to Surbiton during TWRM outage

R.9 Additional network reinforcement elements have been identified that are specific for individual options. These include:

- Tunnel from Beckton to Coppermills WTW for blending of water from Beckton and Crossness desalination options
- Tunnel from Crossness desalination plant site to Beckton to extend the Beckton-Coppermills tunnel to Crossness so that it can transfer resource from the proposed desalination plant at Crossness
- New shaft on the TWRM at Kempton is required the first phase of additional treatment

R.10 Since draft WRMP24 further water balance modelling has been undertaken for London WRZ and identified potential network constraints and associated local deficits which would require network upgrades before 2040. The water balance modelling has identified the following potential network upgrades.

- Merton TWRM Shaft to Hampton 36 Flow Monitoring Zone (FMZ)
- Kempton WTW to Merton TWRM Shaft
- Battersea TWRM Shaft to Nunhead Service Reservoir
- Coppermills 70” Tunnel to Woodford FMZ
- Coppermills WTW to Finsbury Park and Woodford C FMZs
- Woodford PS to Chigwell Service Reservoir
- Park Lane TWRM Shaft to Putney Service Reservoir
- Brookfield Lane (Cheshunt) Pumping Station to Hoddesdon Service Reservoir
- Streatham TWRM Shaft to Norwood Service Reservoir

| | Option Type | Resource Element Location | Resource Element DO Ml/d ADPW | Conveyance Element Location | Conveyance Element Nominal Capacity Ml/d | Raw Water System | Treatment Element Location | Network Element Location |
|---|---|---|---|---|---|---|---|---|
| Swindon & Oxfordshire (SWOX) | Raw Water Transfer | Severn Thames Transfer (See London WRZ for support elements) | See London Constrained list table | Deerhurst to Culham | 300<br>400<br>500 | N/A | Radcot WTW 24 Ml/d each phase | Transfers to service reservoir included in WTW elements |
| | | Oxford Canal | 12 | Dukes Cut to Farmoor | 15 | | | |
| | New Reservoir | SESRO / Abingdon Reservoir - 150 Mm3 | 271 | Abingdon to Farmoor Reservoir (if treatment capacity not required | 24 | N/A | | |
| | | SESRO / Abingdon Reservoir - 125 Mm3 | 230 | | | | | |
| | | SESRO / Abingdon Reservoir - 100 Mm3 | 185 | | | | | |
| | | SESRO / Abingdon Reservoir - 75 Mm3 | 149 | | | | Abingdon SWOX WTW (if treatment capacity rqd) 24 Ml/d each phase | Transfers to service reservoir included in WTW elements |
| | | SESRO / Abingdon Reservoir Phased - 80 + 42 Mm3 | 224 Ml/d (155.1 + 68.9) | | | | | |
| | | SESRO / Abingdon Reservoir Phased – 30 + 100 Mm3 | 238 Ml/d (65.5 + 173.1) | | | | | |
| | | Chinnor Reservoir 30 Mm3 | 66 | N/A | | | TBC | TBC |
| | | Marsh Gibbon Reservoir - 75 Mm3 | 149 | | | | | |
| | | Marsh Gibbon Reservoir - 50 Mm3 | 103 | | | | | |
| | | Marsh Gibbon Reservoir - 30 Mm3 | 66 | | | | | |
| | Groundwater | Woods Farm Increase DO | 2.9 | N/A | | N/A | N/A | N/A |
| | | GW - Moulsford 1 | 3.5 | N/A | | N/A | N/A | N/A |
| | Removal of constraints to DO | Ashton Keynes borehole pumps | 2.04 | N/A | | N/A | N/A | N/A |
| | Inter-zonal transfers | | | Henley to SWOX | 2.4 | N/A | N/A | N/A |
| | | | | | 5 | | | |
| | | GW - Mortimer disused source | 4.5 | Kennet Valley to SWOX | 6.7 | | | |
| | | | | | 2.3 | | | |
| Slough, Wycombe & Aylesbury (SWA) | Raw Water Transfer | Severn Thames Transfer# (See London WRZ for support elements) | See London Constained list table | Deerhurst to Culham | 300/400/500 | N/A | Abingdon SWA WTW | Abingdon to north SWA |
| | | | | | | New intake 80 / 53 | Medmenham WTW | Transfers to service reservoir included in WTW elements |
| | | Oxford Canal | 12 | | | | | |
| | New Reservoir# | SESRO / Abingdon Reservoir - 150 Mm3 | 271 | N/A | | N/A | Abingdon SWA WTW | Abingdon to north SWA |
| | | SESRO / Abingdon Reservoir - 125 Mm3 | 230 | | | | | |
| | | SESRO / Abingdon Reservoir - 100 Mm3 | 185 | | | | | |
| | | SESRO / Abingdon Reservoir - 75 Mm3 | 149 | | | New intake 80 / 53 | Medmenham WTW | Transfers to service reservoir included in WTW elements |
| | | SESRO / Abingdon Reservoir Phased - 80 + 42 Mm3 | 224 Ml/d (155.1 + 68.9) | | | | | |
| | | SESRO / Abingdon Reservoir Phased – 30 + 100 Mm3 | 238 Ml/d (65.5 + 173.1) | | | | | |
| | | Chinnor Reservoir 30 Mm3 | 66 | N/A | | New intake 80 / 53 | Medmenham WTW | |
| | | Marsh Gibbon Reservoir - 75 Mm3 | 149 | N/A | | | | |
| | | Marsh Gibbon Reservoir - 50 Mm3 | 103 | | | | | |
| | | Marsh Gibbon Reservoir - 30 Mm3 | 66 | | | | | |
| | Raw Water Purchase | Didcot | 22.6 | N/A | | New intake 80 / 53 | Medmenham WTW | Transfers to service reservoir included in WTW elements |
| | Groundwater | Taplow Increase DO | 5.7 | N/A | | N/A | N/A | N/A |
| | | Datchet Increase DO | 6.2 | | | | | |
| | | Dorney Increase DO | 4.3 | | | | | |
| | Inter-zonal transfers | | | Henley to SWA | 2.4 / 5 | N/A | N/A | N/A |
| Guildford | Groundwater | Dapdune licence disaggregation | 2.2 | N/A | | N/A | N/A | N/A |
| | Removal of constraints to DO | Dapdune removal of constraints | 1 | N/A | | N/A | N/A | N/A |
| | Inter-co. transfers | | | SouthEast Water to Guildford | 10 | N/A | N/A | N/A |
| | | | | SES Reigate to Guildford | 5 | | | |
| | | | | | 20 | | | |
| Kennet Valley | Groundwater | GW - Mortimer disused source (recommission) | 4.5 | N/A | | N/A | N/A | N/A |
| | Removal of constraints to DO | East Woodhay borehole pumps | 2.1 | N/A | | N/A | N/A | N/A |
| | Inter-zonal transfers | | | T2ST KV Spur: Culham to Newbury (Potable) | 10 | N/A | N/A | N/A |

Table R-4: Constrained List Elements – Thames Valley WRZs

R.11 Since draft WRMP24 we have carried out initial analysis of the 2022 drought specific learnings in relation to our abstractions from the Lower Thames and the benefits. This analysis has revealed that constraints may exist on the Lower Thames which mean that, during times of low flow, we are not able to abstract water sufficient volumes to allow us to hit the 300 Ml/d Teddington Target Flow. The modelling identified the following potential raw water system upgrades to address these constraints:

- A new river abstraction from the River Thames near Teddington and transfer to Queen Mary Reservoir
- A new river abstraction from the River Thames near Surbiton and transfer to Queen Mary Reservoir
- A new river abstraction from the River Thames near Walton and transfer to Queen Mary Reservoir

R.12 More detailed modelling and option assessment will be undertaken to confirm the raw water system upgrades needed to address both the learning from 2022 drought and the future impacts associated with the River Thames flood relief scheme.

## Element references

R.13 At WRMP19 each resource element was allocated a unique reference. The element references comprised an element type, sub-type, location and size (where there is more than one size variant). Table R-5 provides a list of WRMP19 abbreviations used for element references.

| Type | Sub-type | Location |
|---|---|---|
| RES (Resource) | DES (Desalination) | BEC (Beckton) |
| | | CRO (Crossness) |
| | RWTS (Raw Water Transfer Support) | MIN (Minworth) |
| | | NTH (Netheridge) |
| | | OXC-CRP (Oxford Canal to Cropredy) |
| | | OXC-DKC (Oxford Canal to Duke's Cut) |
| | | VYR (Vyrnwy) |
| | | WYE (Wye) |
| | RU (Recycling) | BEC (Beckton) |
| | | DPH (Deephams) |
| | WRP (Raw Water Purchase) | DID (Didcot) |
| | | CHD (Chingford) |
| | ICT (Inter-Company Transfer) | SEW-GUI-MNT (South East Water to Guildford, Mount Service Reservoir) |
| | | WSX-FLX (Wessex Water to SWOX, Flaxlands Service Reservoir) |
| | IZT (Inter-Zonal Transfers) | HEN-SWA-HAM (Henley to SWA, Hambleden WTW) |
| | | HEN-SWX-NET (Henley to SWOX, Nettlebed) |

| Type | Sub-type | Location |
|---|---|---|
| | | KEN-SWOX-CLV (Kennet Valley to SWOX, Cleeve) |
| | AR (Artificial Recharge) | SLARS (South London Artificial Recharge Scheme) |
| | ASR (Aquifer Storage and Recovery) | HTK (Horton Kirby) |
| | | SEL (South East London) |
| | | TV (Thames Valley) |
| | GW (Groundwater) | ADD (Addington) |
| | | DAP (Dapdune) |
| | | DAT (Datchet) |
| | | HON (Honor Oak) |
| | | LCC (London Confined Chalk) |
| | | MOR (Mortimer) |
| | | MOU (Moulsford) |
| | | SOU (Southfleet/Greenhithe) |
| | RC (Removal of Constraints) | ASH (Ashton Keynes) |
| | | DAP (Dapdune) |
| | | DAT (Datchet) |
| | | EPS (Epsom) |
| | | EWO (East Woodhay) |
| | | LAD (Ladymead) |
| | | MTN (Merton) |
| | | NRV (New River Head) |
| | RRR (Reservoir) | ABI (Abingdon) |
| CON (Conveyance) | RU (Recycling) | BEC-LCK (Beckton to Lockwood) |
| | | DPH-KGV (Deephams to King George V) |
| | | DPH-TLTEX (Deephams to TLT extension) |
| | RWS (Raw Water Systems) | ABI-FMR (Abingdon to Farmoor) |
| | | BEC-CRO (Beckton to Crossness) |
| | | BT-COP (Break tank to Coppermills) |
| | | CHS (Chingford South intake) |
| | | DAT (Datchet intake) |
| | | DKC-FMR (Duke's Cut to Farmoor) |
| | | KGV (KGV Reservoir intake) |
| | | LCK-KGV (Lockwood PS to KGV Intake) |

| Type | Sub-type | Location |
|---|---|---|
| | | LTN (Littleton intake) |
| | | MMM (Medmenham intake) |
| | | QMR-KEM (Queen Mary Reservoir to Kempton WTW) |
| | | SUR (Surbiton intake) |
| | | TLT-UPG (Thames Lee Tunnel Upgrade) |
| | RWT (Raw Water Transfers) | DEH-CLM (Deerhurst to Culham) |
| WTW (Water Treatment Works) | LON (London) | COP (Coppermills) |
| | | KEM (Kempton) |
| | SWA (Slough, Wycombe & Aylesbury) | MMM (Medmenham) |
| | SWOX (Swindon and Oxford) | ABI (Abingdon) |
| | | ABI-SWA (Abingdon to SWA) |
| | | RAD (Radcot) |
| NET (Network Reinforcement) | DES (Desalination) | BEC-COP (Beckton to Coppermills) |
| | | CRO-BEC (Crossness to Beckton) |
| | GUI (Guildford) | SFD-NML (Shalford to Netley Mill) |
| | IZT (Inter-Zonal Transfers) | AB-LC (Abingdon to Long Crendon) |
| | TWRM (Thames Water Ring Main) | BAR-PUM (Barrow Hill Pump) |
| | | COP-HEA (Coppermills Header Tank) |
| | | COP-HON (Coppermills WTW to New Honor Oak SR) |
| | | COP-PS (Coppermills Pumping Station) |
| | | HAM-BAT (Hampton WTW to Battersea) |
| | | KEM (Kempton WTW New shaft) |
| | | NRV-PUM (New River Head Pump) |

Table R-5: Abbreviations used for element references (WRMP19)

R.14 The option references have been updated for WRMP24 to align with the Water Resources South East (WRSE) naming convention. Table R-6 summarises the abbreviations used for the element references for WRSE and WRMP24.

R.15 For some elements we have included the ability to bring the option online in phases, these are options which can be built in a modular way, which gives us flexibility to meet incremental increases in need over time. The WRSE ID may include P1, P2 etc to denote the phasing. The phasing also allows alternative capacities of both phase 1 and subsequent phases. In the option dossiers the WRSE ID has been simplified to remove P1, P2 etc and the potential phasing is described in the dossier.

R.16 The first phase of delivery of large options has been split into planning, development and construction stages, denoted by PLA, DEV and CNO in the WRSE ID. In the option dossiers this has been simplified to a single WRSE ID with XXX replacing PLA, DEV and CNO.

R.17 The planning and development stages are common across all capacities of phase 1. Later phases have not been split into these 3 stages and this is denoted in the WRSE ID by ALL. Likewise options which have not been split into planning, development and construction stages are denoted by ALL in the WRSE ID.

R.18 Beckton Recycling is an example of an option where the WRSE ID has been simplified in the dossier. This option has planning, development and construction stages and options for a first phase of 50 Ml/d, 100 Ml/d or 150 Ml/d, followed by further phases of 50 Ml/d, 100 Ml/d or 150 Ml/d up to a combined limit of 300 Ml/d. The full list of WRSE IDs is:

- TWU_KGV_HI-REU_RE1_PLA_reuse beckton
- TWU_KGV_HI-REU_RE1_DEV_reuse beckton
- TWU_KGV_HI-REU_RE1_CNO_reuse beckton 50
- TWU_KGV_HI-REU_RE1_CNO_reuse beckton 100
- TWU_KGV_HI-REU_RE1_CNO_reuse beckton 150
- TWU_KGV_HI-REU_RE2_ALL_reuse beckton 50 p2
- TWU_KGV_HI-REU_RE2_ALL_reuse beckton 100 p2
- TWU_KGV_HI-REU_RE2_ALL_reuse beckton 150 p2

R.19 This has been simplified in the dossier to:

- TWU_KGV_HI-REU_RE1_XXX_reuse beckton 50
- TWU_KGV_HI-REU_RE1_XXX_reuse beckton 100
- TWU_KGV_HI-REU_RE1_XXX_reuse beckton 150

| Company code | WRZ code | Option Type ID | Element | Real Options stage |
|---|---|---|---|---|
| TWU : Thames Water | GUI : Thames, Guildford | HI-GRW : Groundwater | RE1 : first resource phase | PLA : Planning |
| | HEN : Thames, Henley | HI-IMP : Water import (raw or potable) | RE2 : subsequent resource phase | DEV : Development |
| | KVZ : Thames, Kennet Valley | HI-TFR : Water transfer (raw or potable) | CON : raw water conveyance | CNO : Construction and operation |
| | LON : Thames, London | HI-LRE : Loss reduction | WT1 : first water treatment phase | |
| | SWA : Thames, Slough, Wycombe and Aylesbury | HI-ROC : Removal of constraints | WT2 : subsequent water treatment phase | |
| | SWX : Thames, Swindon and Oxfordshire | HI-RSR : Reservoir | NET : network reinforcement | |
| | | HI-REU : Reuse | ALL : integrated option | |
| | | HI-RAB : River abstraction | | |
| | | HI-DES : Desalination | | |
| | | HI-OTH : Other | | |
| | | BG-CAT : Catchment management | | |
| | | BG-OTH : Other | | |

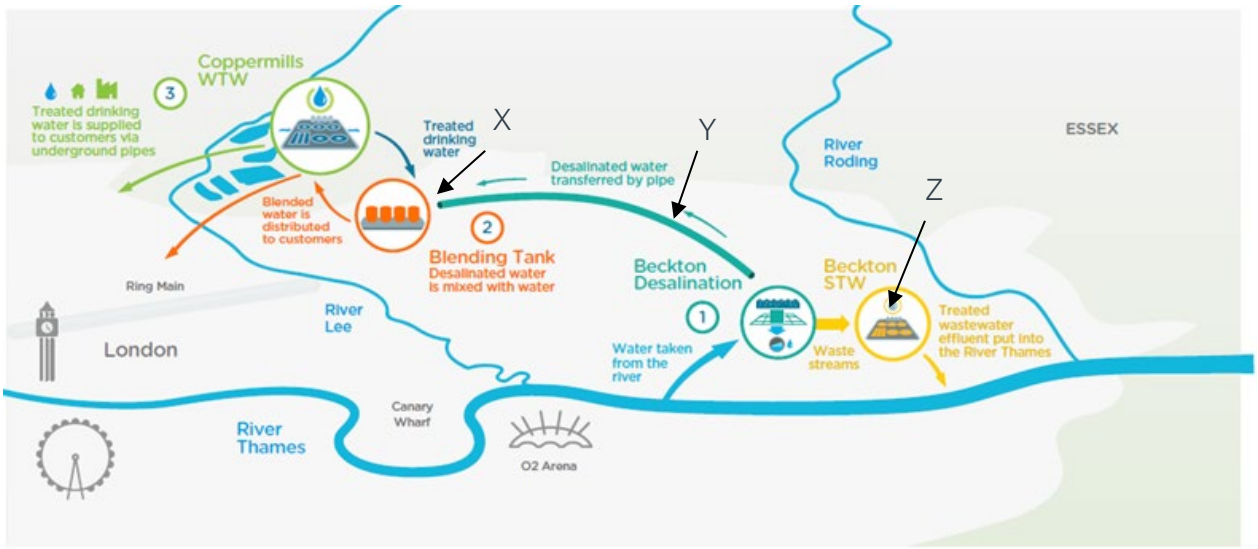
Table R-6: Abbreviations used for water resource element references (WRMP24)

# Desalination

## Beckton Desalination treatment plant

| Name | Desalination – Beckton Desalination treatment plant |
|---|---|
| WRSE ID | TWU_LON_HI-DES_ALL_XXX_beckton desal 150<br>TWU_LON_HI-DES_ALL_XXX_beckton desal 100<br>TWU_LON_HI-DES_ALL_XXX_beckton desal 50 |
| WRMP19 Reference | RES-DES-BEC-150 |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | Brackish estuarine water would be abstracted at low tide and used as raw water for the desalination plant. The new desalination plant will be located on land within the existing Beckton STW site. Treatment would include clarification, rapid gravity filters, ultrafiltration membranes, reverse osmosis, re-mineralisation, disinfection and final chemical treatment. The desalinated water would then be transferred via a tunnel to the Coppermills WTW Thames Water Ring Main (TWRM) shaft location and blended with potable treated water from Coppermills WTW prior to entering supply. |
| Engineering Components | Treatment works includes;<br>• Water abstracted through eel screens<br>• Storage reservoirs<br>• Clarification, and rapid gravity filters (RGF)<br>• Ultra-filtration (UF) membranes<br>• Multistage reverse osmosis (RO) membranes<br>• Water conditioning to add alkalinity and hardness<br>• Disinfection and final water chemical addition<br>• The waste streams from the clarifiers, RGF, UF membranes and the neutralised chemical cleaning wastewater would be pumped back to the Beckton STW inlet works for treatment<br>• Brine waste stream from the RO would be returned to the final effluent channel for blending prior to discharge in the River Thames |
| Phases/benefits | Beckton desalination can be developed in phases of 50, 100 or 150 Ml/d up to a maximum capacity of 150 Ml/d.<br><br>Capacity (Ml/d) / DO Benefits (Ml/d)<br>150 / 133<br>100 / 89<br>50 / 44<br><br>DO benefits above apply for 1 in 2 average, 1 in 500 average and 1 in 500 peak. |

| Name | Desalination – Beckton Desalination treatment plant |
|---|---|
| Lead times[1] | The lead time for each phase is 11 years. |
| Mutual Exclusivities | Deephams Reuse, Crossness Desalination, Beckton Desalination and Beckton Reuse are subject to a combined Tidal Thames Limit for desalination and recycling options of 366 Ml/d due to the impact on salinity in the river. [2] |
| Interdependencies/ Exclusivity | The Beckton desalination option is dependent on the following elements which would be constructed with the initial phase of Beckton desalination, with capacity for all phases:<br>• Beckton to Coppermills Tunnel (Conveyance of treated water to Coppermills WTW for blending and supply).<br>• New Header Tank and Pumping Station at Coppermills WTW<br>To provide an additional resource to London WRZ the following system element may also be required:<br>• Additional capacity in the Thames Water ring main |



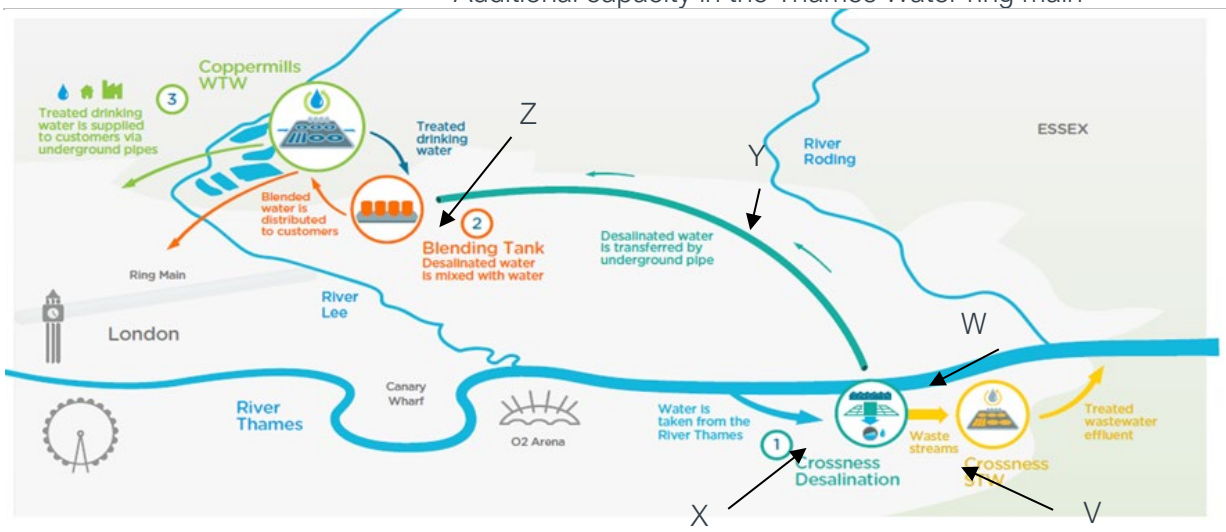

| | |
|---|---|
| X | New Header Tank and Pumping Station at Coppermills WTW |
| Y | Beckton to Coppermills Tunnel |
| Z | Beckton Desalination |

[1] Lead time is the time from starting to develop the option to be producing water this include the planning, development and construction period.
[2] Further work is ongoing to review the combined Tidal Thames Limit for desalination and reuse.

## Crossness Desalination treatment plant

| Name | Crossness desalination treatment plant |
|---|---|
| WRSE ID | TWU_LON_HI-DES_ALL_XXX_crossnessdesal50<br>TWU_LON_HI-DES_ALL_XXX_crossnessdesal100 |
| WRMP19 Reference | RES-DES-CRO-100 |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | Brackish estuarine water shall be abstracted at low tide and used as raw water for the desalination plant. The new phased construction of the desalination plant will be located on land to the south of the existing Crossness STW site. Treatment includes clarification, rapid gravity filters, reverse osmosis re-mineralisation and disinfection. The desalinated water will then be transferred via a tunnel to Beckton to then be transferred to the Coppermills WTW Thames Water Ring Main (TWRM) shaft location and blended with potable treated water from Coppermills WTW prior to entering supply. |
| Engineering Components | Treatment works key engineering components:<br>• Water abstracted through eel screens<br>• Storage reservoirs<br>• Clarification, and rapid gravity filters (RGF)<br>• Ultra-filtration (UF) membranes<br>• Multistage reverse osmosis (RO) membranes<br>• Water conditioning to add alkalinity and hardness<br>• Disinfection and final water chemical addition<br>• The waste streams from the clarifiers, RGF, UF membranes and the neutralised chemical cleaning wastewater will be pumped back to the Crossness STW inlet works for treatment<br>• Brine waste stream from the RO will be returned to the final effluent channel for blending prior to discharge in the River Thames |
| Phases/benefits | Crossness desalination can be developed in phases of 50 or 100 Ml/d up to a maximum capacity of 300 Ml/d<br>Capacity (Ml/d) / DO Benefits (Ml/d)<br>300 / 267<br>250 / 222<br>200 / 178<br>150 / 133<br>100 / 89<br>50 / 44<br>DO benefits above apply for 1 in 2 average, 1 in 500 average and 1 in 500 peak. |
| Lead Time | The lead time for each phase is 11 years. |

| Name | Crossness desalination treatment plant |
|---|---|
| Mutual exclusivities | Deephams Reuse, Crossness Desalination, Beckton Desalination and Beckton Reuse are subject to a combined Tidal Thames Limit for Desal and recycling options of 366 Ml/d due to the impact on salinity in the river.[3] |
| Interdependencies/ Exclusivity | The Crossness desalination option is dependent on the following elements:<br>• Beckton to Crossness tunnel (would be constructed with the initial phase of Crossness desalination)<br>• Crossness to Beckton Tunnel (would be constructed with the initial phase of Crossness desalination)<br>• Beckton to Coppermills Tunnel (Conveyance of treated water to Coppermills for blending and supply)<br>• New Header Tank and Pumping Station at Coppermills WTW<br>The above elements are sized to have sufficient capacity for all phases of Crossness desalination and do not need to be duplicated for later phases.<br>To provide an additional resource to London WRZ the following system elements may also be required:<br>• Additional capacity in the Thames Water ring main |




| | |
|---|---|
| V | Crossness Desalination |
| W | Crossness to Beckton Tunnel |
| X | Beckton to Crossness Tunnel |
| Y | Beckton to Coppermills Tunnel |
| Z | New Header Tank and Pumping Station at Coppermills WTW |

[3] Further work is ongoing to review the combined Tidal Thames Limit for desalination and reuse.

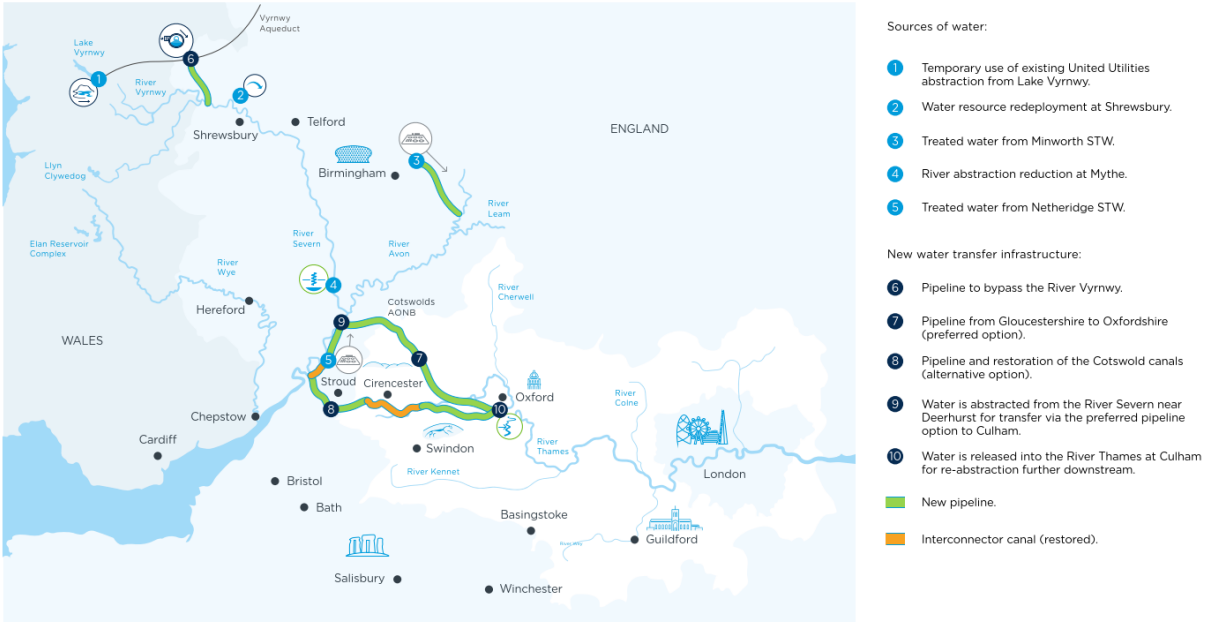
# Raw Water Transfers

## Minworth STW to River Avon 115 Ml/d

| Name | Minworth STW to River Avon 115 Ml/d |
|---|---|
| WRSE ID (separate ID have been given to the source elements for each different STT conveyance option) | For 300 Ml/d pipeline conveyance<br>TWU_STT_HI-REU_RE1_ALL_p7-300-minworth_115<br>TWU_STT_HI-REU_RE1_ALL_p11-300-min_115_p2<br>TWU_STT_HI-REU_RE1_ALL_p-300-minworth_all<br>For 400 Ml/d pipeline conveyance<br>TWU_STT_HI-REU_RE1_ALL_p7-400-minworth_115<br>TWU_STT_HI-REU_RE1_ALL_p11-400-min_115_p2<br>TWU_STT_HI-REU_RE1_ALL_p-400-minworth_all<br>For 500 Ml/d pipeline conveyance<br>TWU_STT_HI-REU_RE1_ALL_p7-500-minworth_115<br>TWU_STT_HI-REU_RE1_ALL_p11-500-min_115_p2<br>TWU_STT_HI-REU_RE1_ALL_p-500-minworth_all |
| WRMP19 Reference | RES-RWTS-MIN |
| Element Type | Resource |
| WRZ | LONDON / SWOX / SWA |
| Engineering Scope | This option involves the construction of an advanced water treatment plant and laying of a new pipeline from Minworth WwTW to the river Avon near Stoneleigh to allow transfer of up to 115 Ml/d for abstraction in the lower Severn at Deerhurst. Water would then be transferred through the Severn Thames Transfer (STT) to the River Thames. |
| Engineering Components | The element is offered by Severn Trent Water and includes all engineering works required to deliver the flow to the River Avon<br>• Tertiary treatment and intake after the treatment<br>• Pumping station at Minworth WTW<br>• Rising main<br>• An outfall to the River Avon |
| Phases/Benefits | Maximum capacity delivered at the discharge to the River Avon is 115 Ml/d and can be implemented in two phases of 58 Ml/d and 57 Ml/d. |

| | DO Benefits (Ml/d) | | |
|---|---|---|---|
| Capacity (Ml/d) | 1 in 2 average | 1 in 500 average | 1 in 500 peak |
| 115 | 74 | 74 | 103 |
| 58 | 37 | 37 | 53 |

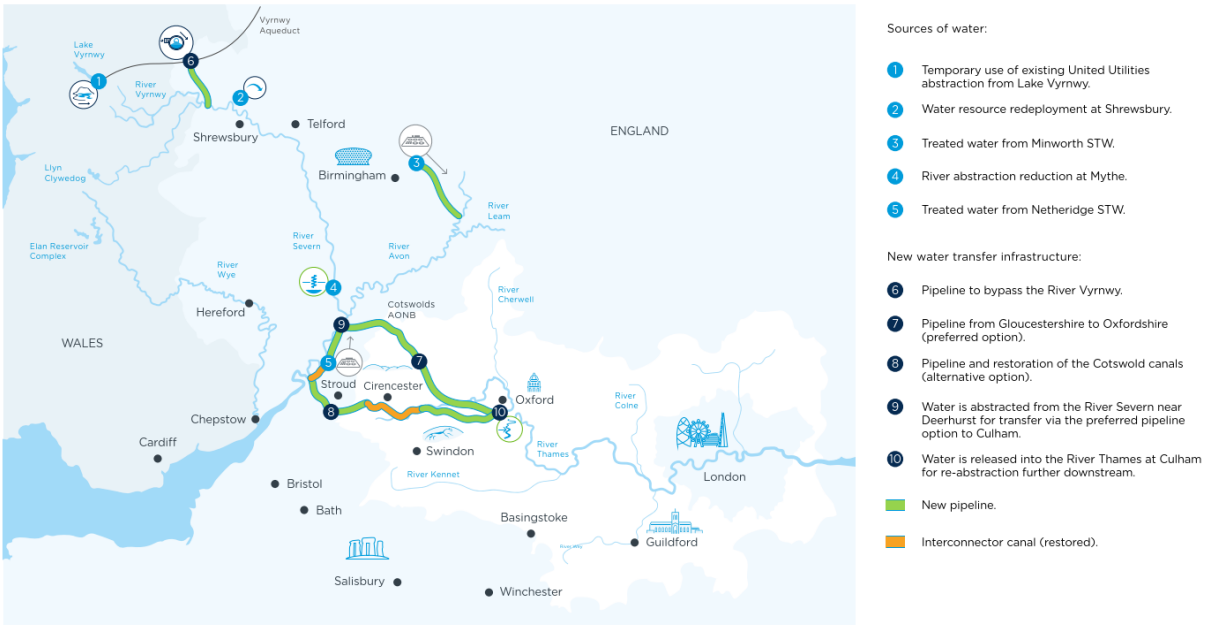
| Name | Minworth STW to River Avon 115 Ml/d |
|---|---|
| Lead Time | The lead time of the STT Deerhurst to Culham pipeline conveyance element is 10 years. Minworth can be delivered within this timescale. |
| Mutual exclusivities | None. |
| Interdependencies/ Exclusivity | Dependent on the provision of a conveyance i.e. – the Severn Thames Transfer pipeline.<br>Deerhurst to Culham (300 Ml/d) pipeline<br>Deerhurst to Culham (400 Ml/d) pipeline<br>Deerhurst to Culham (500 Ml/d) pipeline |




## Netheridge STW to River Severn 35 Ml/d

| Name | Netheridge STW to River Severn 35 Ml/d |
|---|---|
| WRSE ID (separate ID have been given to the source elements for each different STT conveyance option) | For 300 Ml/d pipeline conveyance<br>TWU_STT_HI-REU_RE1_ALL_p5-300-neth_p35<br>For 400 Ml/d pipeline conveyance<br>TWU_STT_HI-REU_RE1_ALL_p5-400-neth_p35<br>For 500 Ml/d pipeline conveyance<br>TWU_STT_HI-REU_RE1_ALL_p5-500-neth_p35 |
| WRMP19 Reference | RES-RWTS-NTH |
| Element Type | Resource |
| WRZ | LONDON / SWOX / SWA |
| Engineering Scope | Transfer of a 35 Ml/d of final effluent from Netheridge Sewage Treatment Works to the River Severn downstream of the proposed water intake at Deerhurst to replace water abstracted to the Severn Thames Transfer Deerhurst to Culham Pipeline. |

| Name | Netheridge STW to River Severn 35 Ml/d |
|---|---|
| Engineering Components | The element is offered by Severn Trent Water and includes all engineering works required to deliver the flow to the River Severn.<br>• Tertiary treatment and an intake manhole to enable the required flow to be directed to the Netheridge FE pumping station<br>• A pumping station which would pump the water from Netheridge STW to River Severn at Deerhurst;<br>• A rising main;<br>• An outfall to the River Severn.<br>Netheridge has the potential to support the sweetening flows through the Deerhurst to Culham pipeline by augmenting flows in the River Severn when base flows are below the 'Hands off Flow'. |
| Phases/Benefits | Maximum capacity delivered at the discharge to the River Severn is 35 Ml/d, which provides the following DO benefit:<br>• 24 Ml/d (1 in 2 average)<br>• 24 Ml/d (1 in 500 average)<br>• 34 Ml/d (1 in 500 peak) |
| Lead Time | The lead time of the Severn Thames Transfer Deerhurst to Culham Pipeline conveyance element is 10 years, Netheridge can be delivered in this timescale. |
| Mutual exclusivities | None. |
| Interdependencies/ Exclusivity | Dependent on the provision of a conveyance i.e., the Severn Thames Transfer pipeline.<br>Deerhurst to Culham (300 Ml/d) pipeline<br>Deerhurst to Culham (400 Ml/d) pipeline<br>Deerhurst to Culham (500 Ml/d) pipeline |

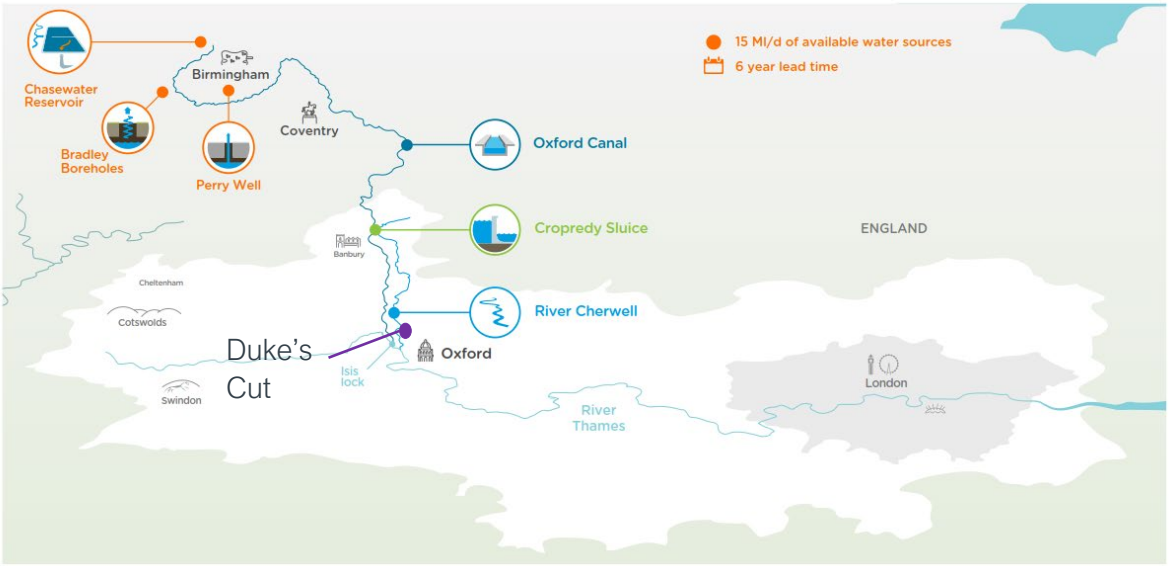


## Oxford Canal - BCN Surplus – Raw Water Transfer Resource (Cropredy)

| Name | Oxford Canal - BCN Surplus – Raw Water Transfer Resource (Cropredy) |
|---|---|
| WRSE ID | TWU_UTC_HI-IMP_UTC_XXX_oxcanal-cropredy |
| WRMP19 Reference | RES-RWTS-OXC-CRP-15 |
| Element Type | Resource |
| WRZ | LON / SWA |
| Engineering Scope | This element includes upgrades to the canal network to transfer 15 Ml/d surplus from the Wolverhampton Levels to Cropredy, where it is discharged to the River Cherwell for onward transfer to the River Thames. |
| Engineering Components | All engineering works provided by others – the Canal and River Trust (CRT), key elements including:<br>• Three new Pump Stations<br>• Rebuild two Pump Stations<br>• Bypass pipelines<br>• Bypass weirs |
| Phasing/Benefits | DO benefits of:<br>• 1 In 2 average: 10.3 Ml/d<br>• 1 In 500 average: 10.3 Ml/d<br>• 1 In 500 peak: 10.3 Ml/d |
| Lead Time | 7 years |
| Mutual exclusivities | This element is mutually exclusive with the Oxford Canal to Duke's Cut |
| Interdependencies/ Exclusivity | This resource could support the following new WTWs:<br>Medmenham WTW (72 Ml/d)<br>Kempton WTW expansion (800 Ml/d) |

## Oxford Canal - BCN Surplus – Raw Water Transfer Resource (Duke's Cut)

| Name | Oxford Canal - BCN Surplus – Raw Water Transfer Resource (Duke's Cut) |
|---|---|
| WRSE ID | TWU_SWX_HI-IMP_SWX_XXX_oxc-dukes cutswox |
| WRMP19 Reference | RES-RWTS-OXC-DKC-15 |
| Element Type | Resource |
| WRZ | SWOX |
| Engineering Scope | This element includes upgrades to the canal network to transfer 15 Ml/d surplus from the Wolverhampton Levels to upstream of Duke's Cut. From that point, the water would be transferred to the River Thames upstream of Farmoor Reservoir, in the Duke's Cut to Farmoor 15 Ml/d Pipeline. |
| Engineering Components | All engineering works provided by others – the Canal and River Trust (CRT), key elements including:<br>• Three new Pump Stations<br>• Rebuild two Pump Stations<br>• Bypass pipelines<br>• Bypass weirs |
| Phasing/Benefits | DO benefits of:<br>• 1 In 2 average: 12 Ml/d<br>• 1 In 500 average: 12 Ml/d<br>• 1 In 500 peak: 12 Ml/d |
| Lead Time | 7 Years |
| Mutual exclusivities | This element is mutually exclusive with Oxford Canal to Cropredy |
| Interdependencies/ Exclusivity | This element is interdependent with Duke's Cut to Farmoor 15 Ml/d Pipeline |

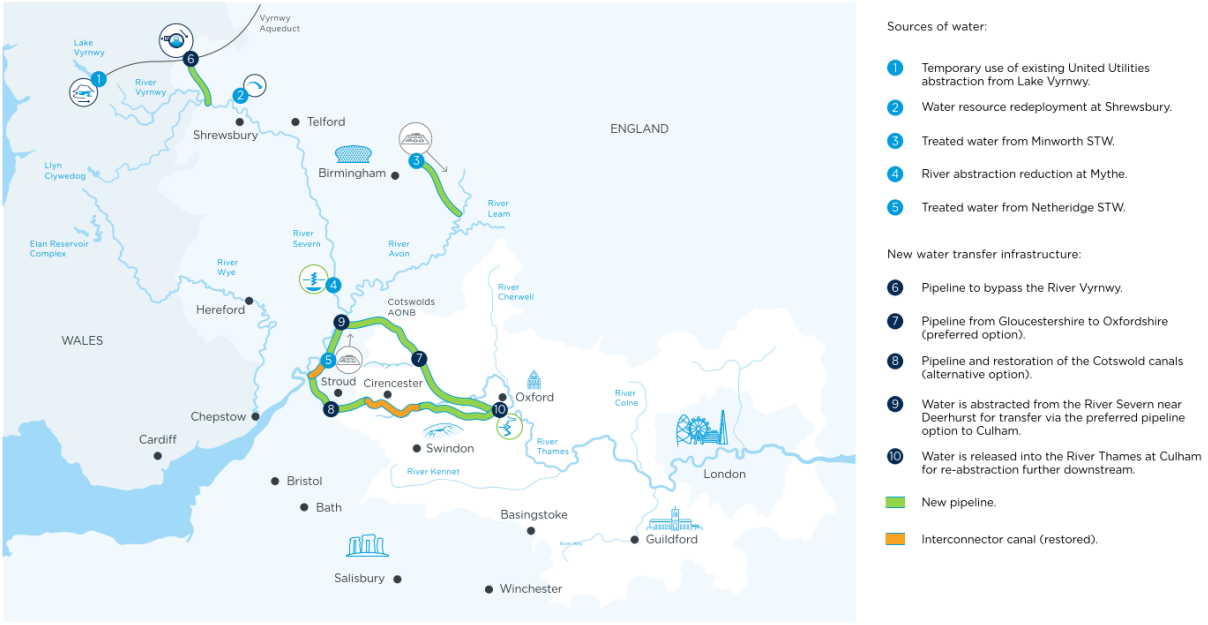


## Lake Vyrnwy (United Utilities) – 180 Ml/d

| Name | Lake Vyrnwy (United Utilities) – 180 Ml/d |
|---|---|
| WRSE ID (separate ID have been given to the source elements for each different STT conveyance option)[4] | For 300 Ml/d pipeline conveyance<br>TWU_STT_HI-RAB_RE1_ALL_p3-300-vyrnwy_50<br>TWU_STT_HI-RAB_RE1_ALL_p4-300-vyrnwy_75<br>TWU_STT_HI-RAB_RE1_ALL_p9-300-vyrnwy_100_b<br>TWU_STT_HI-RAB_RE1_ALL_p7-300-vyrnwy_135_b<br>TWU_STT_HI-RAB_RE1_ALL_p8-300-vyrnwy_155_b<br>TWU_STT_HI-RAB_RE1_ALL_p10-300-vyrnwy_180_b<br>TWU_STT_HI-RAB_RE1_ALL_p6-300-shrewsbury_25<br>For 400 Ml/d pipeline conveyance<br>TWU_STT_HI-RAB_RE1_ALL_p3-400-vyrnwy_50<br>TWU_STT_HI-RAB_RE1_ALL_p4-400-vyrnwy_75<br>TWU_STT_HI-RAB_RE1_ALL_p9-400-vyrnwy_100_b<br>TWU_STT_HI-RAB_RE1_ALL_p7-400-vyrnwy_135_b<br>TWU_STT_HI-RAB_RE1_ALL_p8-400-vyrnwy_155_b<br>TWU_STT_HI-RAB_RE1_ALL_p10-400-vyrnwy_180_b<br>TWU_STT_HI-RAB_RE1_ALL_p6-400-shrewsbury_25<br>For 500 Ml/d pipeline conveyance<br>TWU_STT_HI-RAB_RE1_ALL_p3-500-vyrnwy_50<br>TWU_STT_HI-RAB_RE1_ALL_p4-500-vyrnwy_75<br>TWU_STT_HI-RAB_RE1_ALL_p7-500-vyrnwy_135_b<br>TWU_STT_HI-RAB_RE1_ALL_p8-500-vyrnwy_155_b<br>TWU_STT_HI-RAB_RE1_ALL_p10-500-vyrnwy_180_b<br>TWU_STT_HI-RAB_RE1_ALL_p6-500-shrewsbury_25 |
| WRMP19 Reference | RES-RWTS-VYR-60, RES-RWTS-VYR-148, RES-RWTS-VYR-180 |
| Element Type | Resource |
| WRZ | LONDON / SWOX / SWA |
| Engineering Scope | A release of water from Lake Vyrnwy, which is an existing river regulation reservoir. The release will be a combination of a direct release into the River Vyrnwy (a tributary of the River Severn) and a bypass pipeline to discharge additional flows further downstream (to address environmental impacts). The combined release will be used for downstream abstraction and transfer into the Thames Water area.<br>The reservoir is owned and operated by Hafren Dyfrdwy but supplies water to United Utilities, who have offered the water to Thames Water. |

[4] Please note that the option IDs align with the option variants considered in the dWRMP. Between dWRMP and rdWRMP, option variants were altered (phases of Vyrnwy water being 25, 50, 80, 110, 140, 160, 180, rather than 50, 75, 100, 135, 155, 180).

<table>
<tr><th>Name</th><th>Lake Vyrnwy (United Utilities) – 180 Ml/d</th></tr>
<tr><td>Engineering Components</td><td>It is assumed that water for direct release to the River Vyrnwy will be through existing dam pipework and valves with only minor works at that location. The bypass will work in combination with the Vyrnwy Aqueduct and Oswestry WTW to transfer flows by gravity further downstream.</td></tr>
<tr><td>Phases/Benefits</td><td>Maximum capacity delivered at the discharge to the River Vyrnwy is 180 Ml/d, which can be delivered in phases.
<table>
<tr><td></td><td colspan="3">DO Benefits (Ml/d)</td><td>Option ID Reference</td></tr>
<tr><td>Capacity (Ml/d)</td><td>1 in 2 average</td><td>1 in 500 average</td><td>1 in 500 peak</td><td></td></tr>
<tr><td>180</td><td>0</td><td>112</td><td>160</td><td>Shrewsbury 25</td></tr>
<tr><td>160</td><td>0</td><td>100</td><td>141</td><td>180</td></tr>
<tr><td>140</td><td>0</td><td>87</td><td>123</td><td>155</td></tr>
<tr><td>110</td><td>0</td><td>68</td><td>96</td><td>135</td></tr>
<tr><td>80</td><td>0</td><td>48</td><td>68</td><td>100</td></tr>
<tr><td>50</td><td>0</td><td>29</td><td>41</td><td>75</td></tr>
<tr><td>25</td><td>0</td><td>13</td><td>18</td><td>50</td></tr>
</table></td></tr>
<tr><td>Lead Time</td><td>The lead time of the STT Deerhurst to Culham pipeline conveyance element is 10 years. Vyrnwy can be delivered within this timescale</td></tr>
<tr><td>Mutual exclusivities</td><td>None.</td></tr>
<tr><td>Interdependencies/ Exclusivity</td><td>This option is enabled by the North West Transfer SRO which is being promoted by United Utilities.<br>Dependent on the provision of a conveyance i.e. – the Severn Thames Transfer pipeline conveyance :<br>• Deerhurst to Culham (300 Ml/d) pipeline<br>• Deerhurst to Culham (400 Ml/d) pipeline<br>• Deerhurst to Culham (500 Ml/d) pipeline<br>Vyrnwy options are being selected by both WRW and WRSE. Adaptive planning enables the use of 75 Ml/d from the North West Transfer by Severn Trent until the year the scheme is selected by WRSE.</td></tr>
</table>

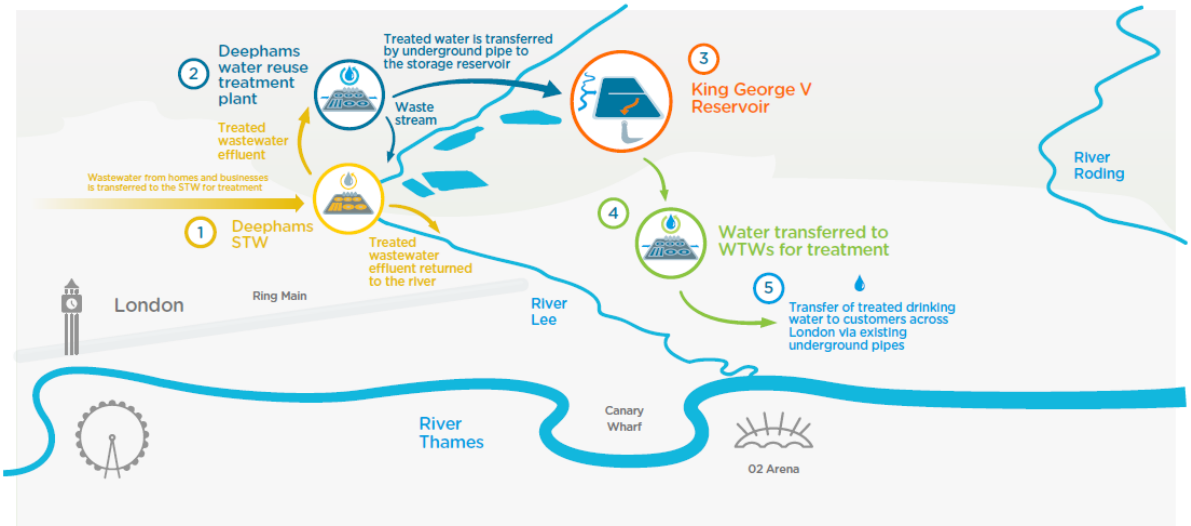



# Water Recycling

## Deephams Recycling and conveyance to King George V Reservoir (46.5 Ml/d)

| Name | Deephams Recycling and conveyance to King George V Reservoir (46.5 Ml/d) |
|---|---|
| WRSE ID | TWU_KGV_HI-REU_RE1_XXX_deephams recycling 46.5 |
| WRMP19 Reference | RES-RU-DPH<br>CON-RU-DPH-KGV |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | 46.5 Ml/d capacity Water Recycling Treatment Plant, located within the existing Deephams STW boundary and treating the STW effluent. The treated water will then be pumped to a proposed discharge location on the River Lee Diversion with the opportunity to discharge into the King George V Reservoir. |
| Engineering Components | 46.5 Ml/d Water Recycling treatment plant, consisting of the following treatment processes:<br>• Duty/standby pressurised automatic backwash screens<br>• Ferric addition<br>• Ultrafiltration plant complete with filtrate pumps<br>• Backwash, and clean in place (CIP) system<br>• RO membrane plant<br>• Hydrogen peroxide and UV treatment (AOP)<br>• Remineralisation plant consisting of a lime and $CO_2$ dosing<br>• Waste stream system returned to the Deephams STW inlet works for treatment<br>• Conveyance from Deephams Recycling plant to King George V Reservoir (KGV) |
| Phases/Benefits | DO benefits of: |

| Name | Deephams Recycling and conveyance to King George V Reservoir (46.5 Ml/d) |
|---|---|
| | • 1 In 2 average: 42 Ml/d<br>• 1 In 500 average: 42 Ml/d<br>• 1 In 500 peak: 42 Ml/d |
| Lead Time | 7.5 years (earliest delivery date is c.2060) |
| Mutual exclusivities | This option is mutually exclusive with Deephams Reuse and conveyance to Thames Lee Tunnel |
| Interdependencies/ Exclusivity | To provide an additional resource to London WRZ the following system elements may[5] also be required:<br>• Additional capacity in the raw water systems to allow the water to be abstracted from the Lee Valley Reservoirs and conveyed to a Water Treatment Works in east London<br>• Additional treatment in east London<br>• Additional capacity in the Thames Water ring main<br>Deephams Reuse, Crossness Desalination, Beckton Desalination and Beckton Effluent Reuse are subject to a combined Tidal Thames Limit for Desal and recycling options of 366 Ml/d due to the impact on salinity in the river. [6] |



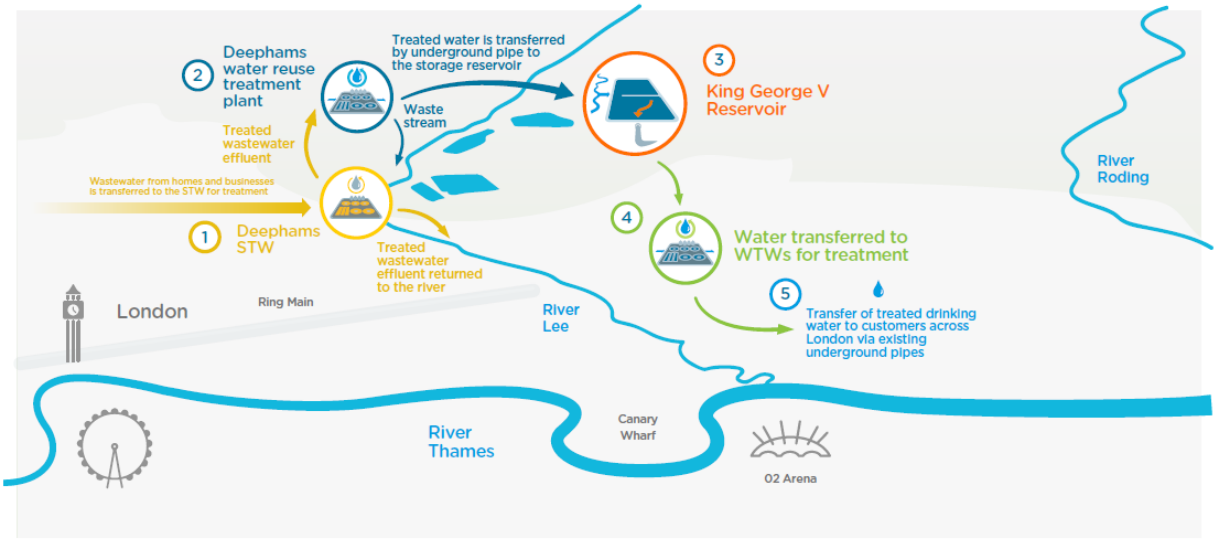

## Deephams Recycling and conveyance to Thames Lee Tunnel (46.5 Ml/d)

| Name | Deephams Recycling and conveyance to Thames Lee Tunnel (46.5 Ml/d) |
|---|---|
| WRSE ID | TWU_KGV_HI-REU_RE1_XXX_deephams reuse 46.5b |
| WRMP19 Reference | RES-RU-DPH<br>CON-RU-DPH-TLTEX |
| Element Type | Resource |
| WRZ | LONDON |

[5] The requirement for system elements is dependent on which combination of resource options is selected. This is not related to a single resource element.
[6] Further work is ongoing to review the combined Tidal Thames Limit for desalination and reuse.

| Name | Deephams Recycling and conveyance to Thames Lee Tunnel (46.5 Ml/d) |
|---|---|
| Engineering Scope | 46.5 Ml/d capacity Water Recycling Treatment Plant, located within the existing Deephams STW boundary and treating the STW effluent. The treated water would then be pumped to a proposed discharge location into a shaft the Thames Lee Tunnel extension. |
| Engineering Components | 46.5 Ml/d Water recycling treatment plant, consisting of the following treatment processes:<br>• Duty/standby pressurised automatic backwash screens.<br>• Ferric addition<br>• Ultrafiltration plant with filtrate pumps<br>• Backwash, and clean in place (CIP) system<br>• RO membrane plant<br>• Hydrogen peroxide and UV treatment (AOP)<br>• Remineralisation plant consisting of a lime and $CO_2$ dosing<br>• Waste stream system, returned to the Deephams STW inlet works for treatment<br>• Conveyance from Deephams Recycling Plant to Thames Lee Tunnel Shaft |
| Phasing/Benefit | DO benefits of:<br>• 1 In 2 average: 42 Ml/d<br>• 1 In 500 average: 42 Ml/d<br>• 1 In 500 peak: 42 Ml/d |
| Lead Time | 7.5 years (earliest delivery date is c2060). |
| Mutual exclusivities | This option is mutually exclusive with Deephams Reuse and conveyance to King George V Reservoir |
| Interdependencies/ Exclusivity | Dependent on the TLT extension from Lockwood PS to KGV reservoir intake<br>To provide an additional resource to London WRZ the following system elements may[7] also be required:<br>• Additional capacity in the raw water systems to allow the water to be abstracted from the Lee Valley Reservoirs and conveyed to a Water Treatment Works in east London;<br>• Additional treatment in east London<br>• Additional capacity in the Thames Water ring main<br>Deephams Reuse, Crossness Desalination, Beckton Desalination and Beckton Effluent Reuse are subject to a combined Tidal Thames Limit for Desal and recycling options of 366 Ml/d due to the impact on salinity in the river. |

[7] The requirement for system elements is dependent on which combination of resource options is selected. This is not related to a single resource element.

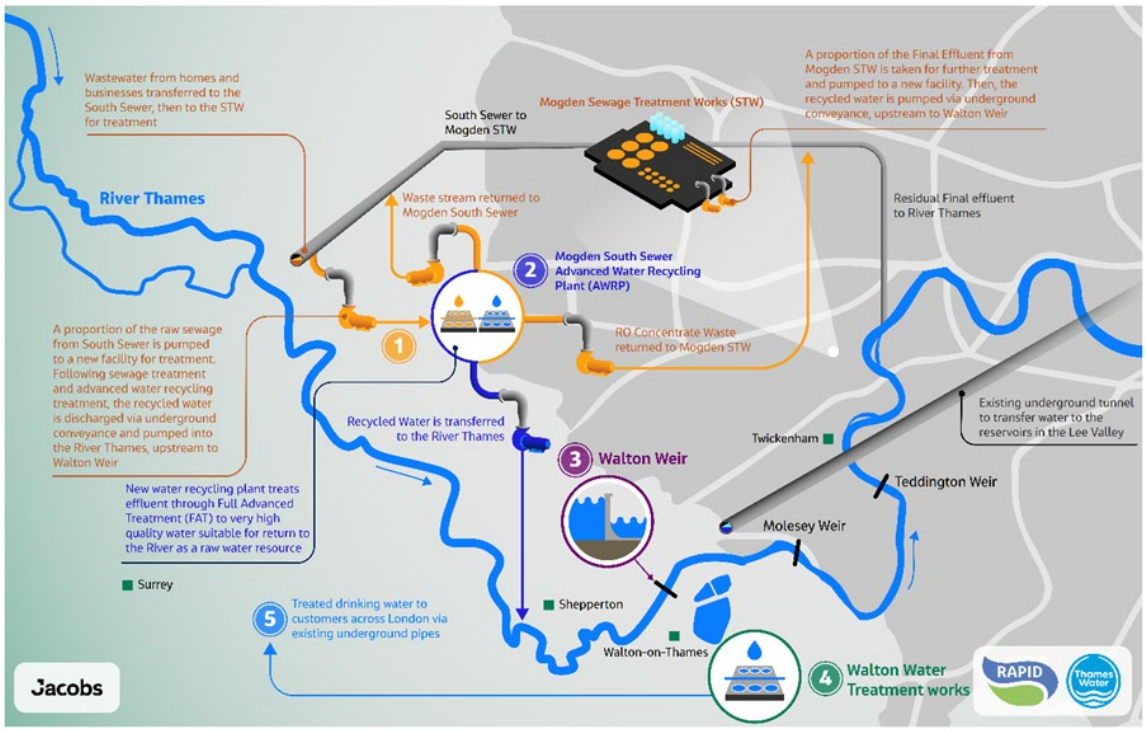



## Mogden South Sewer – Recycling Treatment Plant – 25 Ml/d

| | |
|---|---|
| Name | Mogden South Sewer – Recycling Treatment Plant |
| WRSE ID | TWU_WLJ_HI-REU_RE1_ALL_reusemogdenssewer25 |
| WRMP19 Reference | RES-RU-MSS-50; CON-RU-MSS-WAL-50 |
| Element Type | Resource & Conveyance – Bulk Raw Water Transfer |
| WRZ | LONDON |
| Engineering Scope | Planned indirect potable recycling (IPR) is the process of actively managing returns of highly treated wastewater effluent to water courses above abstraction points. For the Mogden South Sewer scheme, this has been combined with a traditional sewage treatment plant stage to allow raw sewage from the Mogden Sewage Treatment Works (STW) catchment to be transferred via a new pumping station to a new combined STW and Advanced Water Recycling Plant (AWRP) to produce a high purity water stream. The recycled water will then be pumped to a proposed discharge location on the River Thames at Walton to supplement the raw water supply to downstream WTWs. The AWRP can be built in a single phase for a maximum yield of 25 Ml/d total. |
| Engineering Components | The Advanced Water Recycling Plant can be constructed in a single phase of 25 Ml/d yield.<br>The treatment stages include:<br>• Sewage Treatment Works – inlet works (screens and grit removal system); Primary Settlement; Fine screening; Activated Sludge Process, Membrane Bioreactor and odour control systems<br>• AWRP stage – Ultrafiltration; Reverse Osmosis (RO); hydrogen peroxide dosing and UV treatment; remineralisation plant; and waste stream systems<br>• Incoming Transfer Pump Station<br>• Recycled Water Pump Station<br>• Wastewater Discharge Pump Station<br>The associated conveyance stages include: |

| Name | Mogden South Sewer – Recycling Treatment Plant |
|---|---|
| | • Transfer pipeline from the South Sewer to the treatment works<br>• Waste return pipeline from the treatment works to the South Sewer<br>• Recycled water pipeline from the treatment works to the River Thames<br>• RO concentrate return pipeline from the treatment works to Mogden STW |
| Phases/Benefits | Mogden South Sewer would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 23 Ml/d<br>• 1 in 500 average: 23 Ml/d<br>• 1 in 500 peak: 23 Ml/d |
| Lead Time | Alternative delivery programmes have been developed for London Effluent Recycling Gate 2 submission which show a lead time of 8 years and an earliest operational date of 2030. |
| Mutual Exclusivities | The combined yield of Mogden South Sewer, Teddington DRA and Mogden Effluent Reuse options is limited to 200 Ml/d because the three schemes use final effluent of Mogden STW or sewage from the Mogden STW catchment as a water source.<br>Further considerations are being made regarding the impacts on the Middle Thames Tideway and mutual exclusivities between the options. |
| Interdependencies/ Exclusivity | To provide an additional resource to London WRZ, the following elements may also be required:<br>• Upgrades to the west London raw water system<br>• Additional treatment capacity at Kempton WTW<br>• Network reinforcements, potentially including extensions to the London ring main<br>Mogden South Sewer has the potential to support the Thames to Affinity Transfer (T2AT) SRO as T2AT SRO may abstract raw water from the River Thames. Additional requirements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents. |

**Mogden South Sewer Schematic**

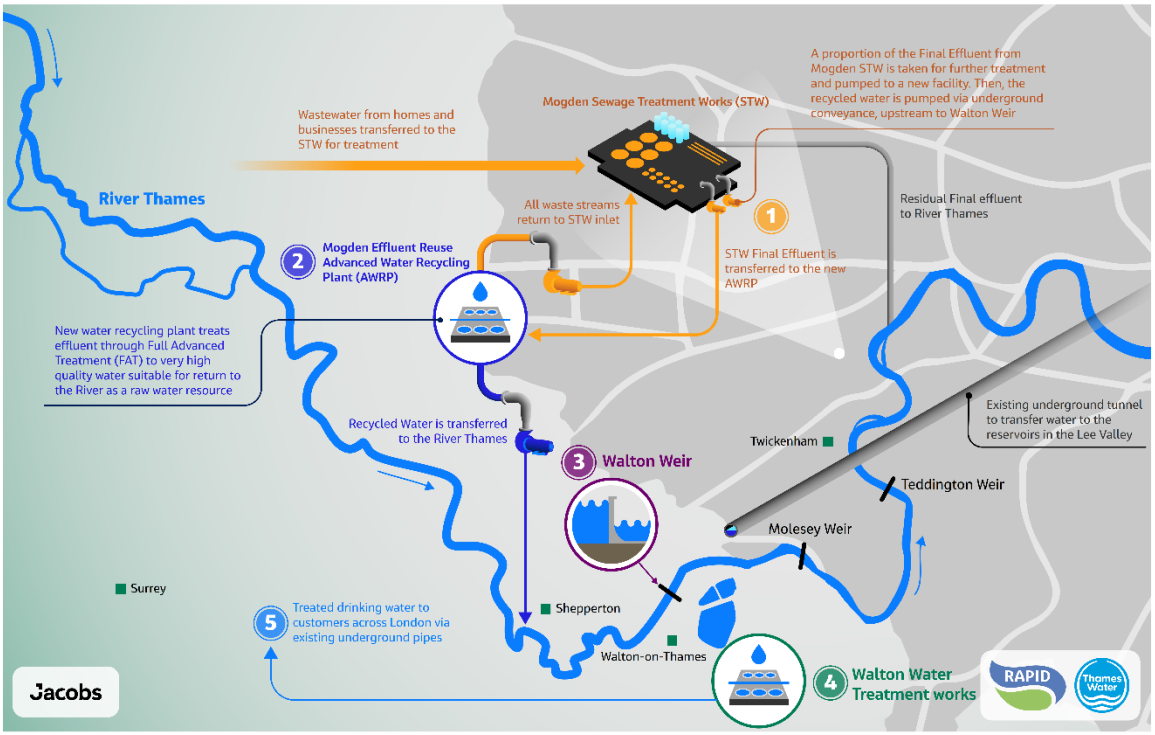



## Mogden Effluent Recycling – Recycling Treatment Plant

| Name | Mogden Effluent Recycling – Recycling Treatment Plant |
|---|---|
| WRSE ID | TWU_WLJ_HI-REU_RE1_XXX_reuse mogden 50<br>TWU_WLJ_HI-REU_RE1_XXX_reuse mogden 100 |
| WRMP19 Reference | RES-RU-MOG-50, RES-RU-MOG-100, |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | Planned indirect potable recycling (IPR) is the process of actively managing returns of highly treated wastewater effluent to water courses above abstraction points. Final effluent from the Mogden Sewage Treatment Works (STW) is to be transferred via a new pumping station to a new Advanced Water Recycling Plant (AWRP) to produce a high purity water stream. The recycled water will then be pumped to a proposed discharge location on the River Thames at Walton to supplement the raw water supply to downstream WTWs. The AWRP can be built in up to three phases for a maximum yield of 150 Ml/d total (based on available final effluent, physical space for the assets, etc). |
| Engineering Components | The Advanced Water Recycling Plant includes:<br>• Ultrafiltration plant<br>• Reverse Osmosis (RO) membrane plant<br>• Hydrogen peroxide dosing and UV treatment (UVAOP)<br>• Remineralisation plant<br>• Final effluent pumping station |

<table>
<tr><td>Name</td><td>Mogden Effluent Recycling – Recycling Treatment Plant</td></tr>
<tr><td></td><td>• Recycled water pumping station<br>• Wastewater return pump station</td></tr>
<tr><td>Phases/Benefits</td><td>Mogden Recycling can be developed in phases of 50 or 100 Ml/d up to a maximum capacity of 150 Ml/d.<br><table><tr><td>Capacity (Ml/d)</td><td>DO Benefits (Ml/d)</td></tr><tr><td>150</td><td>130</td></tr><tr><td>100</td><td>88</td></tr><tr><td>50</td><td>46</td></tr></table>DO benefits above apply for 1 in 2 average, 1 in 500 average and 1 in 500 peak.</td></tr>
<tr><td>Lead Time</td><td>Alternative delivery programmes have been developed for Gate 2 which show a lead time of 9 years (per phase) and an earliest operational date of 2031.</td></tr>
<tr><td>Mutual Exclusivities</td><td>The combined yield of Mogden Effluent Recycling scheme, Teddington DRA and Mogden South Sewer Reuse is limited to 200 Ml/d[4] because the three schemes use final effluent of Mogden STW or sewage from the Mogden STW catchment as a water source.</td></tr>
<tr><td>Interdependencies/ Exclusivity</td><td>To provide an additional resource to London WRZ, the following elements may also be required:<br>• Upgrades to the west London raw water system<br>• Additional treatment capacity at Kempton WTW<br>• Network reinforcements, potentially including extensions to the London ring main<br>Mogden Recycling has the potential to support the Thames to Affinity Transfer (T2AT) SRO as T2AT SRO may abstract raw water from the River Thames. Additional requitements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents.</td></tr>
</table>

**Mogden Effluent Reuse Schematic**

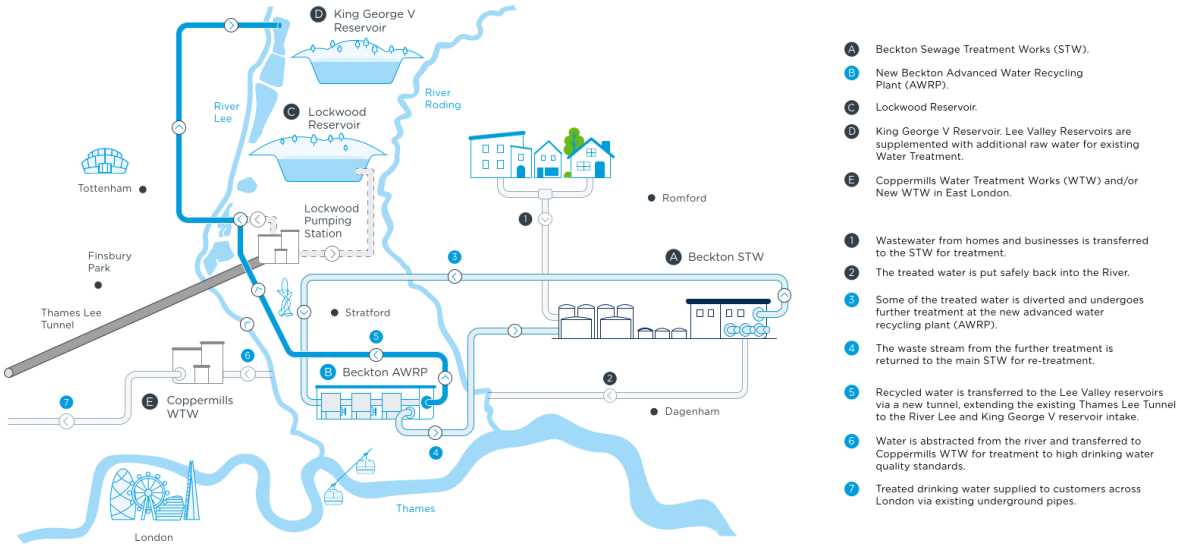



## Beckton Effluent Recycling – Recycling Treatment Plant

| Name | Beckton Effluent Recycling – Recycling Treatment Plant |
|---|---|
| WRSE ID | TWU_KGV_HI-REU_RE1_XXX_reuse beckton 50<br>TWU_KGV_HI-REU_RE1_XXX_reuse beckton 100<br>TWU_KGV_HI-REU_RE1_XXX_reuse beckton 150 |
| WRMP19 Reference | RES-RU-BEC-50, RES-RU-BEC-100, RES-RU-BEC-150 |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | Planned indirect potable Recycling (IPR) is the process of actively managing returns of highly treated wastewater effluent to water courses above abstraction points. Final effluent from the Beckton Sewage Treatment Works (STW) is to be subjected to an advanced treatment process to produce a high purity water stream. The recycled water will then be pumped to a proposed discharge location on the River Lee diversion to supplement the raw water supply to the Lee Valley reservoirs. The proposed site for the treatment plant will be within the Beckton STW boundary to the north of the operational area. |
| Engineering Components | The Advanced Water Recycling Plant includes :<br>• Ultrafiltration plant<br>• Reverse Osmosis (RO) membrane plant<br>• Hydrogen peroxide dosing and UV treatment (UVAOP)<br>• Remineralisation plant<br>• Final effluent pumping station |

<table>
<tr><th>Name</th><th>Beckton Effluent Recycling – Recycling Treatment Plant</th></tr>
<tr><td></td><td>• Recycled water pumping station<br>• Wastewater return pump station</td></tr>
<tr><td>Phases/Benefits</td><td>Beckton Effluent Recycling can be developed in phases of 50, 100 or 150 Ml/d up to a maximum capacity of 300 Ml/d.<br><table><tr><th>Capacity (Ml/d)</th><th>DO Benefits (Ml/d)</th></tr><tr><td>300</td><td>252</td></tr><tr><td>200</td><td>172</td></tr><tr><td>150</td><td>130</td></tr><tr><td>100</td><td>89</td></tr><tr><td>50</td><td>46</td></tr></table>DO benefits above apply for 1 in 2 average, 1 in 500 average and 1 in 500 peak.</td></tr>
<tr><td>Lead Time</td><td>Alternative delivery programmes have been developed for Gate 2 which show a lead time of 9 years (per phase) and an earliest operational date of 2031.</td></tr>
<tr><td>Mutual Exclusivities</td><td>There are no other options or schemes that are mutually exclusive with the Beckton Effluent Reuse scheme.<br><br>Deephams Reuse, Crossness Desalination, Beckton Desalination and Beckton Reuse are subject to a combined Tidal Thames Limit for desalination and recycling options of 366 Ml/d due to the impact on salinity in the river. [8]</td></tr>
<tr><td>Interdependencies/ Exclusivity</td><td>The first phase of Beckton Effluent Reuse is dependent on the following elements:<br><br>Beckton to Lockwood Conveyance<br><br>TLT extension from Lockwood PS to KG reservoir intake<br><br>To provide an additional resource to London WRZ the following system elements may also be required:<br>• Additional capacity in the raw water systems to allow the water to be abstracted from the River Lee Diversion into the Lee Valley Reservoirs and from there conveyed to a Water Treatment Works in east London<br>• Additional treatment capacity in east London<br>• Additional capacity in the Thames Water ring main<br>Beckton Recycling has the potential to support the Thames to Affinity Transfer (T2AT) SRO as T2AT SRO may abstract raw water from the River Lee. Additional requirements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents.</td></tr>
</table>

[8] Further work is ongoing to review the combined Tidal Thames Limit for desalination and reuse.



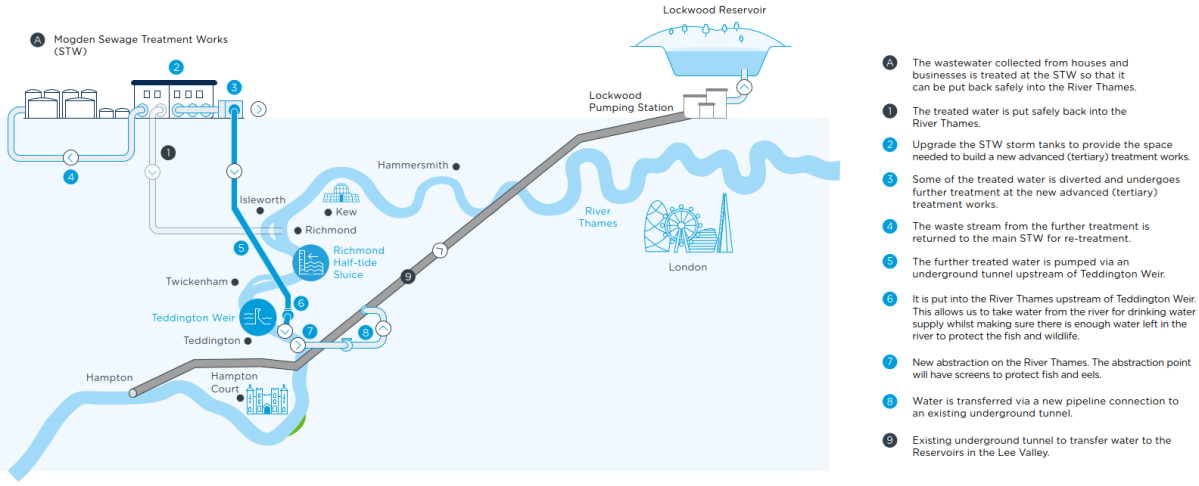

# Direct River Abstraction

## Teddington DRA Tertiary Treatment Plant

| | |
|---|---|
| Name | Teddington DRA Tertiary Treatment Plant – 50 Ml/d output and 75 Ml/d output) |
| WRSE ID | TWU_TED_HI-RAB_RE1_XXX_teddington dra 50<br>TWU_TED_HI-RAB_RE1_XXX_teddington dra 75 |
| WRMP19 Reference | RES-DRA-TED-50, RES-DRA-TED-75 |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | A portion of final effluent from Mogden STW would undergo treatment at a new Tertiary Treatment Plant, sized at a capacity of either 50 Ml/d or 75 Ml/d yield, within the Mogden STW boundary, sufficient to allow consented discharge into the river. The Treated Effluent will then be transferred to a new outfall location on the River Thames, upstream of Teddington Weir and the waste stream will be returned to Mogden STW. This option is part of the Teddington DRA scheme which also includes a new direct river abstraction from the River Thames, to supply the Thames Lee Tunnel with raw water.<br>It is noted that at this stage, a maximum capacity for the Teddington DRA scheme has been set at 75 Ml/d, so no phased construction options are available. |

<table>
<tr><td>Name</td><td>Teddington DRA Tertiary Treatment Plant – 50 Ml/d output and 75 Ml/d output)</td></tr>
<tr><td>Engineering Components</td><td>Teddington DRA tertiary treatment plant (TTP) includes:<ul><li>Coagulation dosing and mixing tank</li><li>Nitrifying Sand Filters</li><li>Mechanical Filters</li><li>Wastewater equalisation tank</li><li>Civil/structural works to deepen 2No. existing storm tanks to create extra storm capacity</li><li>Demolition and in-filling of 2No. existing storm tanks to make space for the new TTP</li><li>Upgrades to deepened storm tank equipment (pumps, mixers, etc)</li><li>Final Effluent Pumping Station</li><li>Treated Effluent Pumping Station</li><li>Wastewater Pumping Station</li></ul></td></tr>
<tr><td>Phases/benefits</td><td>For capacities up to 75 Ml/d no phasing has been included. The TTP can be constructed with either 50 Ml/d or 75 Ml/d capacity<table><tr><td>Capacity (Ml/d)</td><td>DO Benefit (Ml/d)</td></tr><tr><td>50</td><td>46</td></tr><tr><td>75</td><td>67</td></tr></table>DO benefits above apply for 1 in 2 average, 1 in 500 average and 1 in 500 peak.</td></tr>
<tr><td>Lead Time</td><td>Alternative delivery programmes have been developed for Gate 2 which show a lead time of 9 years and an earliest operational date of 2031.</td></tr>
<tr><td>Mutual Exclusivities</td><td>The combined capacity of Teddington DRA, Mogden Effluent Recycling and Mogden South Sewer schemes is limited to 200 Ml/d because the three schemes use final effluent of Mogden STW or sewage from the Mogden STW catchment as a water source.</td></tr>
<tr><td>Interdependencies/ Exclusivity</td><td>The following elements are also required for the Teddington DRA option:<ul><li>Teddington to Thames Lee Tunnel</li><li>Teddington Outfall</li></ul>Teddington DRA scheme does not have dependencies on other options.<br><br>To provide an additional resource to London WRZ, the following elements may also be required:<ul><li>Additional treatment capacity at Water Treatment Works (WTWs) in both east and west London</li><li>Sufficient available extra capacity in the Thames Water Ring Main</li><li>Upgrades to raw water conveyance systems</li><li>Network reinforcements</li></ul>Teddington DRA scheme has the potential to support the Thames to Affinity Transfer (T2AT) SRO. Additional requirements to supply</td></tr>
</table>

| Name | Teddington DRA Tertiary Treatment Plant – 50 Ml/d output and 75 Ml/d output) |
|---|---|
| | water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents. |

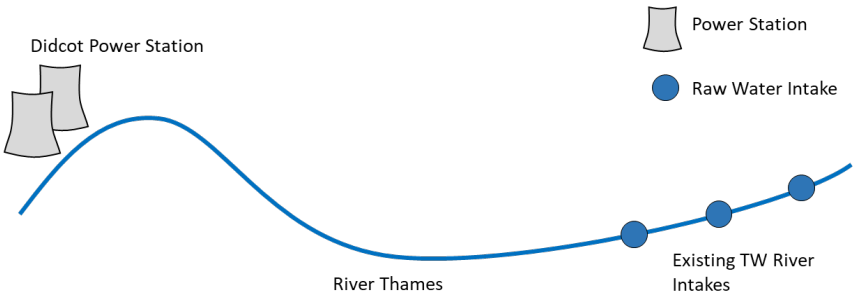



# Raw Water Purchase

## Didcot Raw Water Purchase

| Name | Didcot Raw Water Purchase (available 2025 – 2030) |
|---|---|
| WRSE ID | TWU_LON_HI-OTH_ALL_ALL_didcot purchase |
| WRMP19 Reference | RES-RWP-DID |
| Element Type | Resource |
| WRZ | LONDON / SWA |
| Engineering Scope | Agreement between Thames Water and RWE NPower that NPower will abstract less than the maximum amount of their abstraction licence at Didcot Power Station. This water would then be available downstream for abstraction at Thames Water intakes. Option is available for use between 2025 and 2030. |
| Engineering Components | n/a |
| Phases/Benefits | DO benefits of:<br>• 1 In 2 average: nil<br>• 1 In 500 average: 22.6 Ml/d (2025 – 2030)<br>• 1 In 500 peak: 22.6 Ml/d (2025 – 2030) |
| Lead Time | 0 Years |
| Mutual exclusivities | none |
| Interdependencies/ Exclusivity | To provide a benefit to SWA, the additional elements required are:<br>• New Medmenham Intake |

| Name | Didcot Raw Water Purchase (available 2025 – 2030) |
|---|---|
| | • Medmenham WTW<br>To provide an additional resource to London WRZ, the following elements may also be required:<br>• Upgrades to the west London raw water system<br>• Additional treatment capacity at Kempton WTW<br>• Network reinforcements, potentially including extensions to the London ring main |



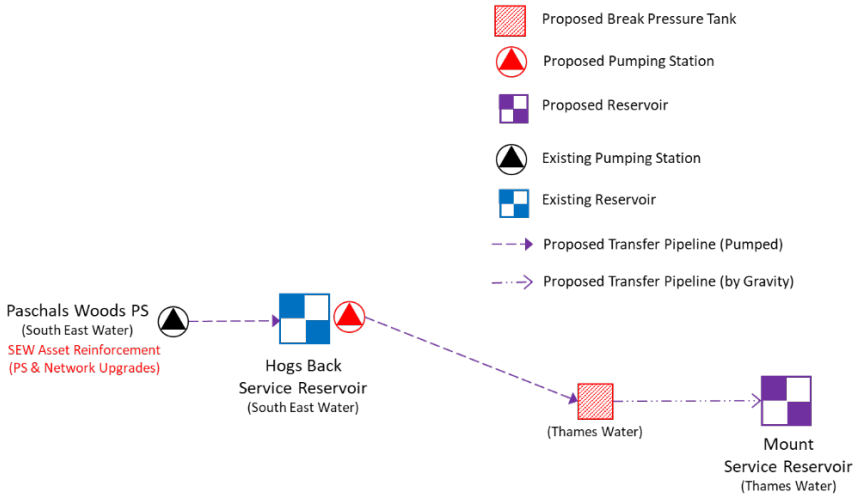

## Lower Thames Licence Trade

| Name | Lower Thames Licence Trade |
|---|---|
| WRSE ID | TWU_WLJ_EF-TFR_RE1_ALL_egham |
| WRMP19 Reference | n/a new option at WRMP24 |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | Agreement between Thames Water and Affinity Water that Affinity Water will abstract less than the maximum amount of their abstraction licence from their Lower Thames intakes. This water would then be available for abstraction at Thames Water intakes. |
| Engineering Components | n/a |
| Phases/Benefits | DO benefits of up to 50 Ml/d |
| Lead Time | 0 Years |
| Mutual exclusivities | none |
| Interdependencies/ Exclusivity | In order to reduce abstraction from the Lower Thames, Affinity Water will need to develop the Grand Union Canal transfer option as an alternative supply. |

# Inter Company Transfers

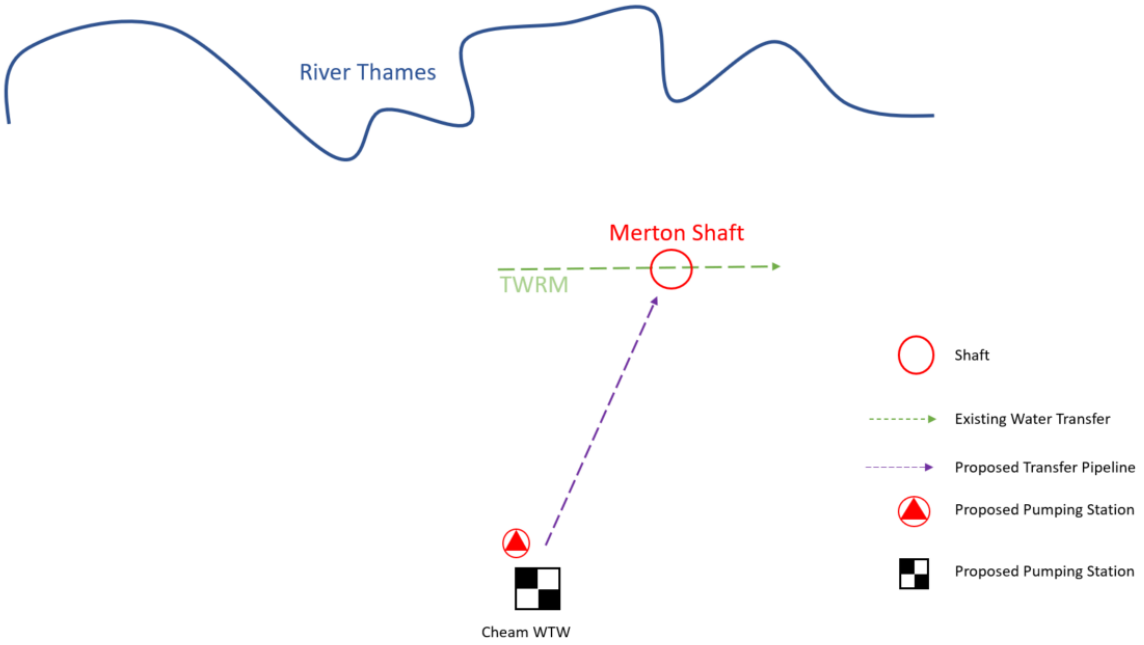
## South East Water to Guildford Transfer

| Name | South East Water to Guildford Inter-company transfer |
|---|---|
| WRSE ID | TWU_GUI_HI-TFR_RZ4_ALL_sewtogui |
| WRMP19 Reference | RES-ICT-SEW-GUI-MNT-10 |
| Element Type | Resource |
| WRZ | Guildford |
| Engineering Scope | Inter-zonal (inter-company) transfer of 10 Ml/d from Hogs Back Service Reservoir (SR) in South East Water (SEW) supply area to Mount SR in Guildford WRZ. |
| Engineering Components | Within SEW Supply area:<br>• A new main from Colonels Gate to Mytchett Place, Keogh Barracks<br>• A new main inlet to Hogs Back SR<br>• New pumping station at Hogs Back<br>• Booster upgrade (10Ml/d) requiring a new building/kiosk and new power supply<br>• Additional 8 Ml storage<br>Within Guildford WRZ:<br>• Treated water pipeline from Hogs Back SR (SEW) to Mount SR<br>• Break pressure tank |
| Phases/Benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 10 Ml/d<br>• 1 in 500 average: 10 Ml/d<br>• 1 in 500 peak: 10 Ml/d |
| Lead Time | 5 Years |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | No interdependency with other WRMP elements. |




## Cheam to Merton Transfer (15 Ml/d)

| Name | Cheam to Merton Transfer (15 Ml/d) – Inter-zonal (inter-company) transfer |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_SES_ALL_cheam-merton |
| WRMP19 Reference | n/a new option at WRMP24 |
| Element Type | Resource |
| WRZ | LON |
| Engineering Scope | Inter-zonal (inter-company) transfer of 15 Ml/d from SES at Cheam to Thames Water at Merton. |
| Engineering Components | • A treated water pipeline from Cheam to Merton<br>• A new pump station |
| Phases/Benefits | This option would be developed in a single phase.<br>DO benefits : 15 Ml/d (TBC) |
| Lead Time | 5 Years |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | No interdependency with other WRMP elements. |




## Woodmansterne WTW to Epsom Downs (10 Ml/d)

| Name | Woodmansterne WTW to Epsom Downs (10 Ml/d) – Inter-zonal (inter-company) transfer |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_SES_ALL_woodman-epsom p |
| WRMP19 Reference | n/a new option at WRMP24 |
| Element Type | Resource |
| WRZ | LON |
| Engineering Scope | Inter-zonal (inter-company) transfer of 10 Ml/d from SES at Woodmansterne WTW to Thames Water at Epsoms Downs. |
| Engineering Components | • A treated water pipeline from Woodmansterne to Epsom Downs<br>• A new pump station |
| Phases/Benefits | This option would be developed in a single phase.<br>DO benefits: 10 Ml/d (TBC) |
| Lead Time | 5 Years |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | No interdependency with other WRMP elements. |


## Reigate to Guildford Transfer (5 Ml/d or 20 Ml/d)

| Name | Transfer – Reigate (SES) to Guildford 5 Ml/d – Inter-zonal (inter-company) transfer<br>Transfer – Reigate (SES) to Guildford 20 Ml/d – Inter-zonal (inter-company) transfer |
|---|---|
| WRSE ID | TWU_GUI_HI-TFR_SES_ALL_reigatetoguildford5<br>TWU_GUI_HI-TFR_SES_ALL_reigatetoguildford20 |
| WRMP19 Reference | n/a new option at WRMP24<br>WRMP19_ML_ Reigate to Guildford 5 Ml/d<br>WRMP19_ML_ Reigate to Guildford 20 Ml/d |
| Element Type | Resource |
| WRZ | Guildford |
| Engineering Scope | Inter-zonal (inter-company) transfer of 5 Ml/d or 20 Ml/d from SES at Reigate to Thames Water Guildford WRZ. |
| Engineering Components | • A treated water pipeline from Reigate to Guildford<br>• A new pump station |
| Phases/Benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 5 Ml/d (TBC)or<br>• 20 Ml/d (TBC) |
| Lead Time | 5 Years |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | No interdependency with other WRMP elements. the 5 M/d and 20 Ml/d options are mutually exclusive. |


## Thames to Affinity Transfer – Conjunctive Use Benefit

| Name | Thames to Affinity Transfer |
|---|---|
| WRSE ID | T2AT option codes:<br>AFW_AZ3_HI-TFR_KGV_CNO_beckton_conv100<br>AFW_RA4_HI-TFR_UTC_CNO_ltr_2a_conv100<br>Conjunctive use codes:<br>AFW_KEM_HI-OTH_ALL_ALL_con_lon_50_ph1<br>AFW_KEM_HI-OTH_ALL_ALL_con_lon_50_ph2 |
| WRMP19 Reference | Affinity Water Option |
| Element Type | Conjunctive Use |
| WRZ | NA |
| Engineering Scope | A modelling study carried out as part of the Thames to Affinity Transfer (T2AT) SRO scheme has shown that T2AT brings conjunctive use benefits to Thames Water.<br>Refer to Thames to Affinity Transfer SRO Gate 1 and Gate 2 submissions for more information. |
| Engineering Components | None |
| Phases/Benefits | Conjunctive Use Benefit for Thames Water: 25 Ml/d per 50 Ml/d of transfer up to a maximum of 50 Ml/d. |
| Lead Time | 11 years (T2AT conveyance). Delivery programmes have been developed for Gate 2 which show an earliest operational date of 2034/5; however this is dependent on the availability of resource to support the transfer. |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | The Lower Thames Reservoir (LTR) option is dependent on additional water resource being made available for abstraction from the River Thames. SESRO is a pre-requisite for the LTR scheme because without the new reservoir, the scheme would leave Thames Water with an unacceptable reduction in the volume of |

| Name | Thames to Affinity Transfer |
|---|---|
| | strategic raw water storage available to supply London. Should the supported STT option be implemented instead of or ahead of SESRO, then one of the alternative feasible configurations for T2AT from the River Thames could apply.<br>The Beckton Recycling (BRI) option is dependent on additional water resource being made available for abstraction from the River Lee from Beckton Recycling. |

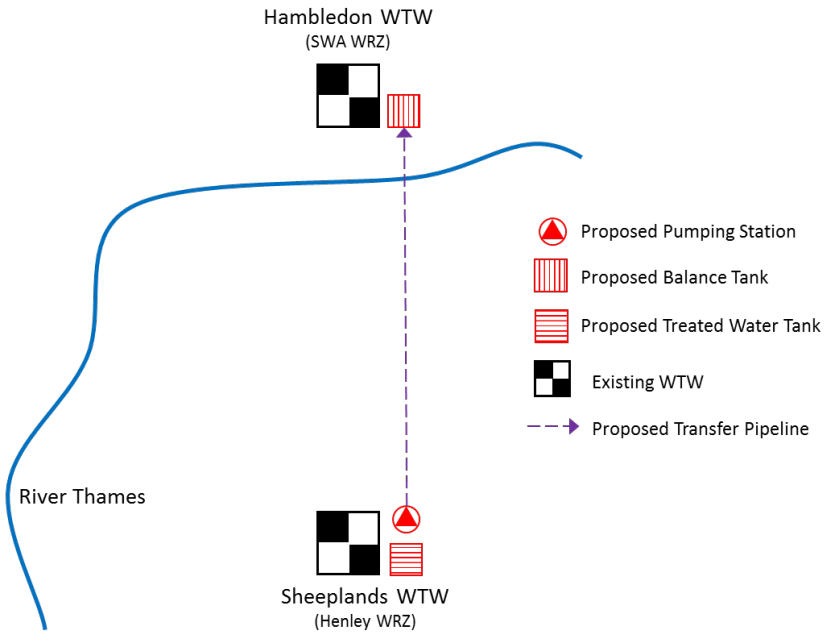
## SESRO / STT interconnector – Conjunctive Use Benefit

| Name | SESRO / STT interconnector |
|---|---|
| WRSE ID | TWU_STT_HI-TFR_STT_ALL_stt-sesro |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Conjunctive Use |
| WRZ | London |
| Engineering Scope | SESRO SRO has modelled the potential DO benefit that could be achieve by providing a link between SESRO and STT. Refer to SESRO SRO Gate 2 submission for more information. |
| Engineering Components | Provision for STT to be able to discharge into SESRO |
| Phases/Benefits | DO for connection with STT (Deerhurst pipeline) is 3.6-10.8 Ml/d, depending on pipeline capacity and reservoir size |
| Lead Time | TBC |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | This option is dependent on both SESRO / Abingdon Reservoir and STT options being selected. |

# Inter Zonal Transfers

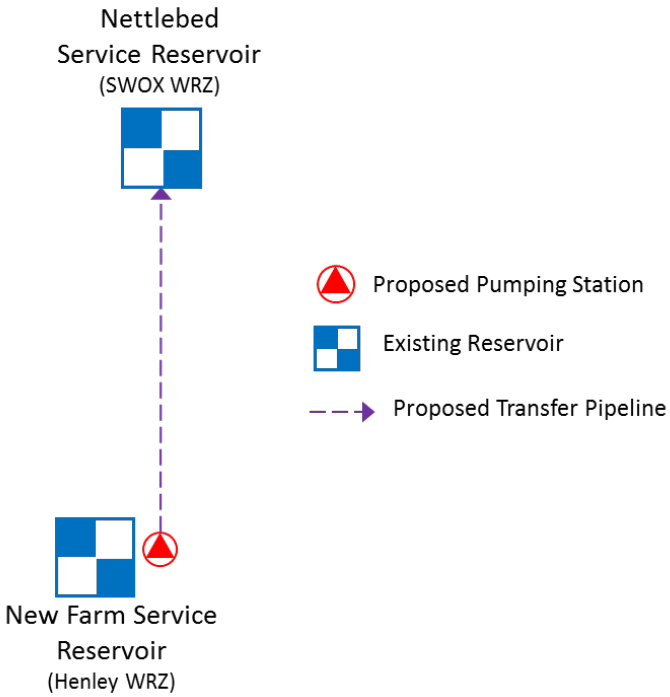
## Henley to SWA Transfer (2.4 Ml/d or 5 Ml/d)

| Name | Henley to SWA 2.4 Ml/d – Inter-zonal transfer<br>Henley to SWA 5 Ml/d – Inter-zonal transfer |
|---|---|
| WRSE ID | TWU_SWA_HI-TFR_HEN_ALL_henley-swa2.4<br>TWU_SWA_HI-TFR_HEN_ALL_henley-swa5 |
| WRMP19 Reference | RES-IZT-HEN-SWA-HAM- 2.37<br>RES-IZT-HEN-SWA-HAM-5 |
| Element Type | Resource |
| WRZ | SWA |
| Engineering Scope | Inter-zonal transfer of 2.4 Ml/d or 5 Ml/d from Sheeplands WTW in Henley WRZ to Hambleden WTW in SWA WRZ. |
| Engineering Components | The components for this scope are as follows:<br>• New treated water pipeline from Sheeplands WTW to Hambleden WTW<br>• Orthophosphate treatment at Hambleden WTW<br>• A treated water tank and pumping station at Sheeplands WTW<br>• A balance tank at Hambleden WTW |
| Phases/Benefits | This option would be developed in a single phase.<br>DO benefit: n/a |
| Lead Time | 5 Years |
| Mutual Exclusivities | The transfer options are mutually exclusive to each other and also Henley to SWOX Transfer (2.4 Ml/d or 5 Ml/d). |
| Interdependencies/ Exclusivity | No interdependency with other WRMP elements. |



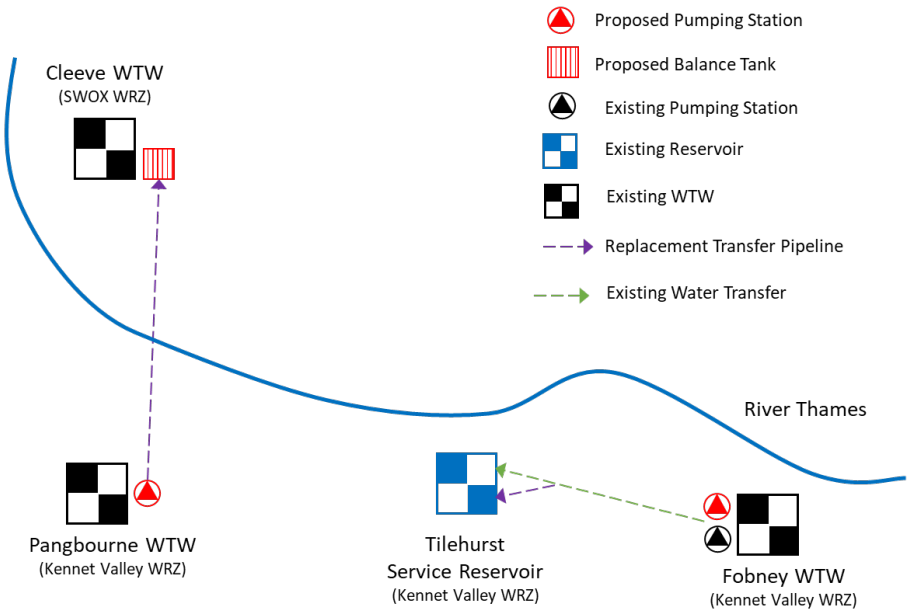
## Henley to SWOX Transfer (2.4 Ml/d or 5 Ml/d)

| | |
|---|---|
| Name | Henley to SWOX 2.4 Ml/d – Inter-zonal transfer<br>Henley to SWOX 5 Ml/d – Inter-zonal transfer |
| WRSE ID | TWU_SWX_HI-TFR_HEN_ALL_henley-swox2.4<br>TWU_SWX_HI-TFR_HEN_ALL_henley-swox5 |
| WRMP19 Reference | RES-IZT-HEN-SWX-NET-2.37<br>RES-IZT-HEN-SWX-NET-5 |
| Element Type | Resource |
| WRZ | SWOX |
| Engineering Scope | Inter-zonal transfer of 2.4 Ml/d or 5 Ml/d from New Farm SR in Henley WRZ to Nettlebed SR in SWOX WRZ. |
| Engineering Components | The components for this scope are as follows:<br>• A treated water pipeline to transfer water from New Farm SR to Nettlebed SR<br>• New pumping station at New Farm SR |
| Phases/Benefits | This option would be developed in a single phase.<br>DO benefit: n/a |
| Lead Time | 5 Years |
| Mutual Exclusivities | Both transfer options are mutually exclusive to each other and also Henley to SWA Transfer (2.4 Ml/d or 5 Ml/d) |
| Interdependencies/ Exclusivity | No interdependency with other WRMP elements. |



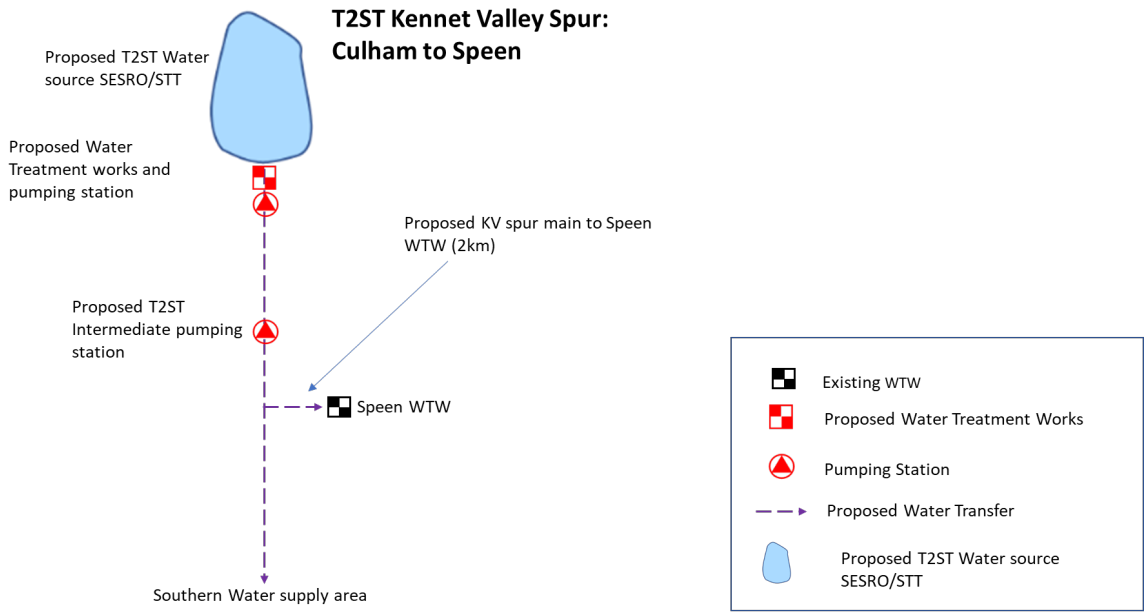
## Kennet Valley to SWOX Transfer (2.3 Ml/d or 6.7 Ml/d)

| | |
|---|---|
| Name | Kennet Valley to SWOX 2.3 Ml/d – inter-zonal transfer<br>Kennet Valley to SWOX 6.7 Ml/d – inter-zonal transfer |
| WRSE ID | TWU_SWX_HI-TFR_KVZ_ALL_kennet-swox2.3<br>TWU_SWX_HI-TFR_KVZ_ALL_kennet-swox6.7 |
| WRMP19 Reference | RES-IZT-KEN-SWOX-CLV-2.3<br>RES-IZT-KEN-SWOX-CLV-6.7 |
| Element Type | Resource |
| WRZ | SWOX |
| Engineering Scope | Phased construction of a new pipeline from Pangbourne WTW to Cleeve WTW to transfer 2.3 Ml/d or 6.7 Ml/d of treated water and a new pumping station at Pangbourne WTW.<br>Additionally, a new potable water pipeline is required for the end section of the existing main from Fobney WTW to Tilehurst SR, to enable an increase in flow in the pipeline. |
| Engineering Components | The components for this scope are as follows:<br>• New treated water pipeline from Pangbourne WTW to Cleeve WTW<br>• New treated water pipeline for the end section from Fobney WTW to Tilehurst SR<br>• New pumping station at Pangbourne WTW<br>• Balance tank at Cleeve WTW<br>• Additional pumps at the existing pumping station building at Fobney WTW |
| Phasing/Benefits | This option would be developed in a single phase.<br>DO benefit: n/a |
| Lead Time | 5 Years |
| Mutual exclusivities | Both transfer options are mutually exclusive to each other. |
| Interdependencies/ Exclusivity | To provide an additional resource to SWOX WRZ the following system element is also required:<br>An additional 4.5 Ml/d from Mortimer Recommissioning to enable the release of 4.5 Ml/d supply capacity from Fobney WTW. |




## T2ST KV Spur: Culham to Newbury (Potable)

| Name | T2ST KV Spur: Culham to Newbury (Potable) |
|---|---|
| WRSE ID | TWU_KVZ_HI-TFR_T2S_ALL_t2st cul to speen |
| WRMP19 Reference | n/a option new to WRMP24 |
| Element Type | Network Reinforcement |
| WRZ | Kennet Valley |
| Engineering Scope | Treated water spur 10 Ml/d connection from Thames to Southern Transfer (T2ST) pipeline to Speen WTW within the Kennet Valley water resource zone. Pumping head is provided by T2ST pumping station. |
| Engineering Components | The components for this scope are as follows:<br>• 1.6km long potable spur connection from T2ST pipeline to Speen WTW<br>• Break pressure tank at Speen WTW |
| Phases/benefits | n/a |
| Lead Time | 12 Years (as lead time for T2ST scheme) |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | This option is dependent on Thames to Southern Transfer being selected. |

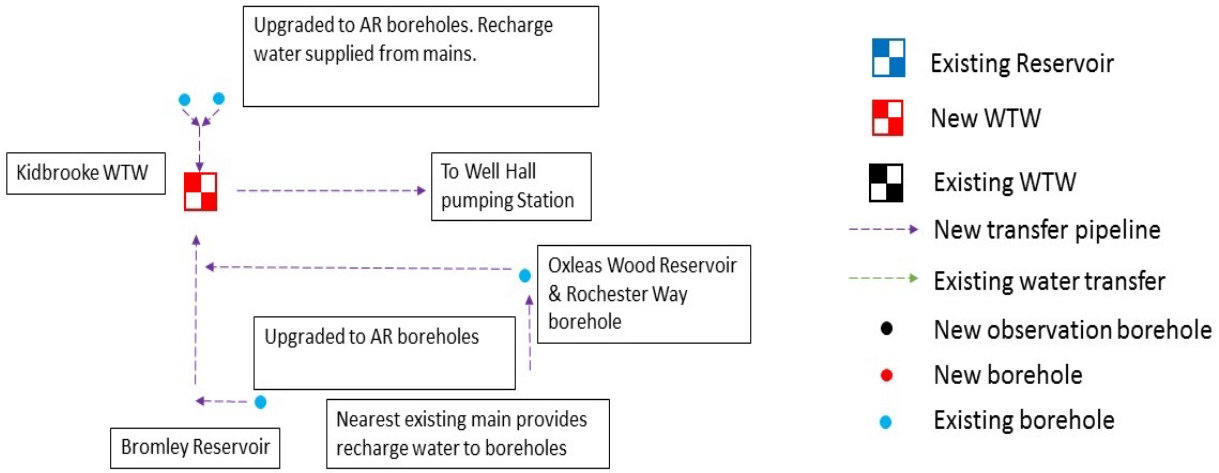



# Groundwater

## South London Artificial Recharge Scheme – Kidbrooke

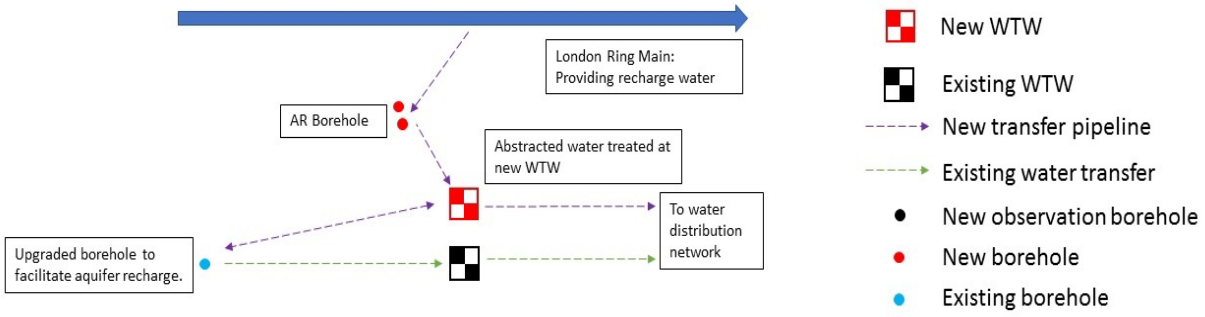
| Name | South London Artificial Recharge Scheme (SLARS) – Kidbrooke |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_ALL_XXX_kidbrooke slars |
| WRMP19 Reference | RES-AR-SLARS1-7 |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | Upgrading four existing boreholes for Artificial Recharge (one at the Rochester Way site, two at Kidbrooke and another at the Bromley Reservoir site and construction of a new 8.1 Ml/d WTW at the Kidbrooke borehole site to serve all the boreholes. Recharge water for the Kidbrooke boreholes will be provided from the local distribution main and will be recharged into the confined Chalk aquifer under mains pressure. Recharge water for Bromley Reservoir borehole and Rochester Way borehole will be provided via supply mains.<br>Water abstracted from the AR boreholes will be treated at the new Kidbrooke WTW. Treated water from the Kidbrooke WTW will be returned to supply via the Well Hall Pumping station when an additional resource for the London Water Resource Zone is required. A discharge consent for recharge of the Chalk aquifer permit will be required from the Environment Agency for recharge of the Chalk aquifer. |
| Engineering Components | The components for this scope are as follows: |

| Name | South London Artificial Recharge Scheme (SLARS) – Kidbrooke |
|---|---|
| | • Construction of a new 8.1 Ml/d treatment works at the Kidbrooke<br>• New headworks and submersible abstraction pump with variable speed drives (VSD) for the existing Kidbrooke boreholes<br>• Existing Bromley reservoir borehole will have an abstraction pump installed<br>• Existing Rochester Way borehole will have an abstraction pump installed<br>• A VSD booster pump will be installed at Oxleas Wood reservoir to pump recharge water to Rochester Way<br>• A new connection for recharge water to be constructed at the existing mains Bromley Reservoir site, transfer pipe will be constructed for raw water being pumped from Bromley to Kidbrooke WTW<br>• Construction of a main from Rochester Way borehole to transfer abstracted water to Kidbrooke WTW<br>• A main to be installed from Oxleas Wood to provide recharge water for Rochester Way |
| Phases/Benefits | This option would be developed in a single phase.<br>DO benefits of 8Ml/d. |
| Lead Time | 6.5 Years |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | The scheme is independent of the other sub-components of the larger SLARS project: Streatham (SLARS) and Merton (SLARS) |



## South London Artificial Recharge Scheme – Streatham

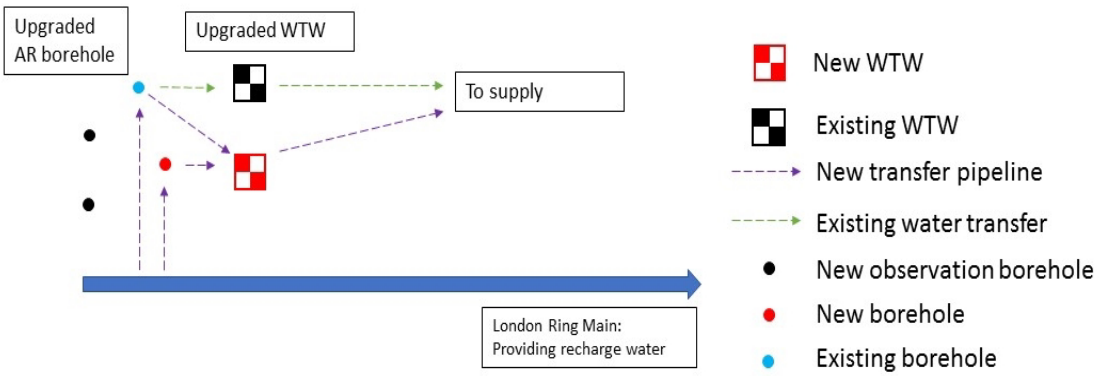
| Name | South London Artificial Recharge Scheme (SLARS) – Streatham |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_ALL_ALL_streatham ar |
| WRMP19 Reference | RES-AR-SLARS2 |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | Component of the larger SLARS project based on the development of boreholes for recharge/abstraction purposes in the confined Chalk. Upgrade of existing borehole at Streatham WTW and construction of new artificial recharge (AR) borehole on-site at the existing Streatham WTW. Construction of a new 17 Ml/d WTW located on the existing WTW site. Recharged water is treated at the new WTW.<br>A new licence and discharge consent will be required from the Environment Agency to allow abstraction/recharge from the Chalk. A winter licence from the River Thames will also be required to supply water during the recharge phase of the AR scheme. |
| Engineering Components | The components for this scope are as follows:<br>• Construction of a new 17 Ml/d treatment works on the existing site<br>• New recharge/abstraction borehole<br>• Variable speed drive (VSD) pump for new borehole<br>• Redevelopment of existing borehole to become a recharge/abstraction borehole<br>• New recharge water connection to the existing main in Conyers Road<br>• Connection from treated water main to distribution network<br>• New run-to-waste sewer connection |
| Phases/Benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 5 Ml/d<br>• 1 in 500 average: 5 Ml/d<br>• 1 in 500 peak: 7 Ml/d |
| Lead Time | 4 Years |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | The scheme is independent of the other sub-components of the larger SLARS project: Kidbrooke (SLARS) and Merton (SLARS). |




## South London Artificial Recharge Scheme Merton Abbey

| Name | South London Artificial Recharge Scheme (SLARS) – Merton Abbey |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_ALL_XXX_merton ar |
| WRMP19 Reference | RES-AR-SLARS3 |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | This option involves upgrading the existing well and adit system at the Merton Abbey Water Treatment Works (WTW) for artificial recharge (AR) and the construction of a new AR borehole with two observations boreholes. A new WTW will be constructed at Merton Abbey to serve the Byegrove Road AR borehole. Recharge water for the Merton Abbey and Byegrove Road AR boreholes will be provided via the London Ring Main and will be recharged to the confined Chalk aquifer. Abstracted water from the AR boreholes will be treated at the new and upgraded WTWs. Treated water from the Merton Abbey WTW will be returned to local distribution mains when an additional resource is needed for the London WRZ.<br>A new licence and discharge consent will be required from the Environment Agency to allow abstraction/recharge from the Chalk. A winter licence from the River Thames will also be required to supply water during the recharge phase of the AR scheme. |
| Engineering Components | The components for this scope are as follows:<br>• Installation of new submersible pump, in the existing abstraction well, at Merton Abbey WTW, capable of pumping 8 Ml/d<br>• Construction of a new 4.5 Ml/d treatment works at the Merton Abbey WTW site<br>• Installation of a new submersible pump, in the existing abstraction well, at Merton Abbey WTW<br>• Construction of a connection to existing main in Fortescue Road, to provide recharge water<br>• Construction of a new housing for the wellhead at Merton Abbey WTW<br>• Construction of a new WTW to treat water from the new AR borehole at the Byegrove Rd site |

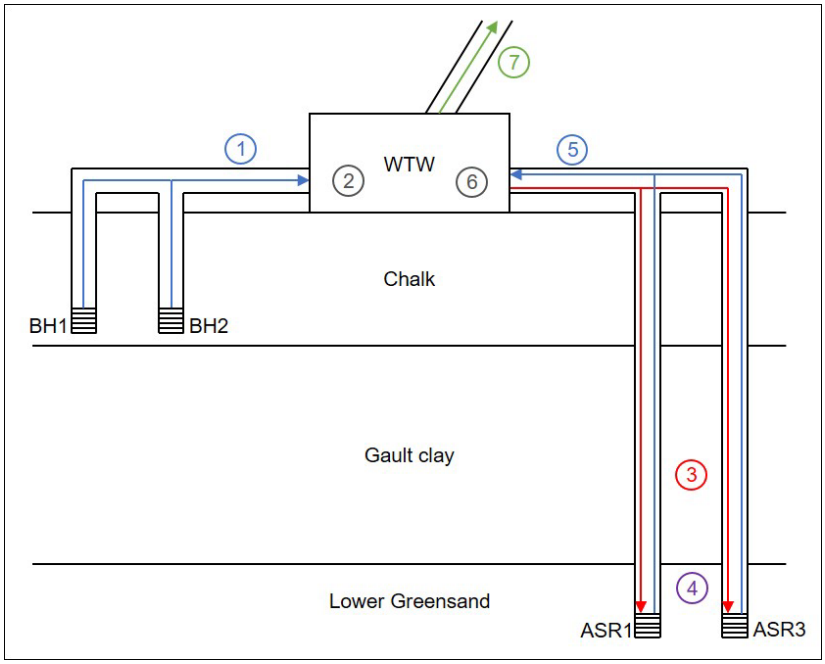
| Name | South London Artificial Recharge Scheme (SLARS) – Merton Abbey |
|---|---|
| | • Construction of a new connection from the new WTW to a local distribution main. A run to waste connection will be provided to the existing site drain<br>• Construction of an AR borehole at Byegrove Road<br>• Two observation boreholes for the AR borehole at Byegrove Road<br>• Construction of a new connection pipeline to the distribution main in Byegrove road to provide recharge water<br>• Construction of pipeline for water transfer from Byegrove AR borehole to new WTW<br>• Additional pumps are required at Byegrove Road AR borehole and the new WTW |
| Phases/Benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 6 Ml/d<br>• 1 in 500 average: 6 Ml/d<br>• 1 in 500 peak: 5 Ml/d |
| Lead Time | 6.5 Years |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | This option is independent of the other sub-components of the larger SLARS project: Kidbrooke (SLARS) and Streatham (SLARS)<br><br>This option cannot be delivered without Merton Recommissioning |



## Horton Kirby Aquifer Storage and Recovery

| Name | Horton Kirby Aquifer Storage and Recovery[9] |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby |
| WRMP19 Reference | RES-ASR-HOR |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | Construction of pipelines between two existing Aquifer Storage and Recovery (ASR) boreholes in the Lower Greensand aquifer to an existing WTW (water treatment works) at Horton Kirby in Kent. Water abstracted from existing Chalk aquifer boreholes (via the mains supply) will be recharged into the two ASR boreholes during periods of water surplus and abstracted when needed and treated at the WTW.<br>A new licence and discharge consent will be required from the Environment Agency to allow abstraction/recharge from the Lower Greensand aquifer. |
| Engineering Components | The components for this scope are as follows:<br>• Raw water pipeline to connect existing ASR3 borehole to existing Horton Kirby WTW<br>• Upgrade to Horton Kirby WTW treatment<br>• New control infrastructure to recharge the aquifer<br>• New ASR borehole kiosk<br>• Two borehole abstraction pumps at the ASR boreholes<br>• Two booster pumps for recharge to ASR boreholes<br>• Two borehole pumps for abstraction from Chalk boreholes<br>• Two force pumps to management control of Horton Kirby WTW output to Farningham storage reservoir<br>• Install turbidity meters at ASR boreholes<br>• New run-to-waste pipelines from ASR (1 and 3) boreholes to River Darent<br>New raw water pipelines between the existing ASR (1 and 3) boreholes and the WTW |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of 5 Ml/d |
| Lead Time | 5 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependent on other options. |

[9] ASR Horton Kirby and Southfleet & Greenhithe Groundwater schemes were included in the WRMP19 Preferred Programme for London for delivery in AMP7 (2020-25). Since WRMP19 the delivery of these options has been deferred beyond the end of AMP7 as the supply demand balance in the London WRZ is in surplus. They are therefore included as WRMP24 Options

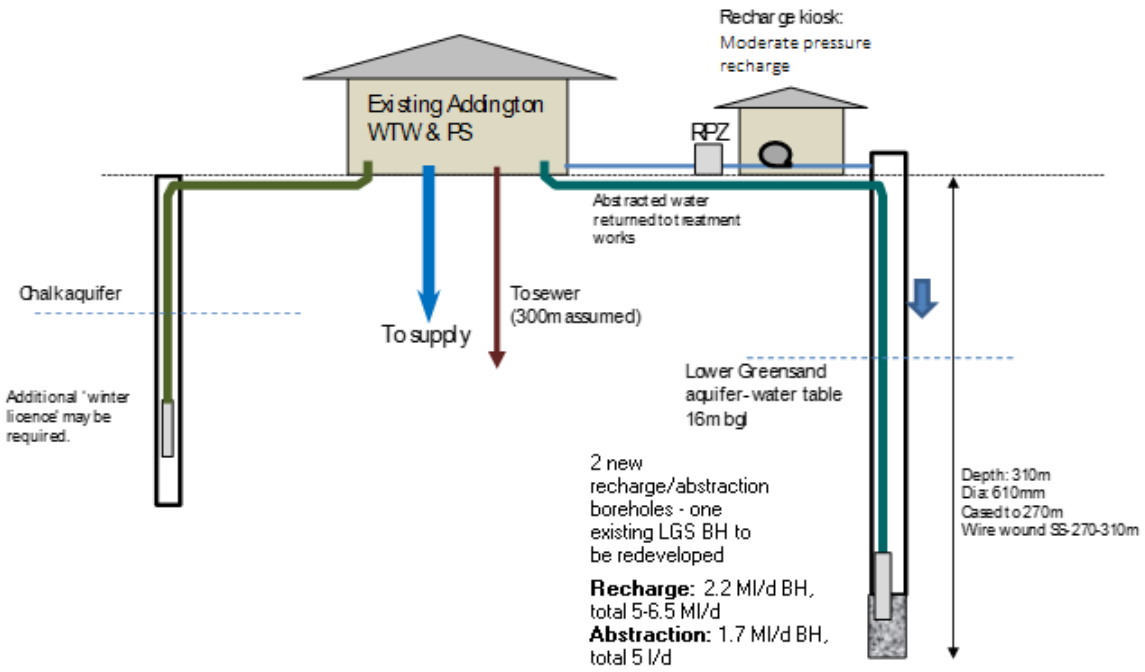



Additional abstraction from Chalk aquifer.
Treatment at WTW
Recharge of additional abstracted water to Lower Greensand Aquifer.
Storage in Lower Greensand aquifer.
Abstraction from storage, when required.
Treatment at WTW.
Distribution as potable water.

## ASR South East London (Addington)

| Name | ASR South East London (Addington) |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_ALL_XXX_addington asr |
| WRMP19 Reference | RES-ASR-SEL |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | Development of the existing Lower Greensand (LGS) borehole for recharge/abstraction purposes. Construction of two new recharge/abstraction boreholes in the LGS aquifer to provide a total of three operational ASR boreholes. Recharge water will be provided via the Addington supply main and abstracted water will be treated at the existing WTW. Waste and sludge discharges drain to an existing sewer connection and treated water will be returned to the Addington supply main when an additional resource for the London Water Resource Zone is required.<br><br>A new licence and discharge consent will be required from the Environment Agency to allow abstraction/recharge from the Lower Greensand aquifer. As part of the application for consent, an understanding of potential impacts of the proposed option on water level (including nearby abstractors) and water quality will be prepared. |
| Engineering Components | The components for this scope are as follows:<br>• Two new abstraction/recharge boreholes<br>• Three new borehole pumps<br>• New moderate pressure recharge building<br>• Upgrade of Addington WTW to treat additional peak supply<br>• New pipelines from WTW to the two new off-site abstraction/recharge boreholes |

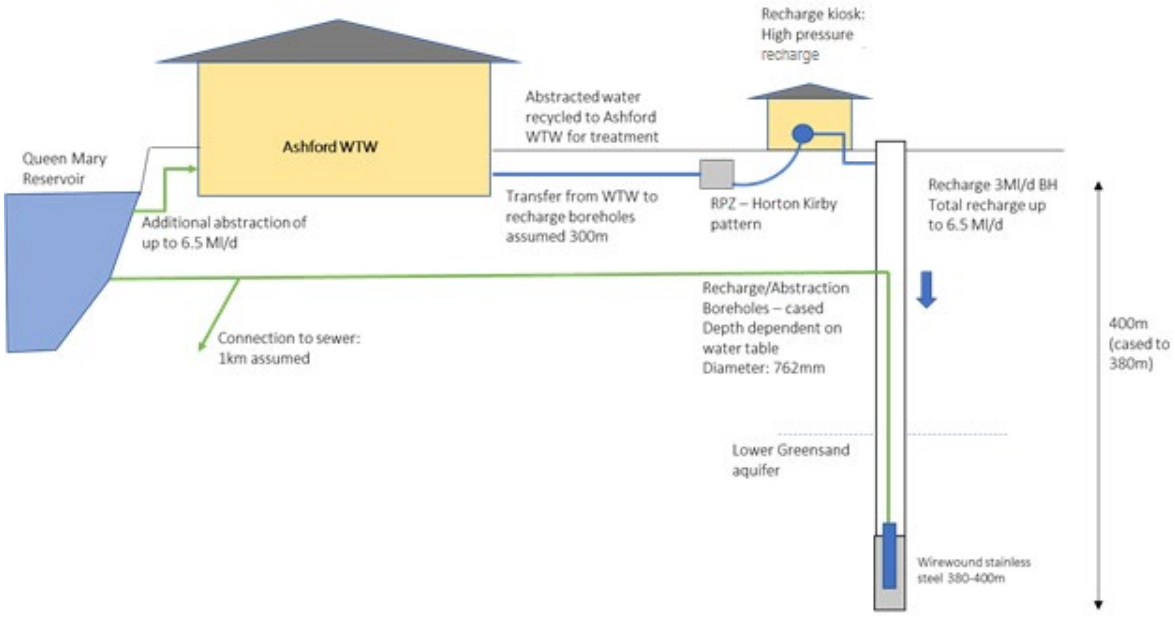
| Name | ASR South East London (Addington) |
|---|---|
| Phases/Benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 In 2 average: 3 Ml/d<br>• 1 In 500 average: 3 Ml/d<br>• 1 In 500 peak: 5 Ml/d |
| Lead Time | 10 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | Delivery of this option in addition to Addington (GW) will require a capacity upgrade of the Addington WTW to treat the additional peak supply. This is included in the Addington new borehole option Addington (GW). |




## Thames Valley Central ASR

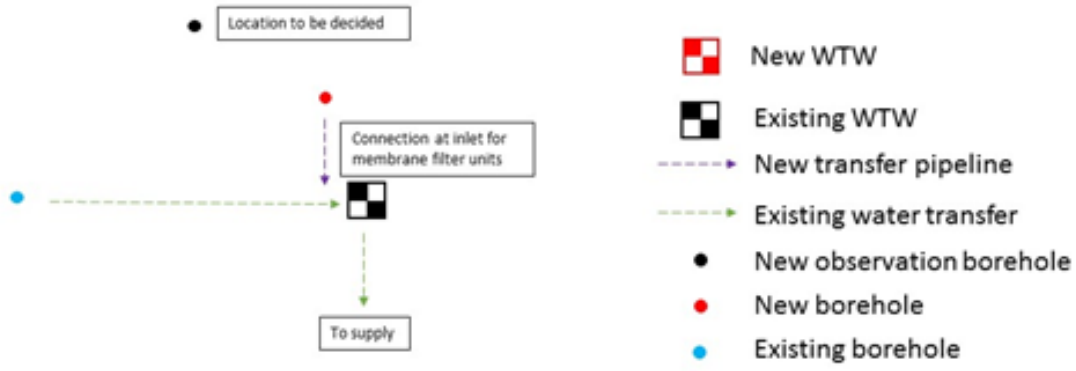
| Name | Thames Valley/Thames Central ASR |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_ALL_ALL_thames valley asr |
| WRMP19 Reference | RES-ASR-TV |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | Construction of two new recharge/abstraction boreholes in the Lower Greensand aquifer (LGS) on-site at the existing Ashford water treatment works. Recharge water will be provided via the transfer main from the existing WTW. Water abstracted from ASR boreholes will be pumped to the Queen Mary Reservoir adjacent to the WTW. All waste and sludge discharge will be pumped to the local sewer via a new sewer connection. Treated water will be |

| Name | Thames Valley/Thames Central ASR |
|---|---|
| | returned to the supply main as an additional resource for the London Water Resource Zone, when required.<br>A new licence and discharge consent will be required from the Environment Agency to allow abstraction/recharge from the Lower Greensand aquifer. |
| Engineering Components | The components for this scope are as follows:<br>• Two new ASR boreholes to be developed. Initially, first borehole will be treated as pilot borehole to test yield and assess scheme viability. Second borehole will then be drilled if tests are successful<br>• One duty pump per borehole<br>• New recharge pumping building<br>• New pipeline to sewer<br>• Construction of pipe to return water to Queen Mary Reservoir<br>• Construction of pipe to transfer water under mains pressure to recharge building |
| Phases/Benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 In 2 average: 3 Ml/d<br>• 1 In 500 average: 3 Ml/d<br>• 1 In 500 peak: 5 Ml/d |
| Lead Time | 10 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependant on other system elements. |



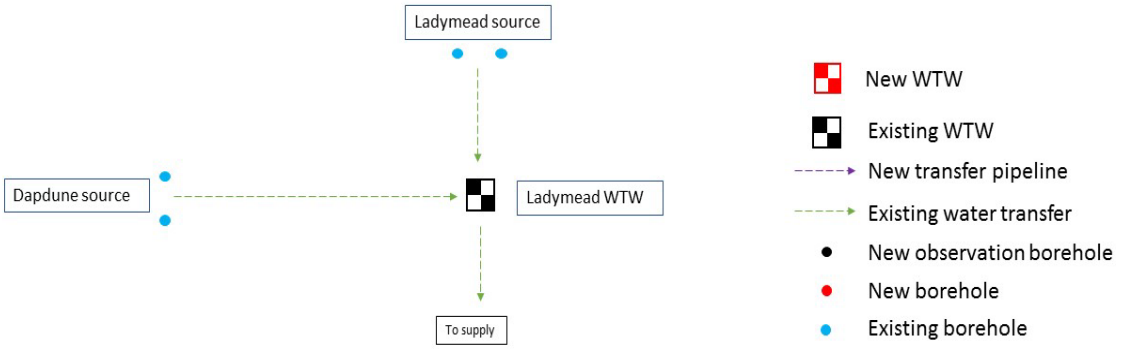
## Groundwater Addington

| Name | Groundwater Addington |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_ALL_ALL_addington gw |
| WRMP19 Reference | RES-GW-ADD |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | The option comprises the construction of a new borehole at Addington WTW, the improvement of existing WTW capacity by additional sodium bisulphate and phosphoric acid dosing capacity and the development of a new run to waste connection. Treated water will be an additional resource for the London Water Resource Zone. |
| Engineering Components | The components for this scope are as follows<br>• New abstraction borehole<br>• Abstraction pipework<br>• A new run-to-waste connection to the existing drain.<br>• Upgrade of chemical dosing (sodium hypochlorite, sodium bisulphate and phosphoric acid) to provide an additional 5 Ml/d treatment capacity<br>• New observation borehole |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 In 2 average: 2.7 Ml/d<br>• 1 In 500 average: 2.7 Ml/d<br>• 1 In 500 peak: 5.7 Ml/d |
| Lead Time | 3 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependent on any other works.<br>The Addington WTW does not have the capacity to treat the additional supply from the combined output of this option and the South East London ASR (Addington (ASR)) If the option Addington (ASR) is not taken forward then the proposed upgrades to Addington WTW will not be required. |



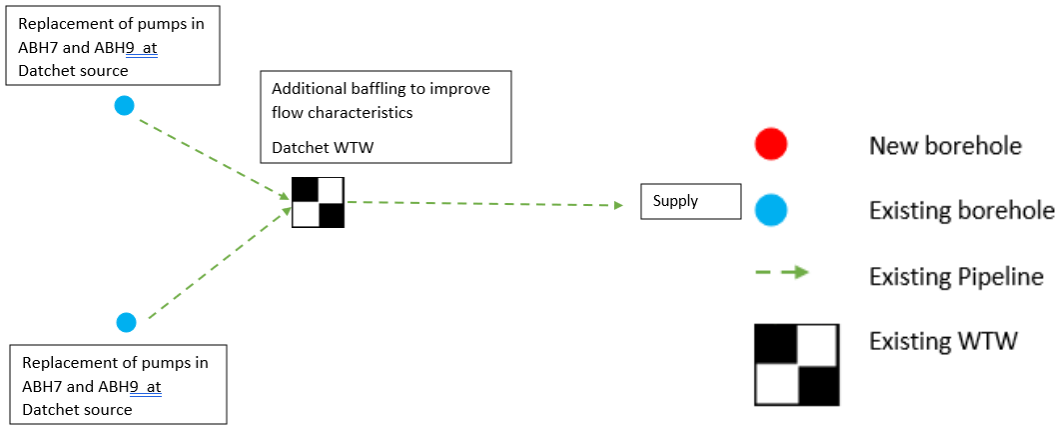

## Dapdune Licence Disaggregation

| Name | Dapdune licence disaggregation |
|---|---|
| WRSE ID | TWU_GUI_HI-GRW_ALL_ALL_dapdune lic disagg |
| WRMP19 Reference | RES-GW-DAP |
| Element Type | Resource |
| WRZ | Guildford |
| Engineering Scope | This option comprises the disaggregation of the group Dapdune – Ladymead – Millmead borehole abstraction licence group for peak licensed quantities only. No change to the average aggregate licence is proposed. The benefit from this option will provide an additional resource to the Guildford water resource zone. |
| Engineering Components | No additional works will need to be performed. This option will require approval from the Environment Agency (EA). |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 0 Ml/d<br>• 1 in 500 average: 0 Ml/d<br>• 1 in 500 peak: 2.2 Ml/d |
| Lead Time | 1 Year |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is dependent on the delivery of the Dapdune (ROC) option and Ladymead removal of constraints option (ROC) which has been progressed in AMP7. |



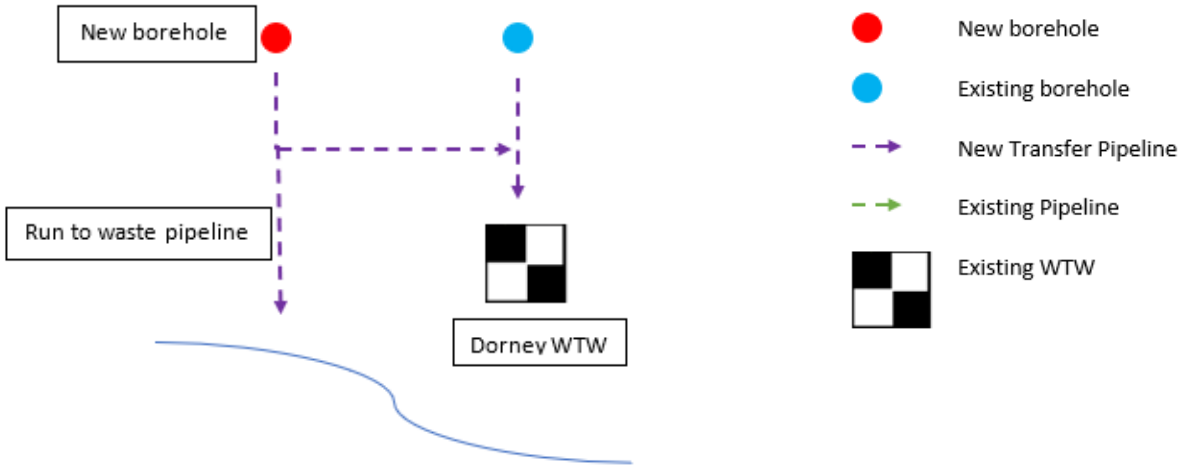

## Datchet Increase DO

| Name | Datchet Increase Do |
|---|---|
| WRSE ID | TWU_SWA_HI-GRW_ALL_ALL_datchet do |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Resource |
| WRZ | Slough, Wycombe & Aylesbury (SWA) |
| Engineering Scope | The WRMP24 Datchet increase DO option aims to increase current DO limited by pump capacity to the annual average licence limit. This would be an increase of 1.6 Ml/d. |
| Engineering Components | The components for this scope are as follows:<br>• Installation of additional baffling to improve the plug flow characteristics of the Datchet WTW contact tank<br>• 1 no. new borehole pump for ABH7<br>• 1 no. new borehole pump for ABH9 installed at a deeper level<br>• Main MCC with busbar<br>• Cable trenches/ducting between the old and new MCC, communications link to be established with existing ICA panel<br>• Replacement transformer<br>• Temporary works – Duty/standby diesel generators and ICA panel |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 1.6 Ml/d<br>• 1 in 500 average: 1.6 Ml/d<br>• 1 in 500 peak: 6.21 Ml/d |
| Lead Time | 3.5 Year |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependent on any other works. |



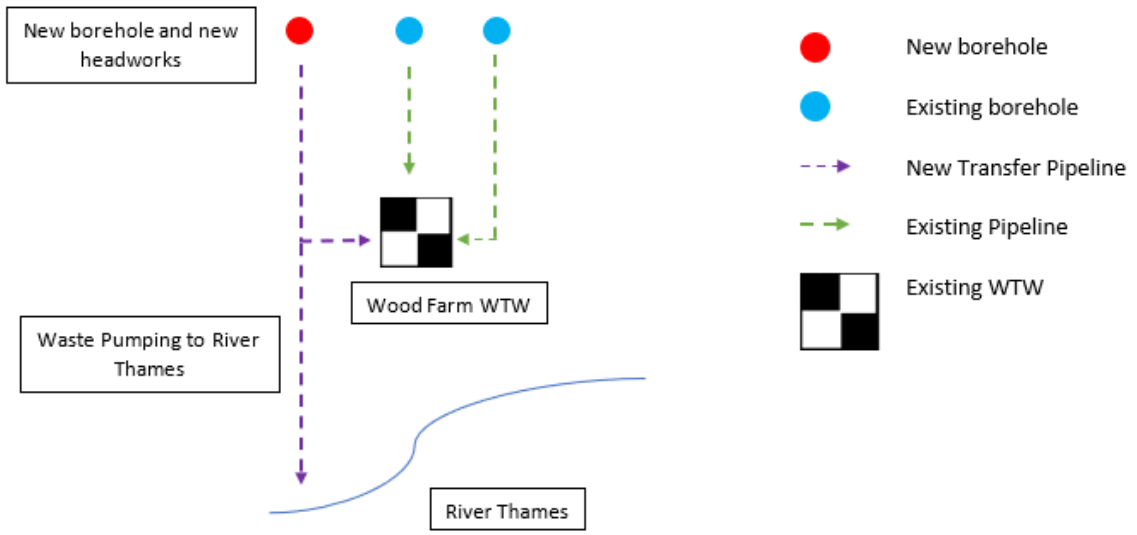

## Dorney Increase DO

| Name | Dorney increase DO |
|---|---|
| WRSE ID | TWU_SWA_HI-GRW_ALL_ALL_dorney DO |
| WRMP19 Reference | n/a – new option to WRMP24 |
| Element Type | Resource |
| WRZ | Slough, Wycombe & Aylesbury (SWA) |
| Engineering Scope | Increase abstraction to peak license at Dorney WTW by constructing a new abstraction borehole in the gravel aquifer at the existing Dorney Reach raw water site. The borehole will be operated within the existing abstraction licence. The water abstracted from the proposed borehole will be treated at the existing Dorney WTW site. |
| Engineering Components | The components for this scope are as follows:<br>• New borehole to be drilled at the Dorney Reach<br>• Two pumps (duty and standby)<br>• New pipeline connecting raw feed to WTW<br>• New run-to-waste pipeline |
| Phases/benefits | DO benefits of:<br>• 1 in 2 average: 0 Ml/d<br>• 1 in 500 average: 0 Ml/d<br>• 1 in 500 peak: 4.3 Ml/d |
| Lead Time | 4 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | The size of the disinfection upgrade in the Taplow Increase DO scheme is dependent on whether the Dorney Increase DO option is selected. |



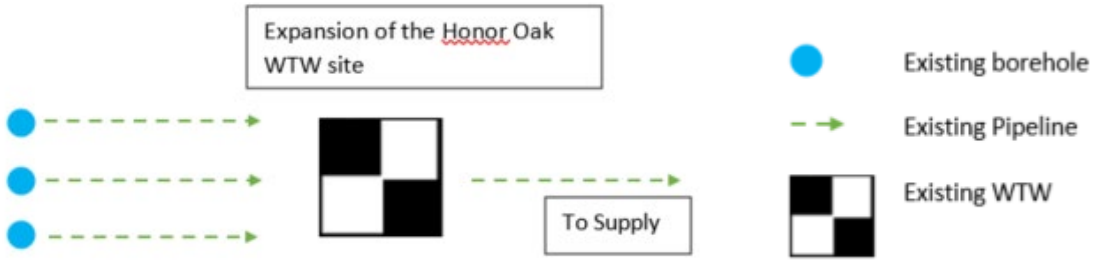

## Wood Farm Increase DO

| Name | Woods Farm increase DO |
|---|---|
| WRSE ID | TWU_SWX_HI-GRW_ALL_ALL_woods farm do |
| WRMP19 Reference | n/a – new option to WRMP24 |
| Element Type | Resource |
| WRZ | Swindon and Oxford (SWOX) |
| Engineering Scope | Increase abstraction to peak license and the average DO at Woods Farm WTW. The objective is to recover DO to licensed quantity by drilling a new borehole to make up for the lost output due to turbidity in ABH3. |
| Engineering Components | The components are as follows:<br>• One new borehole in the Chalk aquifer outside existing site<br>• One duty pump<br>• New raw water pipeline from borehole to WTW<br>• New waste from Wood Farm WTW to the River Thames. This includes three minor crossings |
| Phases/benefits | DO benefits of:<br>• 1 in 2 average: 2.4 Ml/d<br>• 1 in 500 average: 2.4 Ml/d<br>• 1 in 500 peak: 2.9 Ml/d |
| Lead Time | 4 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependent on any other works. |



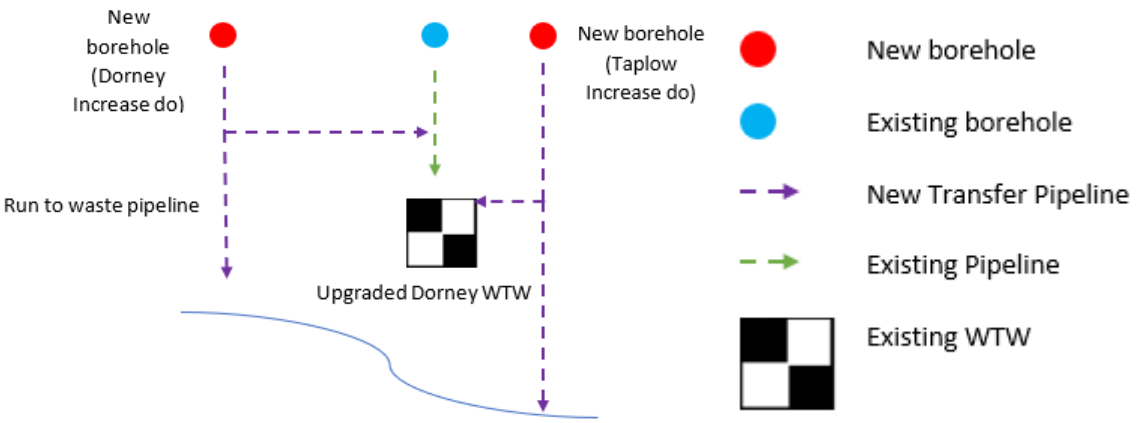

## Honor Oak Increase DO

| Name | Honor Oak increase DO |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_ALL_ALL_honoroak do |
| WRMP19 Reference | n/a – new option to WRMP24 |
| Element Type | Resource |
| WRZ | London |
| Engineering Scope | Restore Honor Oak well and WTW back into service by refurbishing the treatment works and replacing the pump. This option would utilise the existing license. |
| Engineering Components | The components for this scope are as follows:<br>• Well refurbishment; including replacement well pump<br>• Coagulation and flocculation system including re-lift pumping station<br>• Re-lift pumps from new flocculation tank to downstream process units<br>• Replacement of sand filters<br>• Replacement of disinfection + dichlorination equipment<br>• Ammonisation<br>• Orthophosphoric acid |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 1.7 Ml/d<br>• 1 in 500 average: 1.7 Ml/d<br>• 1 in 500 peak: 1.7 Ml/d |
| Lead Time | 5 Years |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | Work on this option must be completed before the Honor Oak (GW) option work can take place. |




## Taplow Increase DO

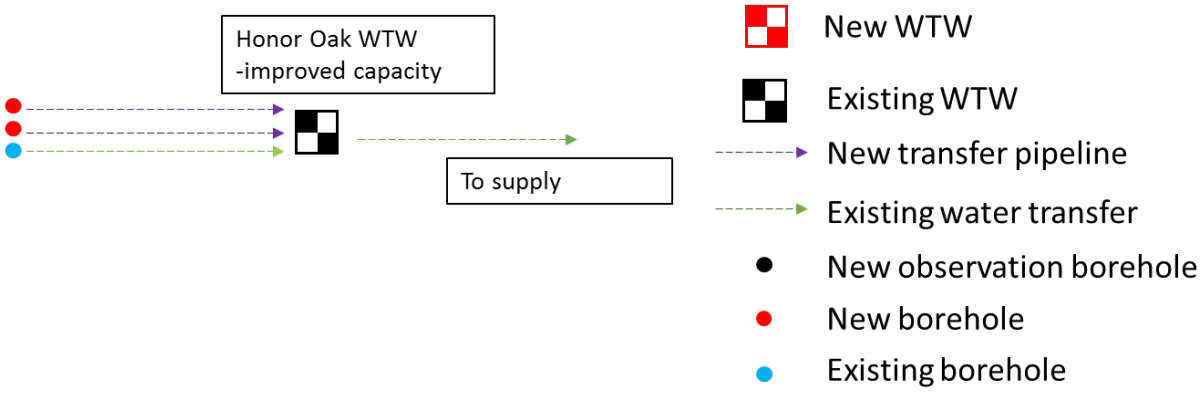
| Name | Taplow increase DO |
|---|---|
| WRSE ID | TWU_SWA_HI-GRW_ALL_ALL_taplowincreasedo |
| WRMP19 Reference | n/a – new option to WRMP24 |
| Element Type | Resource |
| WRZ | Slough, Wycombe & Aylesbury (SWA) |
| Engineering Scope | The WRMP24 Taplow option aims to increase DO up to the licenced quantities. The option includes new chalk abstraction borehole including pumps and variable speed drives (VSD's) at Dorney WTW site but added to the Taplow abstraction licence.<br>Upgrade at Dorney WTW is required if both Taplow Increase DO and Dorney Increase DO options are selected. |
| Engineering Components | The components for the scope are as follows:<br>• New chalk abstraction borehole at the Dorney WTW site<br>• New duty pump<br>• New rising main and a run to waste pipeline.<br>• Disinfection upgrade at Dorney WTW is required to increase treatment capacity to 77 Ml/d. (See Interdependencies) |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 0 Ml/d<br>• 1 in 500 average: 0 Ml/d<br>• 1 in 500 peak: 5.7 Ml/d |
| Lead Time | 4 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | The disinfection upgrade scope will only be included if –Dorney Increase DO option is selected as well as Taplow increase DO. |




## Groundwater Honor Oak

| Name | Groundwater Honor Oak |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_ALL_ALL_honor oak gw |
| WRMP19 Reference | RES-GW-HON |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | This option comprises construction of one or two new abstraction boreholes close to the existing Honor Oak site to increase output within existing licence limits. The option also includes associated headworks and abstraction pumps, and the installation of a new pipeline to transfer the water from the new borehole(s) to the existing WTW. The water abstracted from the proposed borehole(s) will be treated at the existing WTW.<br>The capacity of the existing WTW will be improved by installing new pressure sand filters for iron and manganese removal, and new Granular activated carbon (GAC) adsorbers for pesticide removal. The existing contact tanks have sufficient capacity to treat the total abstraction volume.<br>The treated water will be used to provide additional resource for the London Water Resource Zone (WRZ). |
| Engineering Components | The components for this scope are as follows:<br>• New abstraction boreholes with associated headwords near the existing WTW site<br>• Run to waste facility for boreholes<br>• Two new pipelines to transfer water from the new boreholes to the existing WTW<br>• New abstraction pump in each new borehole<br>• Transfer from the new boreholes to the existing WTW<br>• New pressure sand filter and new GAC absorbers at Honor Oak WTW |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 1.4 Ml/d |

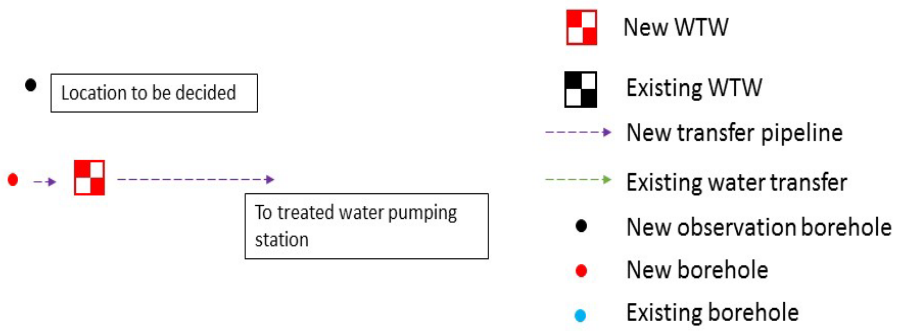
| Name | Groundwater Honor Oak |
|---|---|
| | • 1 in 500 average: 1.4 Ml/d<br>• 1 in 500 peak: 2.7 Ml/d |
| Lead Time | 3 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependent on any other works. |




## London Confined Chalk (north)

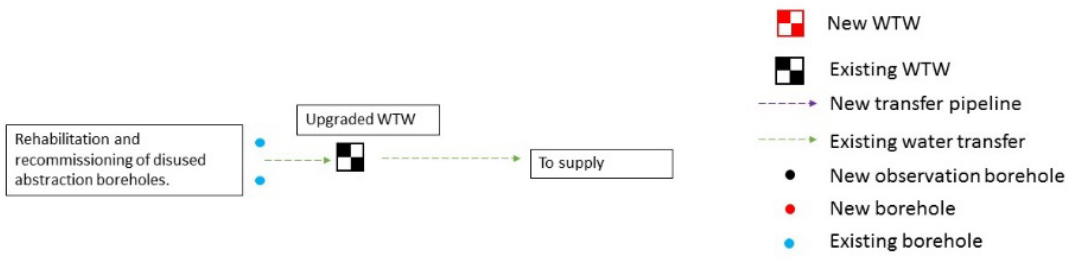
| Name | London Confined Chalk (north) |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_ALL_ALL_london conchalk |
| WRMP19 Reference | RES-GW-LCC |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | Construction of one new abstraction borehole in the confined Chalk aquifer in London and one new water treatment works (WTW). Treatment assumed to include ultrafiltration, reverse osmosis, super-chlorination and dichlorination. Test pumping will be required to support the application for a new abstraction licence. |
| Engineering Components | The components for this scope are as follows:<br>• A new abstraction borehole<br>• Observation borehole<br>• New WTW containing; Ultrafiltration, reverse osmosis, super-chlorination, dichlorination |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 2 Ml/d<br>• 1 in 500 average: 2 Ml/d<br>• 1 in 500 peak: 2 Ml/d |
| Lead Time | 5 Years |
| Mutual Exclusivities | None |

| Name | London Confined Chalk (north) |
|---|---|
| Interdependencies/ Exclusivity | This option is not dependent on any other option. |



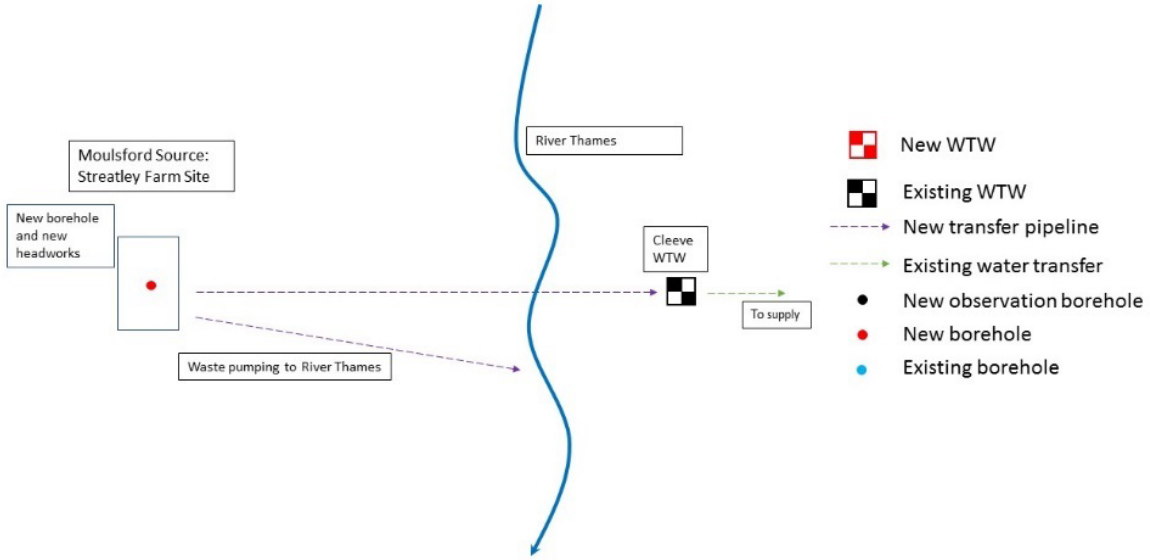

## Mortimer Disused Source Recommissioning

| Name | Mortimer Disused Source Recommissioning |
|---|---|
| WRSE ID | TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm |
| WRMP19 Reference | RES-GW-MOR1 |
| Element Type | Resource |
| WRZ | Kennet Valley |
| Engineering Scope | Rehabilitation and recommissioning of two abstraction boreholes (Borehole A and Borehole B) on the disused Mortimer water treatment works (WTW). The WTW will be upgraded to include treatment for ammonia and iron removal. Test pumping of the boreholes will be required to confirm groundwater quality. Treated water will provide an additional resource for the Kennet Valley Water Resource Zone.<br>An investigation to understand the potential impacts of the proposed option on the Water Framework Directive status of the water body will be carried out in AMP7. |
| Engineering Components | The components for this scope are as follows:<br>• Refurbishment of the existing boreholes<br>• Upgrading the existing WTW for ammonia and iron removal |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 4.5 Ml/d<br>• 1 in 500 average: 4.5 Ml/d<br>• 1 in 500 peak: 4.5 Ml/d |
| Lead Time | 2 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependent on other options. |




## Moulsford 1 groundwater option

| Name | Moulsford 1 groundwater option |
|---|---|
| WRSE ID | TWU_SWX_HI-GRW_ALL_ALL_moulsford gw |
| WRMP19 Reference | RES-GW-MOU |
| Element Type | Resource |
| WRZ | SWOX |
| Engineering Scope | Construction of an abstraction borehole in the unconfined Chalk north of Streatley, on the west bank of River Thames. Abstracted water will be treated at existing Cleeve WTW. Test pumping to support the new abstraction licence will be carried out. Treated water will provide an additional resource for the Swindon and Oxford Water Resource Zone.<br>An abstraction licence will be required. The potential impact of the Moulsford abstraction will be reviewed as part of any licence application, including a review of the impact of the Chiltrey Warren sustainability reduction in AMP7. |
| Engineering Components | The components for this scope are as follows:<br>• A new abstraction borehole and associated headworks,<br>• Installation of pumps<br>• Potential of a new observation borehole<br>• A new transfer pipeline between the abstraction borehole and the WTW<br>A new raw water run to waste pipeline. |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 2 Ml/d<br>• 1 in 500 average: 2 Ml/d<br>• 1 in 500 peak: 3.5 Ml/d |
| Lead Time | 3 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependent on other options. |

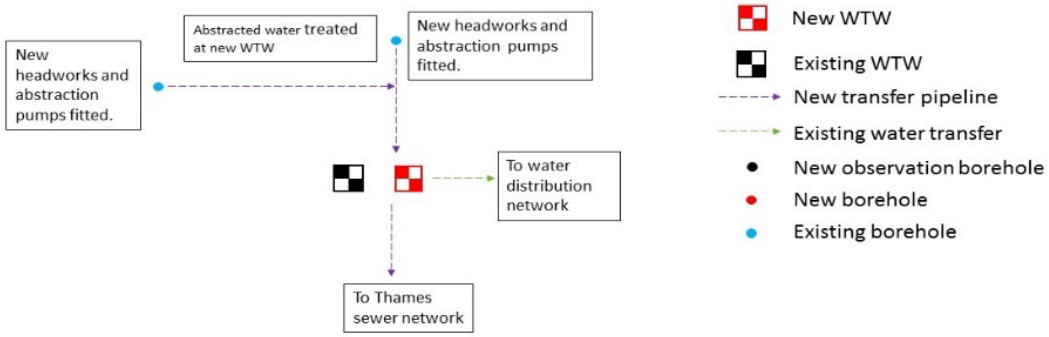



## Southfleet/Greenhithe Licence Disaggregation

| Name | Southfleet-Greenhithe Licence Disaggregation[10] |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg |
| WRMP19 Reference | RES-GW-SOU |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | This option comprises the disaggregation of the group Bean-Southfleet-Greenhithe borehole abstraction licence to a group Southfleet-Greenhithe abstraction licence to allow operation of both sources as per their combined licence amounts. A new water treatment works (WTW) will be constructed at the existing Southfleet WTW. Abstracted water from the two boreholes (one at Southfleet and one at Greenhithe) will be treated at the new WTW. Treated water will provide an additional resource for the London Water Resource Zone.<br>An investigation into potential water quality issues in the catchment will be carried out as part of the delivery of the option and the feasibility of mitigation measures such as catchment management will be investigated. |
| Engineering Components | The components for this scope are as follows:<br>• New headworks and pumps for the existing boreholes<br>• Replacement of borehole buildings at Southfleet and Greenhithe EPM borehole location<br>• Construction of a new WTW in land adjacent to the existing Southfleet WTW |

[10] ASR Horton Kirby and Southfleet & Greenhithe Groundwater schemes were included in the WRMP19 Preferred Programme for London for delivery in AMP7 (2020-25). Since WRMP19 the delivery of these options has been deferred beyond the end of AMP7 as the supply demand balance in the London WRZ is in surplus. They are therefore included as WRMP24 Options

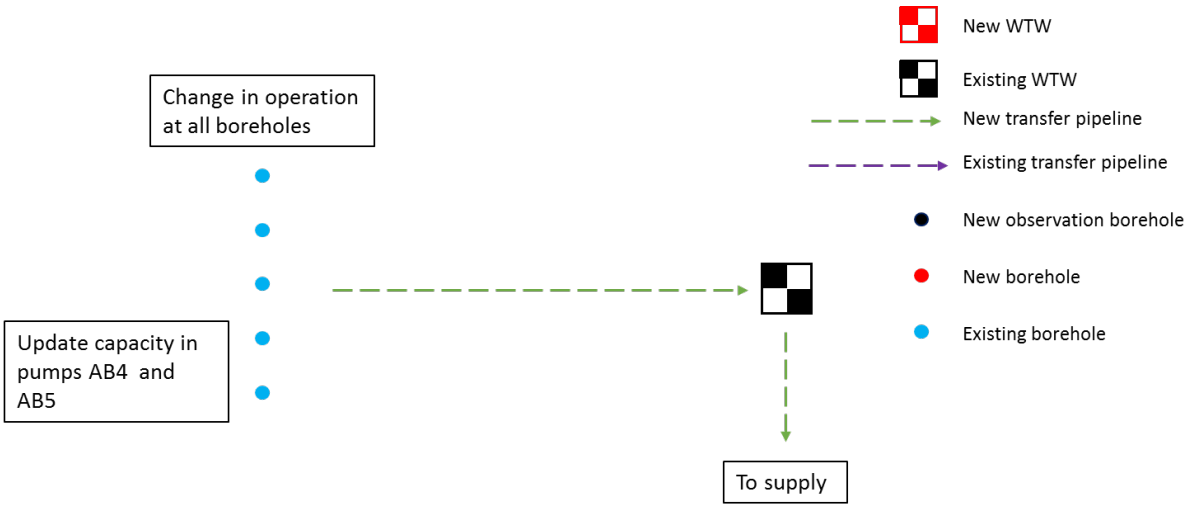
| Name | Southfleet-Greenhithe Licence Disaggregation[10] |
|---|---|
| | • Raw water transfer mains will be constructed from Greenhithe borehole and Southfleet borehole<br>• New pipeline connecting Southfleet EPM WTW to local TWUL sewer network |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 8.8 Ml/d<br>• 1 in 500 average: 8.8 Ml/d<br>• 1 in 500 peak: 8.8 Ml/d |
| Lead Time | 4 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependent on other elements. |




## Ashton Keynes borehole pumps Removal of Constraints

| Name | Ashton Keynes borehole pumps Removal of Constraints |
|---|---|
| WRSE ID | TWU_SWX_HI-GRW_ALL_ALL_ashton keynes roc |
| WRMP19 Reference | RES-RC-ASH |
| Element Type | Resource |
| WRZ | SWOX |
| Engineering Scope | To replace two existing borehole pumps (ABH4 and ABH5) at Ashton Keynes with higher capacity pumps at a lower intake level to increase the peak abstraction.<br>Change in operational abstraction philosophy to spread abstraction across the 5 boreholes to increase the peak abstraction to the licensed quantity of 11.6 Ml/d.<br>An investigation to understand the potential impacts of the proposed option on the Water Framework Directive status of the water body will be carried out in AMP7. |
| Engineering Components | The components for this scope are as follows:<br>• New pump for existing abstraction borehole ABH4 and ABH5 |
| Phases/benefits | This option would be developed in a single phase. |

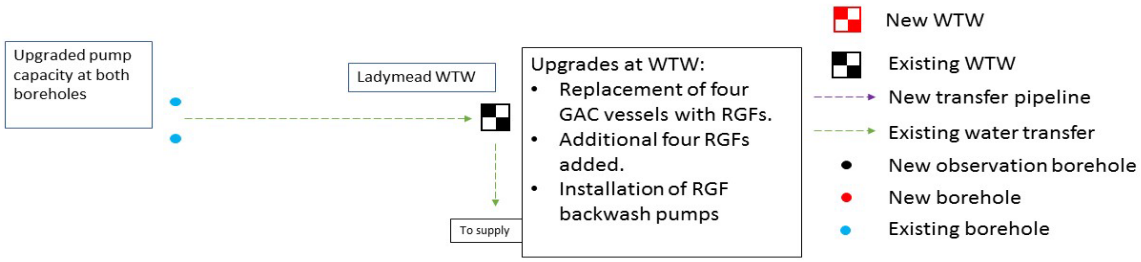
| Name | Ashton Keynes borehole pumps Removal of Constraints |
|---|---|
| | DO benefits of:<br>• 1 in 2 average: 0 Ml/d<br>• 1 in 500 average: 0 Ml/d<br>• 1 in 500 peak: 2.04 Ml/d |
| Lead Time | 1 Year |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependent on any other options. |




## Dapdune removal of constraints to DO

| Name | Dapdune removal of constraints to DO |
|---|---|
| WRSE ID | TWU_GUI_HI-GRW_ALL_ALL_dapdune roc |
| WRMP19 Reference | RES-RC-DAP |
| Element Type | Resource |
| WRZ | Guildford |
| Engineering Scope | This option consists of the removal of the current constraints on the DO at the Dapdune source. This groundwater source consists of two operational boreholes which abstract from a confined Chalk aquifer. Raw water is treated at Ladymead WTW. To remove the DO constraints pump capacity will be increased at the Dapdune boreholes and rapid gravity filters (RGF) will be used to treat the periodic microbial contamination at Ladymead WTW. Treated water will provide an additional resource for the Guildford Water Resource Zone. |
| Engineering Components | The components for this scope are as follows:<br>• Replacement of both borehole pumps at Dapdune<br>• Replacement of four GAC vessels with RGFs by filling GAC vessels with pumice media<br>• Additional four RGF vessels to meet TWUL standard |

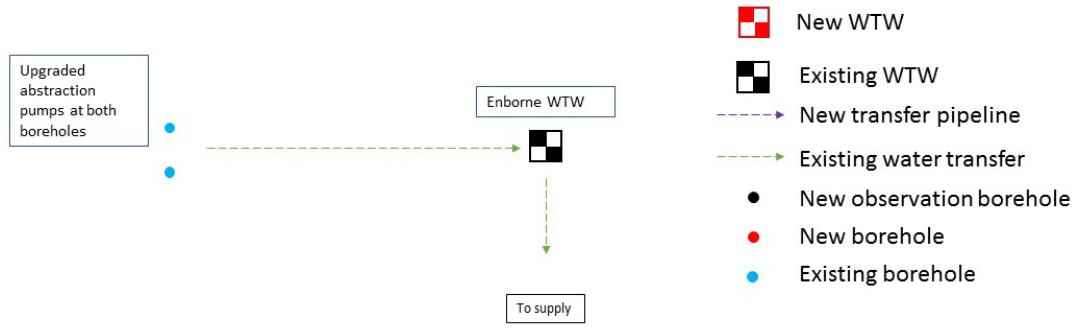
| Name | Dapdune removal of constraints to DO |
|---|---|
| | • Installation of RGF backwash pumps<br>• One standby generator required at Dapdune site |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 0 Ml/d<br>• 1 in 500 average: 0 Ml/d<br>• 1 in 500 peak: 1 Ml/d |
| Lead Time | 2 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | Delivery of the Dapdune removal of constraints option is dependent on the delivery of the Ladymead ROC which has been progressed in AMP7.<br>Additionally, the delivery of the Dapdune Lic (DISAGG) is dependent on the delivery of both the Ladymead ROC and Dapdune (ROC) options. |




## East Woodhay borehole pumps Removal of Constraints to DO

| Name | East Woodhay borehole pumps Removal of Constraints to DO |
|---|---|
| WRSE ID | TWU_KVZ_HI-GRW_ALL_ALL_east woodhay roc |
| WRMP19 Reference | RES-RC-EWO |
| Element Type | Resource |
| WRZ | Kennet Valley |
| Engineering Scope | Upgrade of the two borehole abstraction pumps to increase the peak abstraction within the existing licence. |
| Engineering Components | The components for this scope are as follows:<br>• Replacement of both existing borehole pumps with larger units<br>• Potential upgrade of mains power distribution system after new pumps are installed |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 0 Ml/d<br>• 1 in 500 average: 0 Ml/d<br>• 1 in 500 peak: 2.1 Ml/d |

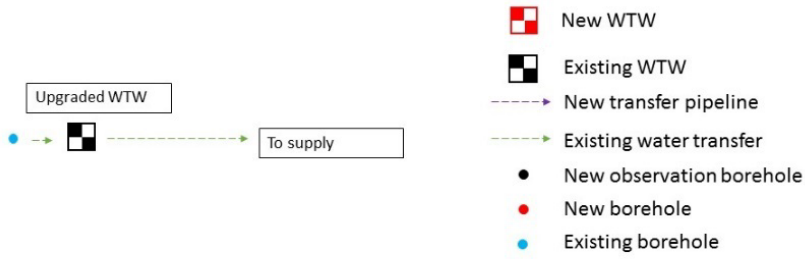
| Name | East Woodhay borehole pumps Removal of Constraints to DO |
|---|---|
| Lead Time | 2 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependent on any other option. |




## Merton Recommissioning

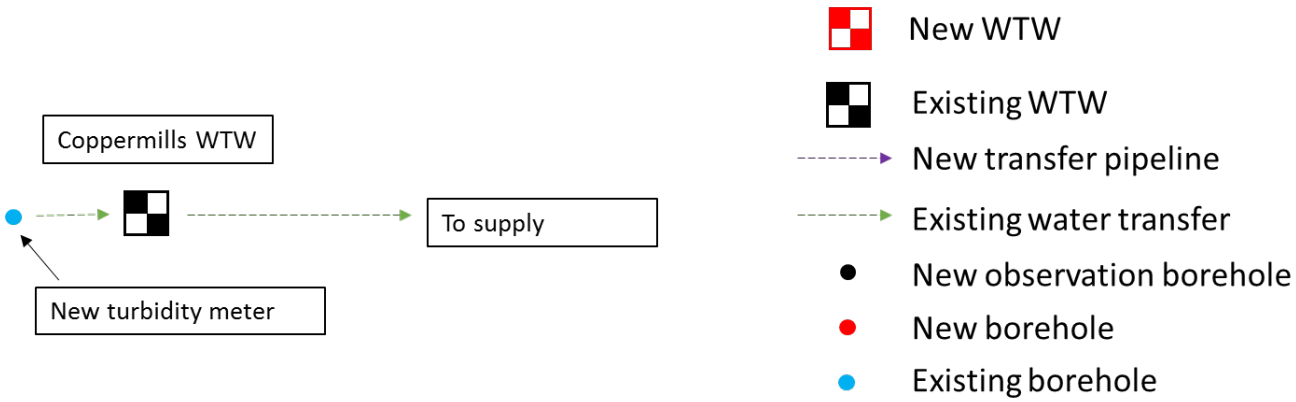
| Name | Merton Recommissioning |
|---|---|
| WRSE ID | TWU_LON_HI-GRW_ALL_ALL_merton recommission |
| WRMP19 Reference | RES-RC-MTN |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | This option consists of the recommissioning of the currently disused Merton Abbey groundwater source and water treatment works (WTW) to address water quality issues. |
| Engineering Components | Providing that the Merton Abbey well and the WTW are operational the components for this scope are to make the following upgrades at the WTW:<br>• Removal of existing GAC adsorbers<br>• Installation of the coagulant dosing plant and flocculation retention tanks in the location of the removed GAC plant<br>• Replacement of the four existing pressure sand filter vessels with six new dual media filter vessels<br>• Replacement of the chlorine contact tanks with larger units<br>• Replacement of the dosing plant for sodium hypochlorite<br>• Replacement of the dosing plant for sodium bisulphate and orthophosphoric acid<br>• Replacement of the chemical storage facilities<br>• Upgrade of the electrical, motoring and control systems<br>• Upgrade of treated water pump station to pump into the local distribution mains |
| Phases/benefits | This option would be developed in a single phase.<br>DO benefits of:<br>• 1 in 2 average: 2 Ml/d<br>• 1 in 500 average: 2 Ml/d |

| Name | Merton Recommissioning |
|---|---|
| | • 1 in 500 peak: 6 Ml/d |
| Lead Time | 2 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | The Merton (SLARS) option is dependent on the delivery of this option as the former includes the adaptation of the well and WTW for a recharge and abstraction scheme. If the Merton Recommissioning option is deemed unfeasible, then the SLARS Merton option cannot go ahead. |



## New River Head Removal of Constraints – RES-RC-NRV

| Name | New River Head Removal of Constraints |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_LON_ALL_nrv-groundimprov |
| WRMP19 Reference | RES-RC-NRV |
| Element Type | Resource |
| WRZ | LONDON |
| Engineering Scope | The New River Head Source is currently non-operational. Implementation of proposed ground stabilisation works within the borehole will allow abstraction at the source up to the existing abstraction licence limit. |
| Engineering Components | This option comprises:<br>• Ground stabilisation around the New River Head borehole (comprising grouting of the potential voids created by sand migration)<br>• Installation of four near surface ground anchors (1m deep) at convenient locations around the borehole<br>• Installation of a turbidity meter<br>• Recommissioning of the licensed but currently disused groundwater source<br>• Installation of the 75kW borehole pump in the New River Head borehole |
| Benefit | DO benefit of 3.0 Ml/d |
| Lead Time | 1 Year |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |



# Reservoirs

## South East Strategic Reservoir Option (SESRO)

| Name | South East Strategic Reservoir Option (SESRO) |
|---|---|
| WRSE ID | TWU_STR_HI-RSR_RE1_XXX_abingdon150(lon)<br>TWU_STR_HI-RSR_RE1_XXX_abingdon125(lon)<br>TWU_STR_HI-RSR_RE1_XXX_abingdon100(lon)<br>TWU_STR_HI-RSR_RE1_XXX_abingdon75(lon)<br>TWU_STR_HI-RSR_RE1_XXX_abingdon30+100[11]<br>TWU_STR_HI-RSR_RE1_XXX_abingdon80+42 |
| WRMP19 Reference | RES-RRR-ABI-150Mm$^3$, RES-RRR-ABI-125Mm$^3$, RES-RRR-ABI-100Mm$^3$, RES-RRR-ABI-30+100Mm$^3$, RES-RRR-ABI-75Mm$^3$, RES-RRR-ABI-80+42Mm$^3$ |
| Element Type | Resource |
| WRZ | London/SWOX/SWA |
| Engineering Scope | Provision of a new fully bunded reservoir with live capacity of: 150Mm$^3$, 125Mm$^3$, 100Mm$^3$, 75Mm$^3$, 30Mm$^3$ (phase 1) with 100Mm$^3$ (phase 2), or 80Mm$^3$ (phase 1) with 42Mm$^3$ (phase 2).<br>Associated conveyance tunnel and intake/discharge structure at Culham on the River Thames to (i) fill reservoir by abstracting raw water from the River Thames, and (ii) support flows in River Thames by discharging water stored in the reservoir. |
| Engineering Components | • Provision of a fully bunded reservoir with storage capacity between 75Mm$^3$ and 150Mm$^3$ (note that there is a Phased option of 30 + 100 Mm$^3$)<br>• Pumping station for filling the reservoir, including turbines for energy recovery during periods when water is released to the River Thames<br>• A conveyance tunnel to transfer flows via the pumping station to/from an intake/outfall structure on the bank of the River Thames<br>• Auxiliary drawdown channel aligned with a proposed alignment of the Wilts & Berks Canal to allow release of water from the reservoir in emergency scenarios<br>• Main access road (from A415) and a road diversion to the south of the reservoir<br>• Rail siding to facilitate delivery of construction materials by freight train<br>• Recreation facilities, landscaping and creation of aquatic/grassland habitats |

[11] Note the SESRO Phase 1 30 Ml/d option can be selected without Phase 2 100 Ml/d, this differs from the 30 Ml/d rejected options as it sets up the site to allow further expansion. The single phase 30 Ml/d option would block future expansion. The single phase option is rejected on the basis that the site is the only location suitable for a larger reservoir, it would therefore not be appropriate to block this site with a small reservoir preventing any future development.

| | |
|---|---|
| Phases/benefits | <table><tr><th>Phase 1</th><th>Phase 2</th><th colspan="2">DO benefit (Ml/d)</th></tr><tr><td>150Mm$^3$</td><td>N/A</td><td colspan="2">271</td></tr><tr><td>125Mm$^3$</td><td>N/A</td><td colspan="2">230</td></tr><tr><td>100Mm$^3$</td><td>N/A</td><td colspan="2">185</td></tr><tr><td>75Mm$^3$</td><td>N/A</td><td colspan="2">149</td></tr><tr><td>30Mm$^3$</td><td>100Mm$^3$</td><td>66 (p1)</td><td>173 (p2)</td></tr><tr><td>80Mm$^3$</td><td>42Mm$^3$</td><td>155 (p1)</td><td>69 (p2)</td></tr></table> DO benefits above apply for 1 in 2 average, 1 in 500 average and 1 in 500 peak values |
| Lead Times | <table><tr><th>Phase 1</th><th>Phase 2</th><th colspan="2">Lead Time (years)</th></tr><tr><td>150Mm$^3$</td><td>N/A</td><td colspan="2">15</td></tr><tr><td>125Mm$^3$</td><td>N/A</td><td colspan="2">15</td></tr><tr><td>100Mm$^3$</td><td>N/A</td><td colspan="2">14</td></tr><tr><td>75Mm$^3$</td><td>N/A</td><td colspan="2">14</td></tr><tr><td>30Mm$^3$</td><td>100Mm$^3$</td><td>14</td><td>14</td></tr><tr><td>80Mm$^3$</td><td>42Mm$^3$</td><td>14</td><td>13</td></tr></table> |
| Mutual exclusivities | The SESRO size variants are mutually exclusive (only one could be taken forward).<br>There is a limit on the amount of additional water that can be discharged into River Thames. This limit will apply to options discharging into the River Thames, including new reservoirs and Severn Thames Transfer (STT).[12] |
| Interdependencies | For SESRO to deliver a benefit, the water that is released into the River Thames will need to be re-abstracted. There are other water resource options being considered in WRMP24 and/or WRSE regional planning that would either benefit, or be dependent on, water supply from SESRO directly or from water provided into, and conveyed by, the River Thames (whether this be via SESRO, STT or a combination of both), these include:<br>• Thames to Affinity Transfer (T2AT) SRO<br>• Thames to Southern Transfer (T2ST) SRO<br>• Thames Water non-SRO options to supply the SWOX or SWA Water Resource Zones<br>To provide an additional resource to London WRZ the following system elements may also be required:<br>• Additional capacity in the raw water systems to allow the water to be abstracted from the River Thames into the west London reservoirs and from there conveyed to Kempton WTW<br>• Additional treatment capacity in Kempton WTW expansion (800 Ml/d)<br>• Additional capacity in the Thames Water ring main. |

[12] Further work is ongoing to review the limit on the amount of additional water that can be discharged into River Thames

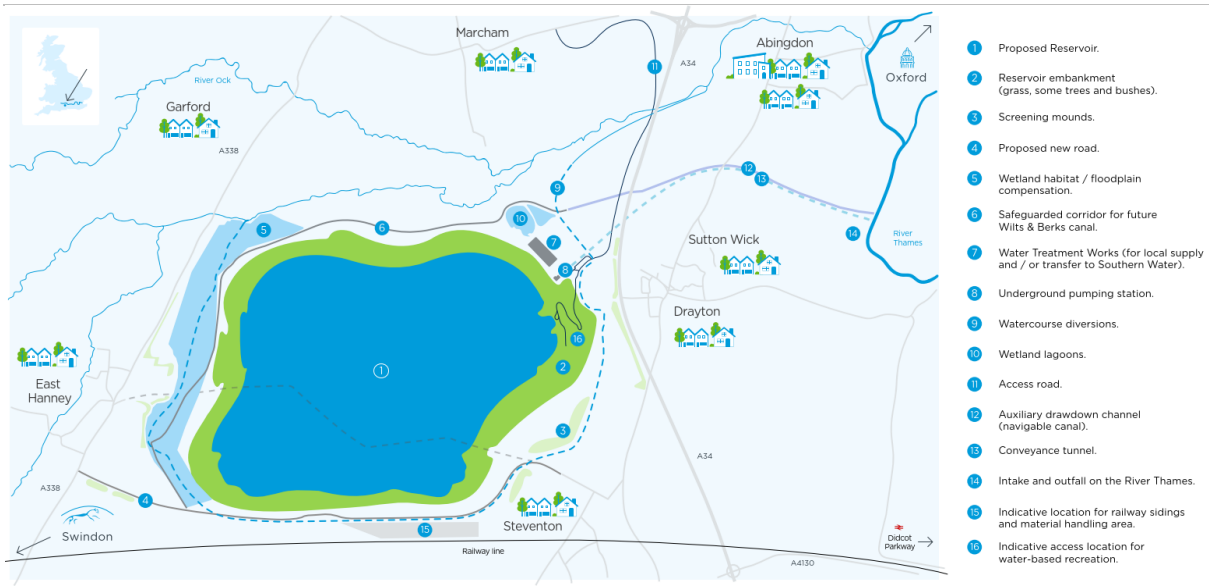
To provide an additional resource to SWOX WRZ the following system elements are required:

- Abingdon WTW new 24 Ml/d (SWOX)
- Abingdon to Farmoor
- Transfer

To provide an additional resource to SWA WRZ the following system elements may also be required:

- Abingdon WTW new 24 Ml/d (SWOX) and SWOX to SWA (48/72) Ml/d or
- Raw Water System – New Medmenham Intake and Medmenham WTW (72 Ml/d)

Additional requirements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents and requirements to supply Southern Water WRZs are described in the Thames to Southern Water Transfer Gate 2 documents.




## Marsh Gibbon Reservoir – 75 $Mm^3$ / 50 $Mm^3$ / 30 $Mm^3$

| Name | Marsh Gibbon Reservoir – 75Mm3 |
|---|---|
| WRSE ID | TWU_STR_HI-RSR_RE1_XXX_res_marshgibbon_1<br>TWU_STR_HI-RSR_RE1_XXX_res_marshgibbon_2<br>TWU_STR_HI-RSR_RE1_XXX_res_marsh gibbon_3 |
| WRMP19 Reference | RES-RRR-MAR-75$Mm^3$<br>RES-RRR-MAR-50$Mm^3$<br>RES-RRR-MAR-30$Mm^3$ |
| Element Type | Resource |
| WRZ | LONDON / SWOX / SWA |
| Engineering Scope | Provision of a new 75 $Mm^3$ / 50 $Mm^3$ / 30 $Mm^3$ non-impounding bunded reservoir located near the Oxford/Buckinghamshire |

<table>
<tr><th>Name</th><th>Marsh Gibbon Reservoir – 75Mm3</th></tr>
<tr><td></td><td>border. Associated conveyance and intake/discharge structure upstream of the Oxford sewage works (i) fill reservoir by abstracting raw water from the River Thames, and (ii) support flows in River Thames by discharging water stored within the reservoir.</td></tr>
<tr><td>Engineering Components</td><td>The components for this scope are as follows:<ul><li>New 75 Mm$^3$ / 50 Mm$^3$ / 30 Mm$^3$ storage reservoir located in Oxford / Buckinghamshire border</li><li>River intake and outfall Structure.</li><li>Inlet and outlet tower</li><li>Conveyance from river to Marsh Gibson Reservoir</li><li>A new pumping station</li><li>A main water draw off tower and secondary draw off tower</li></ul>For Marsh Gibbon 75Mm$^3$ and 50Mm$^3$, two minor local access roads would need to be diverted around the site. Marsh Gibbon 30Mm$^3$ would require just a single road to be diverted.<br>For Marsh Gibbon 75Mm$^3$ two watercourses would need to be diverted around the site.</td></tr>
<tr><td>Phases/benefits</td><td><table><tr><th>Capacity</th><th>DO Benefits (Ml/d)</th></tr><tr><td>75Mm$^3$</td><td>149</td></tr><tr><td>50Mm$^3$</td><td>103</td></tr><tr><td>30Mm$^3$</td><td>66</td></tr></table>DO benefits above apply for 1 in 2 average, 1 in 500 average and 1 in 500 peak values.</td></tr>
<tr><td>Lead Time</td><td>14 – 15 Years (varies based on capacity).</td></tr>
<tr><td>Mutual exclusivities</td><td>The three reservoir capacities are mutually exclusive with each other, however there is a limit on the amount of additional water that can be discharged into River Thames. This limit will apply to options discharging into the River Thames, including new reservoirs and Severn Thames Transfer (STT).[13]</td></tr>
<tr><td>Interdependencies/ Exclusivity</td><td>This option is not dependent on any other option.<br>For the reservoir to deliver a benefit, the water that is released into the River Thames will need to be re-abstracted. There are other water resource options being considered in WRMP24 and/or WRSE regional planning that could benefit water supply from Marsh Gibbon Reservoir or water provided into and conveyed by River Thames, these include:<ul><li>Thames to Affinity Transfer (T2AT) SRO</li><li>Thames to Southern Transfer (T2ST) SRO</li><li>London WRZ</li></ul></td></tr>
</table>

[13] Further work is ongoing to review the limit on the amount of additional water that can be discharged into River Thames

| Name | Marsh Gibbon Reservoir – 75Mm3 |
|---|---|
| | To provide an additional resource to London WRZ the following system elements may also required:<br>• Additional capacity in the raw water systems to allow the water to be abstracted from the River Thames into the west London reservoirs and from there conveyed to a Water Treatment Works in west London<br>• Additional treatment capacity in west London<br>• Additional capacity in the Thames Water ring main |


## Chinnor Reservoir – 30Mm$^3$

| Name | Chinnor Reservoir – 30Mm$^3$ |
|---|---|
| WRSE ID | TWU_UTC_HI-RSR_RE1_XXX_res_chinnor |
| WRMP19 Reference | RES-RRR-CHI-30Mm$^3$ |
| Element Type | Resource |
| WRZ | LONDON / SWOX / SWA |
| Engineering Scope | Provision of a new 30Mm$^3$ non-impounding bunded reservoir located in Oxfordshire 5km south east of Thame. Associated conveyance and intake/discharge structure to (i) fill reservoir by abstracting raw water from the River Thames, and (ii) support flows in River Thames by discharging water stored within the reservoir. |
| Engineering Components | The components for this scope are as follows:<br>• New 30Mm$^3$ storage reservoir located in Oxfordshire<br>• A borrow pit |

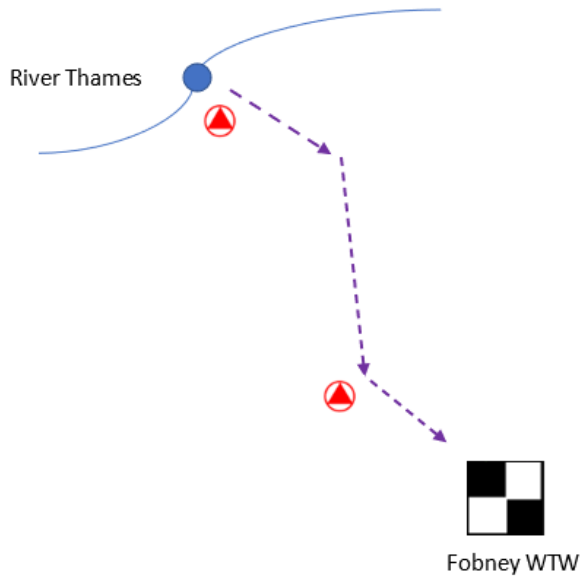
| Name | Chinnor Reservoir – 30Mm$^3$ |
|---|---|
| | • An abstraction intake on the River Thames. Flow regulation discharges back to the River Thames for the regulating reservoir option at the same location<br>• Combined intake and outfall structure situated on the River Thames just upstream of Benson Weir<br>• A new pumping station at the intake, to pump flows directly to the new reservoir<br>• A main water draw off tower and secondary draw off tower<br>• Diversion of the National Cycle Route 57<br>• River diversion works for the Cattle Brook and a drain running north of the site<br>• Emergency drawdown via syphons |
| Phases/benefits | DO benefits of:<br>• 1 in 2 average: 66 Ml/d<br>• 1 in 500 average: 66 Ml/d<br>• 1 in 500 peak: 66 Ml/d |
| Lead Time | 14 – 15 Years (varies based on capacities) |
| Mutual exclusivities | No other options on the constrained list are mutually exclusive with this option; however there is a limit on the amount of additional water that can be discharged into River Thames. This limit will apply to options discharging into the River Thames, including new reservoirs and Severn Thames Transfer (STT).[14] |
| Interdependencies/ Exclusivity | This option is not dependent on any other option.<br>For the reservoir to deliver a benefit, the water that is released into the River Thames will need to be re-abstracted. There are other water resource options being considered in WRMP24 and/or WRSE regional planning that would either benefit, or be dependent on, water supply from water supply from Chinnor Reservoir or water provided into and conveyed by River Thames, these include:<br>• Thames to Affinity Transfer (T2AT) SRO<br>• Thames to Southern Transfer (T2ST) SRO<br>• London WRZ<br>To provide an additional resource to London WRZ the following system elements may also required:<br>• Additional capacity in the raw water systems to allow the water to be abstracted from the River Thames into the west London reservoirs and from there conveyed to a Water Treatment Works in west London<br>• Additional treatment capacity in west London<br>• Additional capacity in the Thames Water ring main |

[14] Further work is ongoing to review the limit on the amount of additional water that can be discharged into River Thames

# Raw Water Conveyance

## Raw Water System Conveyance – Thames to Fobney 40 Ml/d

| Name | Thames to Fobney |
|---|---|
| WRSE ID | TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney |
| WRMP19 Reference | n/a – new option to WRMP24 |
| Element Type | Conveyance |
| WRZ | Kennet Valley |
| Engineering Scope | 40 Ml/d raw water transfer option from River Thames to Fobney WTW to supply Kennet Valley WRZ. |
| Engineering Components | The components for this scope are as follows:<br>• New Raw water conveyance to Fobney WTW<br>• New Intake at River Thames<br>• New Pumping stations |
| Phasing /benefit | n/a |
| Lead Time | 5 Years |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | This option is not dependent on any other option. |

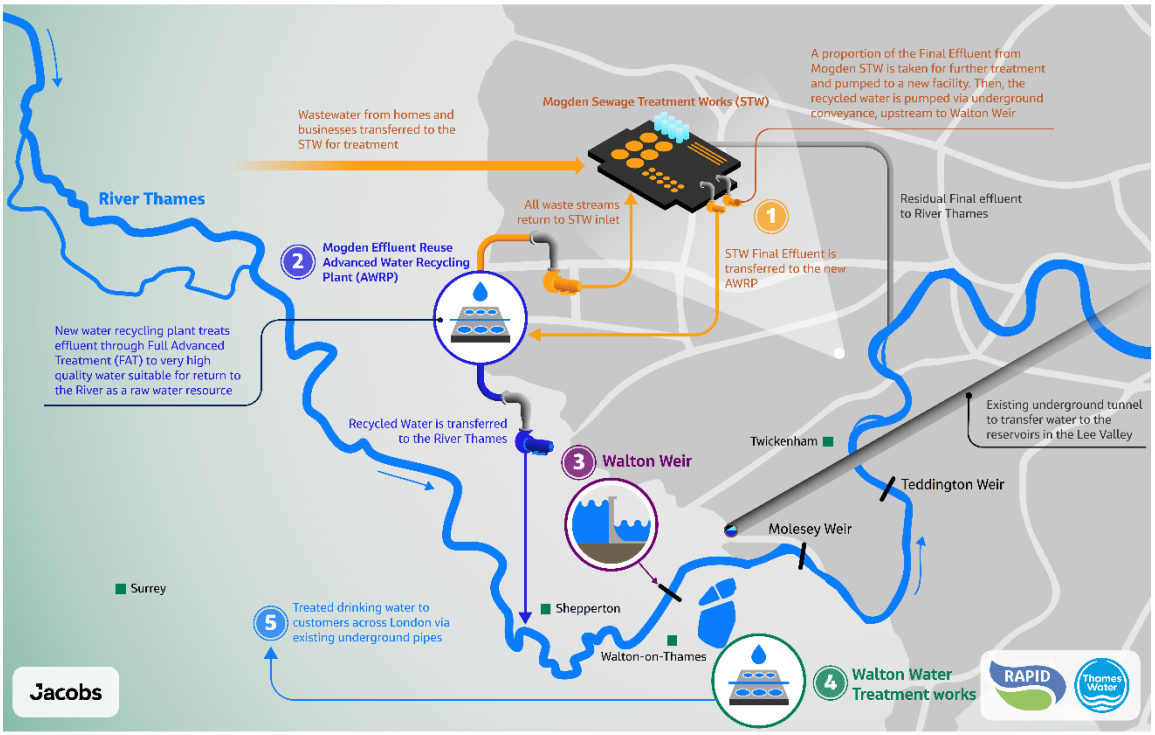


## Recycling Mogden to Walton 150 Ml/d – Conveyance for Mogden Effluent Recycling Treatment

| | |
|---|---|
| Name | Recycling Mogden to Walton 150 Ml/d – Conveyance for Mogden Effluent Recycling Treatment |
| WRSE ID | TWU_WLJ_HI-TFR_WLJ_ALL_reuse mogden/walton |
| WRMP19 Reference | CON-RU-MOG-WAL-200 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | All conveyancing scope for the proposed Mogden Effluent Reuse scheme, consisting of four transfers: Final Effluent transfer (1), RO Concentrate return (4) and waste streams return (2) from Mogden STW to AWRP treatment site & Recycled Water from the AWRP treatment site to River Thames at Walton (3):<br>(1), (2) & (4): 2No pipe jacked tunnels in parallel. Pipes (2) & (4) to be pressurised pipes inside one of the pipe jack tunnels.<br>(3): Recycled Water pipeline is largely open-cut with 2 major trenchless crossings. |
| Engineering Components | • Pipeline, pipe-jacking and all associated conveyancing scope for the four transfers noted above for the Mogden Effluent Recycling scheme<br>• Pipe-jacked tunnel to transfer final effluent (FE) from Mogden STW to the treatment site, suitable for the maximum capacity of all phases of treatment<br>• Pipe-jacked tunnel from the treatment site to Mogden STW to return the waste streams and RO concentrate. 2No. internal pressurised pipes within the pipejack tunnel<br>• Pipe-jack tunnel shafts for the 2No. pipejacks above between Mogden STW and the treatment site<br>• Trenched pipeline from the treatment site to the River Thames at Walton for the recycled water transfer, including trenchless crossings and associated shafts<br>• New river outfall consisting of below ground velocity-reduction chamber, weir, discharge chamber and piping to river |
| Phases/Benefits | The above conveyance elements are sized to have sufficient capacity for all phasing options of Mogden Effluent Recycling and do not need to be duplicated for phase 2 or phase 3. |
| Lead Time | Alternative delivery programmes have been developed for Gate 2 which show a lead time of 9 years (per phase) and an earliest operational date of 2031. |
| Mutual Exclusivities | n/a |
| Interdependencies/ Exclusivity | To provide an additional resource to London WRZ, the following elements may also be required:<br>• Upgrades to the west London raw water system<br>• Additional treatment capacity at Kempton WTW<br>• Network reinforcements, potentially including extensions to the London ring main |

| Name | Recycling Mogden to Walton 150 Ml/d – Conveyance for Mogden Effluent Recycling Treatment |
|---|---|
| | Mogden Effluent Recycling has the potential to support the Thames to Affinity Transfer (T2AT) SRO as T2AT SRO may abstract raw water from the River Thames. Additional requitements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents. |

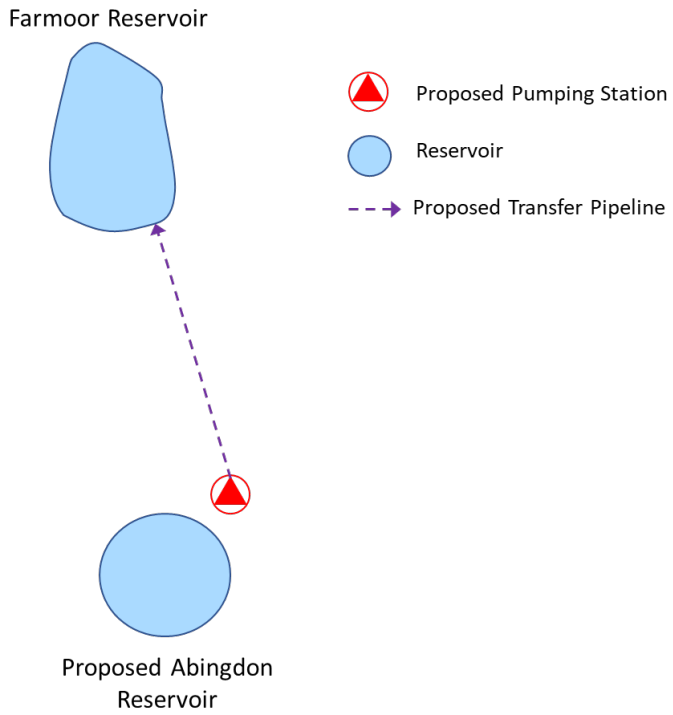
**Mogden Effluent Reuse Schematic**




## Abingdon to Farmoor Transfer

| Name | Abingdon to Farmoor Transfer |
|---|---|
| WRSE ID | TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe |
| WRMP19 Reference | CON-RWS-ABI-FMR |
| Element Type | Conveyance |
| WRZ | SWOX |
| Engineering Scope | Construction of a transfer pipeline to convey 24 Ml/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir, in the SWOX WRZ. The engineering scope includes the provision of a booster pump station at the proposed Abingdon Reservoir site to facilitate the transfer. |
| Engineering Component | The components for this scope are as follows:<br>• Raw water pipeline from proposed reservoir at Abingdon to Farmoor Reservoir<br>• Raw water pumping station |

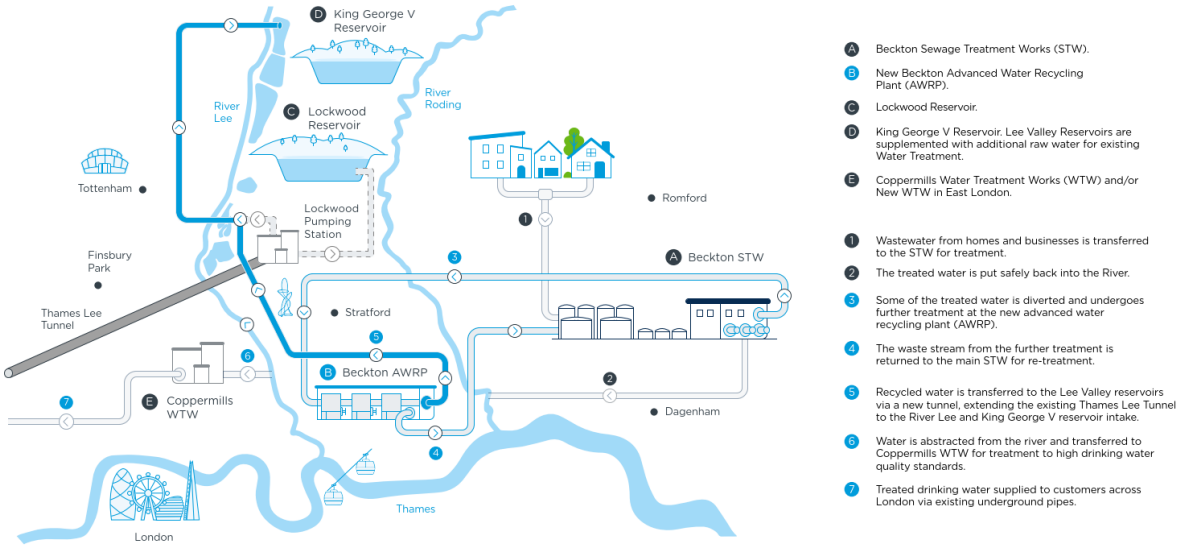
| Name | Abingdon to Farmoor Transfer |
|---|---|
| | • Raw water screens at Abingdon Reservoir intake<br>• New break pressure tank at or near high point of transfer route |
| Phases/benefits | n/a |
| Lead Time | 5 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This element would transfer raw water from the new Abingdon Reservoir resource elements to the existing Farmoor reservoir. Treatment would be provided at the existing WTW. |




## Beckton to Lockwood Conveyance

| Name | Beckton to Lockwood Tunnel Conveyance |
|---|---|
| WRSE ID | TWU_KGV_HI-TFR_KGV_ALL_beckton to lockwood |
| WRMP19 Reference | CON-RU-BEC-LCK-300 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | Conveyance of recycled water from Beckton to Lockwood pumping station, as part of the Beckton Effluent Recycling scheme. A portion of the Beckton STW final effluent is to be subjected to a full advanced treatment process and pumped to location next to Lockwood Reservoir for onward conveyance to the River Lee diversion through TLT extension from Lockwood PS to King George V Reservoir intake to supplement raw water supply to the Lee Valley reservoirs. Conveyance will be via a new raw water tunnel from Beckton to Lockwood. |

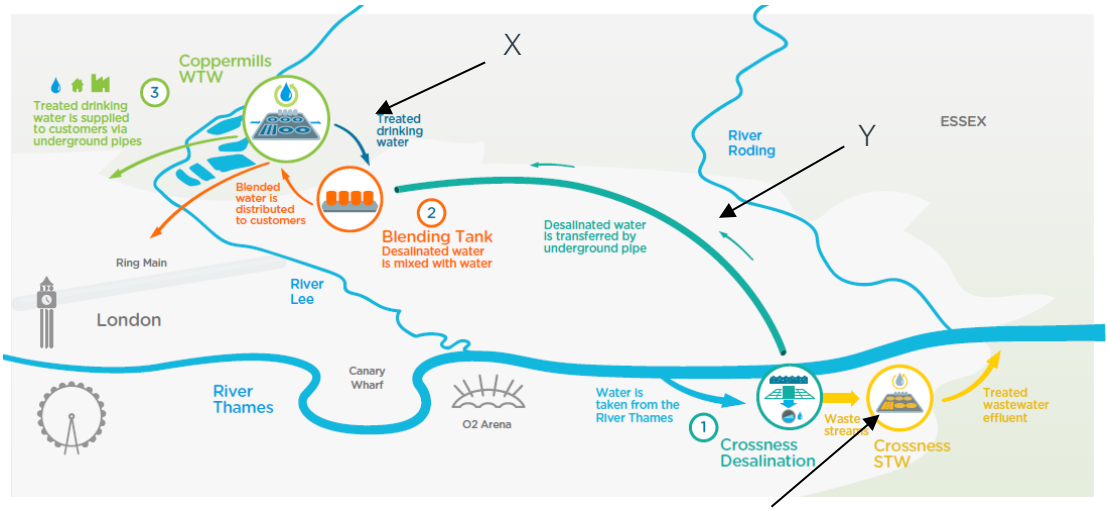
| Name | Beckton to Lockwood Tunnel Conveyance |
|---|---|
| Engineering Components | • Bulk raw water transfer tunnel for a connection from Beckton STW to the Thames Lee Tunnel (TLT) termination at Lockwood Pump Station<br>• Tunnel from north of Beckton STW to Lockwood pumping station<br>• 7No. tunnel shafts for the tunnel construction<br>• Submersible pumps within final shaft to discharge the water<br>• Connection between the final shaft of this tunnel and the first shaft of the TLT extension from Lockwood PS to King George V Reservoir intake |
| Phases/benefits | The above conveyance elements are sized to have sufficient capacity for all phasing options of Beckton Effluent Recycling and do not need to be duplicated for phase 2 or phase 3. |
| Lead Time | Alternative delivery programmes have been developed for Gate 2 which show a lead time of 9 years and an earliest operational date of 2031. |
| Mutual Exclusivities | n/a |
| Interdependencies/ Exclusivity | The Beckton Effluent Reuse option comprises treatment and conveyance elements. The conveyance elements include: Beckton to Lockwood Conveyance ); and the TLT extension from Lockwood PS to KG reservoir intake . Treatment can be phased via all three capacities under Beckton Effluent Reuse option.<br>To provide an additional resource to London WRZ the following system elements are may also be required:<br>• Additional capacity in the raw water systems to allow the water to be abstracted from the River Lee Diversion into the Lee Valley Reservoirs and from there conveyed to a Water Treatment Works in east London<br>• Additional treatment capacity in East London<br>• Additional capacity in the Thames Water ring main<br>Beckton Recycling has the potential to support the Thames to Affinity Transfer (T2AT) SRO as T2AT SRO may abstract raw water from the River Lee. Additional requirements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents. |




## Desalination – Beckton to Crossness tunnel

| Name | Desalination – Beckton to Crossness tunnel |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_LON_XXX_beckton-crossness |
| WRMP19 Reference | CON-RWS-BEC-CRO-300 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | Raw estuarine Thames River water is to be abstracted at Beckton for Crossness desalination treatment plant. The estuarine water is to be conveyed under the River Thames via a tunnel to the Crossness desalination treatment site. |
| Engineering Components | The components for this scope are as follows:<br>• The tunnel under the River Thames to the Crossness desalination plant<br>• 1 No drive shaft<br>• 1 No intermediate shaft<br>• 1 No reception shaft<br>• High Integrity Gate valve |
| Phases/benefits | n/a |
| Lead Time | 10.5 Years |
| Mutual Exclusivities | No other options on the constrained list are mutually exclusive with this option. |
| Interdependencies/ Exclusivity | The Crossness Desalination option comprises conveyance, treatment and treated water network reinforcement. Treatment is phased in 50Ml/d or 100Ml/d increments) The conveyance elements (required for first phase of desalination) include:<br>• Beckton to Crossness Tunnel<br>• Crossness to Beckton Tunnel Beckton to Coppermills Tunnel |

| Name | Desalination – Beckton to Crossness tunnel |
|---|---|
| | To provide an additional resource to London WRZ the following system elements are also required:<br>• Additional blending capacity at Coppermills WTW and capacity to discharge into the local water supply network or into the TWRM<br>• New Header Tank and Pumping Station at Coppermills WTW<br>• Additional capacity in the Thames Water ring main |

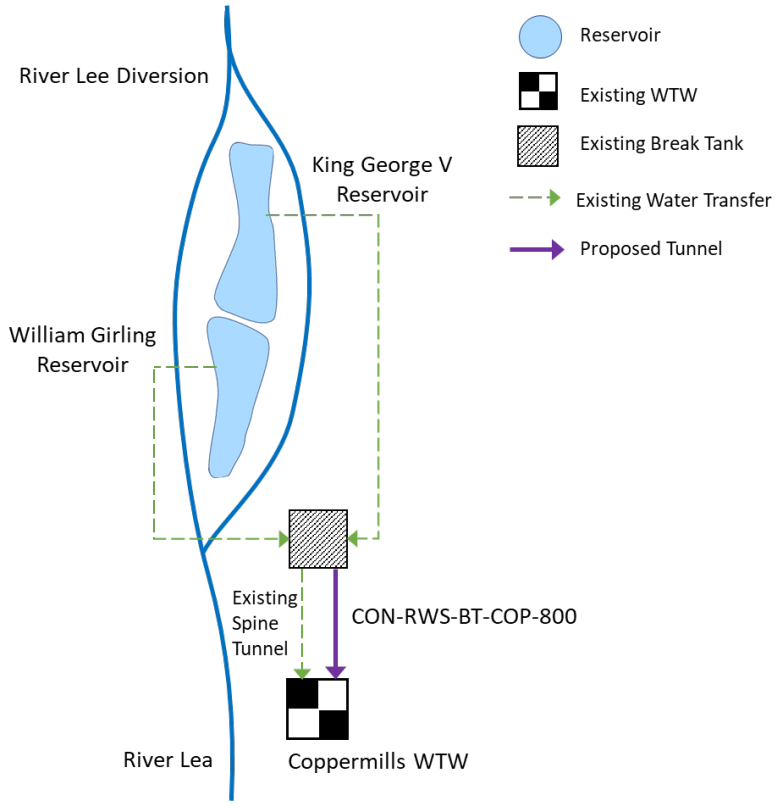



| | |
|---|---|
| X | New Header Tank and Pumping Station at Coppermills WTW |
| Y | Beckton to Coppermills Tunnel |
| Z | Crossness to Beckton Tunnel |

## Raw Water System – Conveyance from Break Tank to Coppermills

| Name | Raw Water System – Conveyance from Break Tank to Coppermills |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_LON_XXX_second spine tunnel |
| WRMP19 Reference | CON-RWS-BT-COP-800 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | Transfer of raw water from the break tank in the east London raw water system to Coppermills WTW. |
| Engineering Components | The components for this scope are as follows:<br>• Tunnel from Break Tank to Coppermills WTW via Reservoir 5<br>• 1 No drive shaft<br>• 1 No  diameter intermediate shaft<br>• 1 No reception shaft<br>• High Integrity Gate Valves |
| Phases/benefits | n/a |

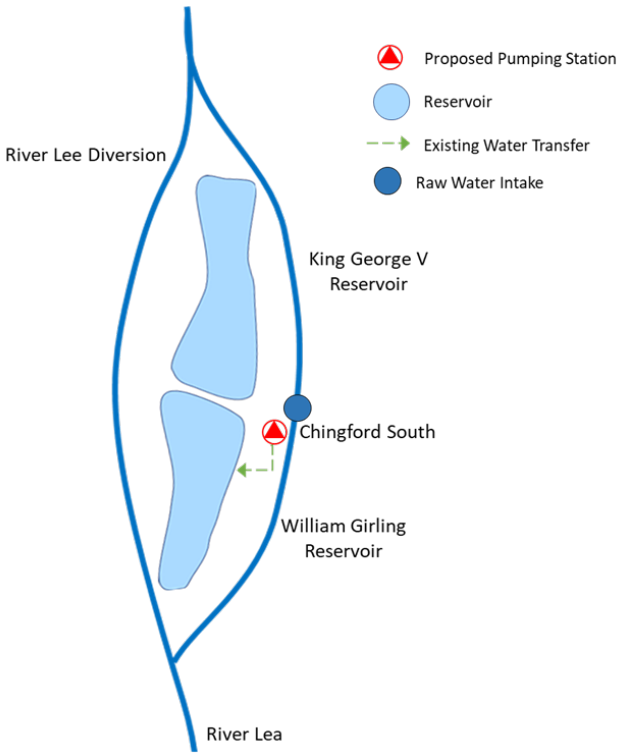
| Name | Raw Water System – Conveyance from Break Tank to Coppermills |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_LON_XXX_second spine tunnel |
| Lead Time | 8 Years |
| Mutual exclusivities | No other options on the constrained list are mutually exclusive with this option. |
| Interdependencies/ Exclusivity | May be required to support additional raw water resources in East London:<br>• Beckton Effluent Reuse<br>• Deephams Recycling (46.5) - deephams reuse 46.5<br>• Deephams Recycling (46.5b) - deephams_reuse_46.5b |




## Raw Water System – Chingford South intake increase

| Name | Raw Water System – Chingford South intake increase |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_LON_ALL_ch'ford s intake |
| WRMP19 Reference | CON-RWS-CHS-100 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | Increase capacity of the Chingford south intake by 100 Ml/d<br>This option is limited to providing benefit up to 2060. |
| Engineering Components | The components for this scope are as follows:<br>• New pumping station<br>• Two new pumps<br>• Screens |

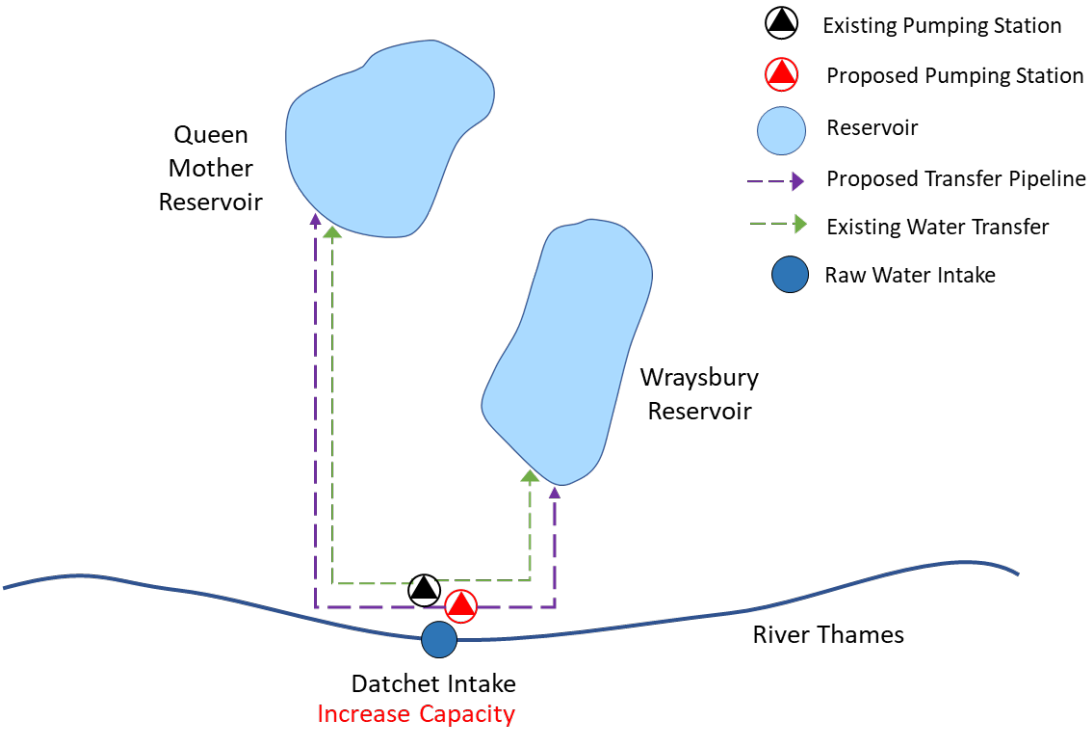
| Name | Raw Water System – Chingford South intake increase |
|---|---|
| Phases/benefits | n/a |
| Benefit | n/a |
| Lead Time | 4 Years |
| Mutual Exclusivities | No other options on the constrained list are mutually exclusive with this option. |
| Interdependencies/ Exclusivity | May be required to support additional raw water resources in East London:<br>• Beckton Effluent Reuse<br>• Deephams Recycling (46.5) - deephams reuse 46.5<br>• Deephams Recycling (46.5b) - deephams_reuse_46.5b |




## Raw Water System – Datchet intake increase

| Name | Raw Water System – Datchet intake increase |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_LON_ALL_datchet int-qm |
| WRMP19 Reference | CON-RWS-DAT-300 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | Increase capacity of the existing River Thames Datchet intake. |
| Engineering Components | The components for this scope are as follows:<br>• New Pumping Station<br>• New Ductile Iron (DI) pipe to Queen Mother<br>• New DI pipe to Wraysbury |

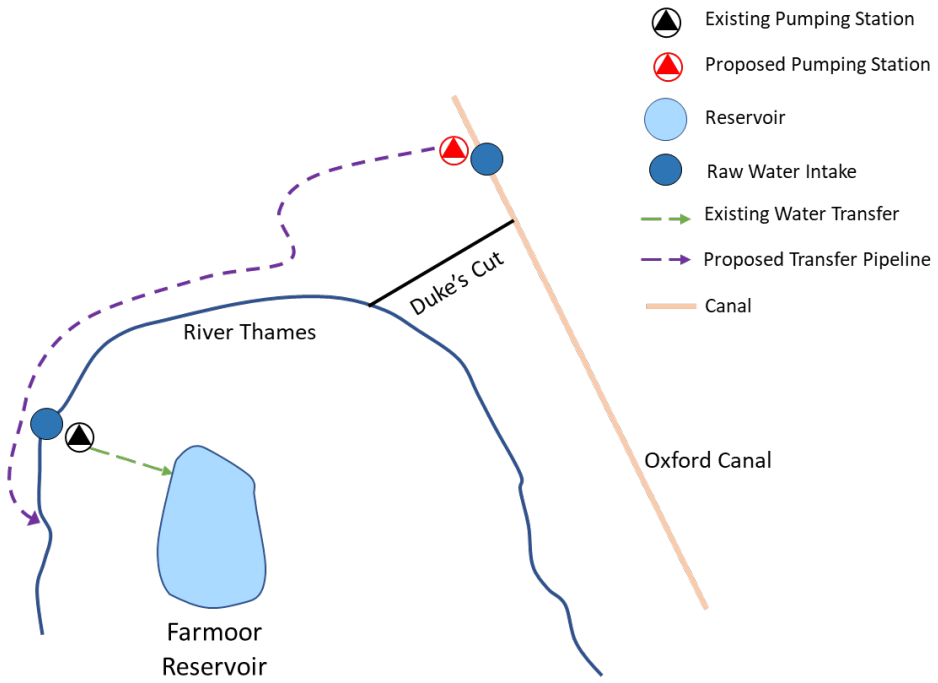
| Name | Raw Water System – Datchet intake increase |
|---|---|
| | • Above ground pipelines to feed into Wraysbury and Queen Mother - twin pipes at each reservoir |
| Phases/benefits | n/a |
| Benefit | n/a |
| Lead Time | 5 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | Required to support additional raw water resources in West London All reservoir sizes under SESRO, Marsh Gibbon Reservoir, Chinnor Reservoir, Ludgershall Reservoir, Aylesbury Reservoir Haddenham Reservoir , Deerhurst to Culham pipeline and transfer additional water to new treatment at Kempton WTW. |




## Raw Water System - Oxford Canal – Duke's Cut to Farmoor 15 Ml/d Pipeline

| Name | Oxford Canal – Duke's Cut to Farmoor 15 Ml/d Pipeline |
|---|---|
| WRSE ID | TWU_SWX_HI-TFR_SWX_ALL_dukescut-farmoor |
| WRMP19 Reference | CON-RWS-DKC-FMR |
| Element Type | Conveyance |
| WRZ | SWOX |
| Engineering Scope | A supported conveyance pipeline option from Duke's Cut on the Oxford Canal to the River Thames upstream of the existing Farmoor intake. The element includes all engineering works required to transfer the flow to the River Thames. |
| Engineering Components | The components for this scope are as follows:<br>• A river intake structure at Duke's Cut with inlet screens |

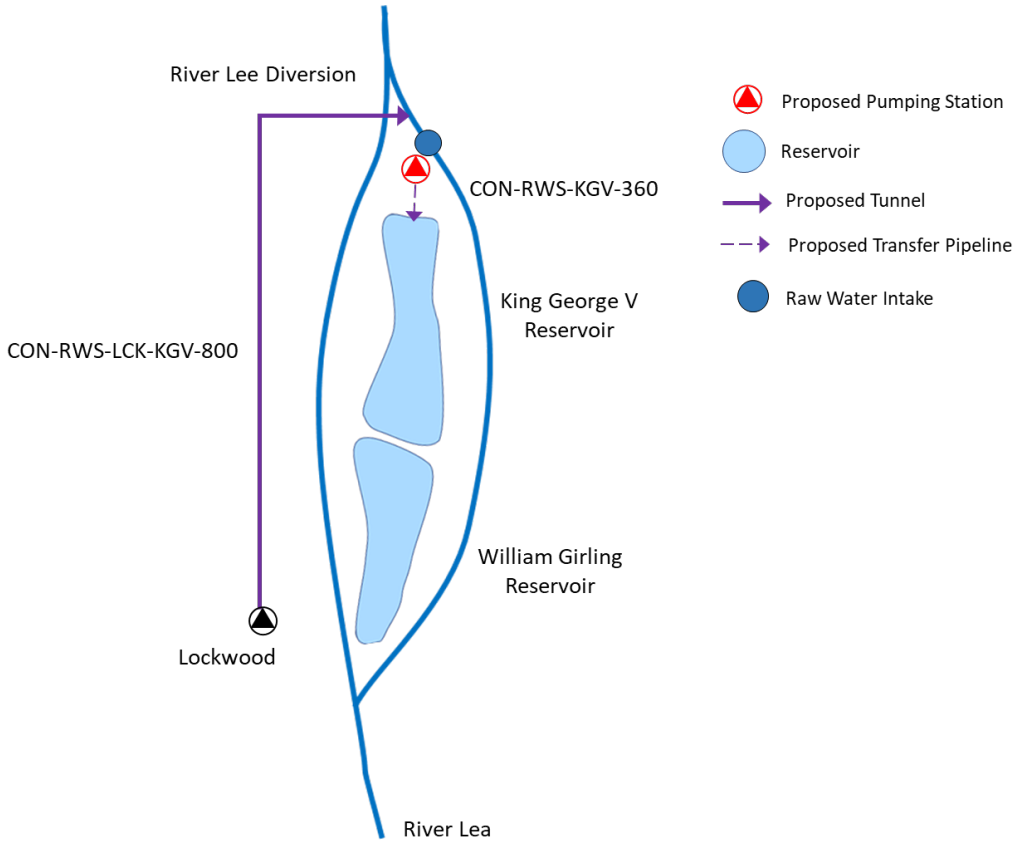
| Name | Oxford Canal – Duke's Cut to Farmoor 15 Ml/d Pipeline |
|---|---|
| | • A raw water low lift pump station<br>• Rising main<br>• Outfall to the River Thames just upstream of the existing Farmoor intake |
| Phases/benefits | n/a |
| Benefit | n/a |
| Lead Time | 5 Years |
| Mutual Exclusivities | This option is mutually exclusive with Oxford Canal to Cropredy option. |
| Interdependencies/ Exclusivity | This element is dependent on surplus in the canal network that will be provided by 3rd parties (Canal and River Trust) as well as Oxford Canal to Duke's Cut element. |




## Raw Water System – KGV Reservoir intake increase

| Name | Raw Water System – KGV Reservoir intake increase |
|---|---|
| WRSE ID | TWU_KGV_HI-TFR_KGV_ALL_kgv res intake |
| WRMP19 Reference | CON-RWS-KGV-360 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | 360Ml/d increase of capacity at existing King George V reservoir intake. |
| Engineering Components | The components for this scope are as follows:<br>• New Pumping Station<br>• Above ground pipelines to KGV |
| Phases/benefits | n/a |

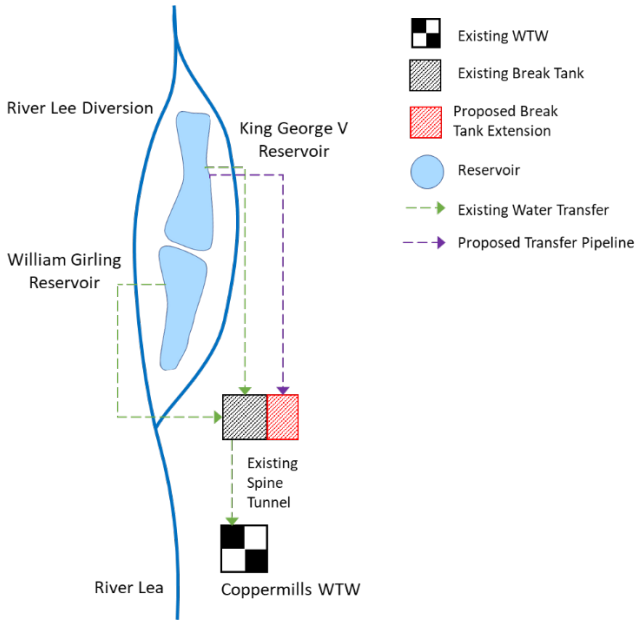
| Name | Raw Water System – KGV Reservoir intake increase |
|---|---|
| Benefit | n/a |
| Lead Time | 5 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | May be required to support additional raw water resources in East London: All sizes under Beckton Reuse, Deephams Reuse and transfer additional water to new treatment at a East London WTW. |




## Raw Water System – KGV Reservoir to Break Tank

| Name | Raw Water System – KGV Reservoir to Break Tank |
|---|---|
| WRSE ID | TWU_KGV_HI-TFR_KGV_ALL_kgv res to bt |
| WRMP19 Reference | CON-RWS-KGV-BT-300 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | New 300 Ml/d capacity pipeline to allow transfer or raw water from King George V reservoir to the existing break tank at the south of William Girling reservoir. |
| Engineering Components | The components for the scope are as follows:<br>• Pipeline from KGV reservoir to the break tank at the south of William Girling reservoir |

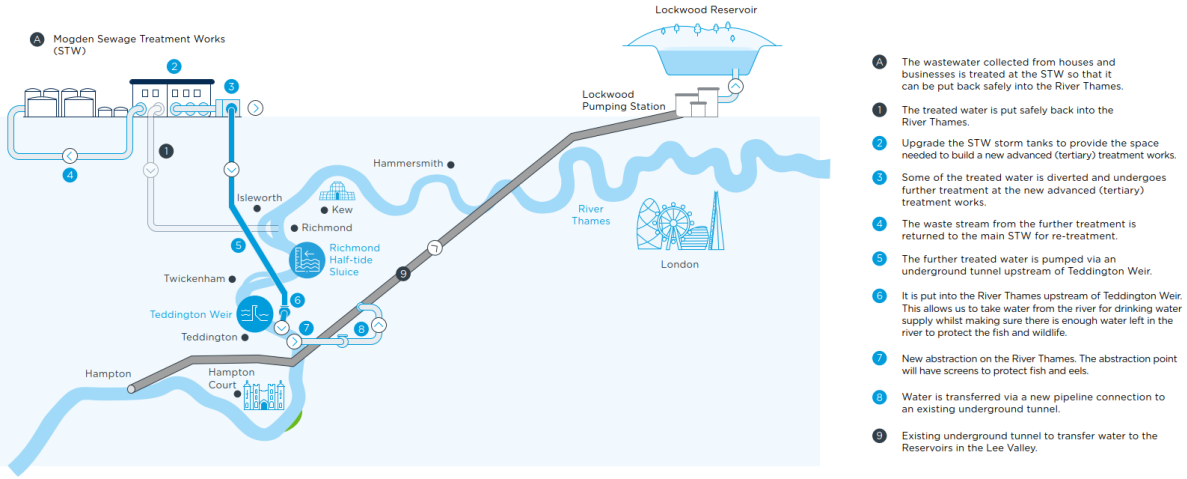
| Name | Raw Water System – KGV Reservoir to Break Tank |
|---|---|
| | • New/increased capacity of the break tank include valves and fittings<br>• New break tank |
| Phases/benefits | n/a |
| Benefit | n/a |
| Lead Time | 5 Years |
| Mutual Exclusivities | No other options on the constrained list are mutually exclusive with this option. |
| Interdependencies/ Exclusivity | May be required to support additional raw water resources in East London:<br>• Beckton Effluent Reuse<br>• Deephams Reuse<br>• Transfer additional water to new treatment at an East London WTW |




## Direct River Abstraction – Teddington to Thames Lee Tunnel

| Name | Direct River Abstraction – Teddington to Thames Lee Tunnel |
|---|---|
| WRSE ID | TWU_KGV_HI-TFR_TED_ALL_teddingtondrated/tlt |
| WRMP19 Reference | CON-RA-TED-TLT |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | Raw water from the River Thames at Teddington is abstracted for transfer into the Thames Lee Tunnel to supplement raw water flows in the tunnel. The capacity of the abstraction will match an input of water to River Thames from the Teddington DRA Tertiary Treatment Plant. |

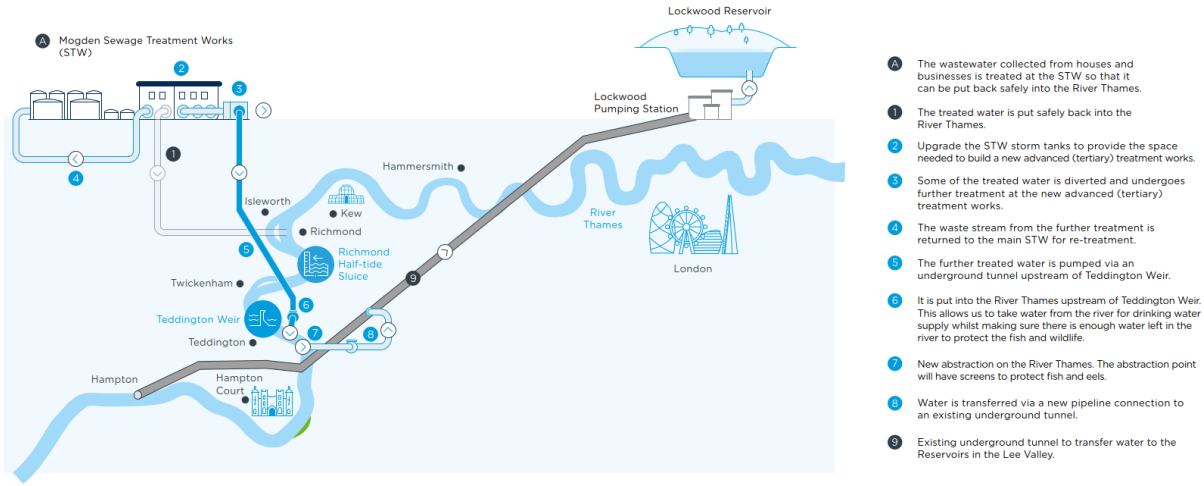
| Name | Direct River Abstraction – Teddington to Thames Lee Tunnel |
|---|---|
| Engineering Components | Abstraction intake, pump station, pipeline and TLT connection scope for abstracting raw water from the River Thames at Teddington into the TLT.<br>• Abstraction intake structure incl. coarse screens, eel-friendly band screens, settling chamber & pipeline to pump station<br>• Abstraction Pump Station, including inline flowmeter<br>• Transfer pipeline to TLT and connection shaft/adit<br>• Power supply/transformer for pump station |
| Phases | n/a |
| Benefits | n/a – the DO benefits are included within Teddington DRA Tertiary Treatment Plant. |
| Lead Time | Alternative delivery programmes have been developed for Gate 2 which show a lead time of 9 years and an earliest operational date of 2031. |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | The following elements are also required for the Teddington DRA option:<br>• Teddington DRA Tertiary Treatment Plant<br>• Teddington Outfall<br>Teddington DRA scheme does not have dependencies on other options.<br>To provide an additional resource to London WRZ, the following elements may also be required:<br>• Raw water system upgrades in east and west London<br>• Additional treatment capacity at Water Treatment Works (WTWs) in both east and west London<br>• Network reinforcements, potentially including extensions to the London ring main<br>In order to provide raw water to the full Lee Valley reservoirs, an additional transfer through TLT extension from Lockwood PS to King George V Reservoir Intake would be required.<br>Teddington DRA scheme has the potential to support the Thames to Affinity Transfer (T2AT) SRO as T2AT SRO may abstract raw water from the River Thames. Additional requirements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents. |




## Teddington DRA Conveyance from Mogden to River Thames (Teddington Outfall)

| Name | Teddington DRA Conveyance from Mogden to River Thames (Teddington Outfall) |
|---|---|
| WRSE ID | TWU_TED_HI-TFR_TED_ALL_teddingtondramog/ted |
| WRMP19 Reference | CON-RA-MOG-TED |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | Pipeline for transporting treated effluent from the Teddington DRA Tertiary Treatment Plant at Mogden STW to the River Thames at Teddington. |
| Engineering Components | • Pipeline for transporting treated effluent from the Teddington DRA Tertiary Treatment Plant at Mogden STW to the River Thames at Teddington<br>• Pipe-jacked tunnel, with shafts, from Mogden STW to River Thames (Teddington)<br>• Pipe for connection between the final shaft and the outfall structure<br>• New river outfall consisting of below ground velocity-reduction chamber, weir, discharge chamber and piping to river |
| Phases | n/a |
| Benefits | n/a – the DO benefits are included within Teddington DRA Tertiary Treatment Plant. |
| Lead Time | Alternative delivery programmes have been developed for Gate 2 which show a lead time of 9 years and an earliest operational date of 2031. |
| Mutual Exclusivities | n/a |

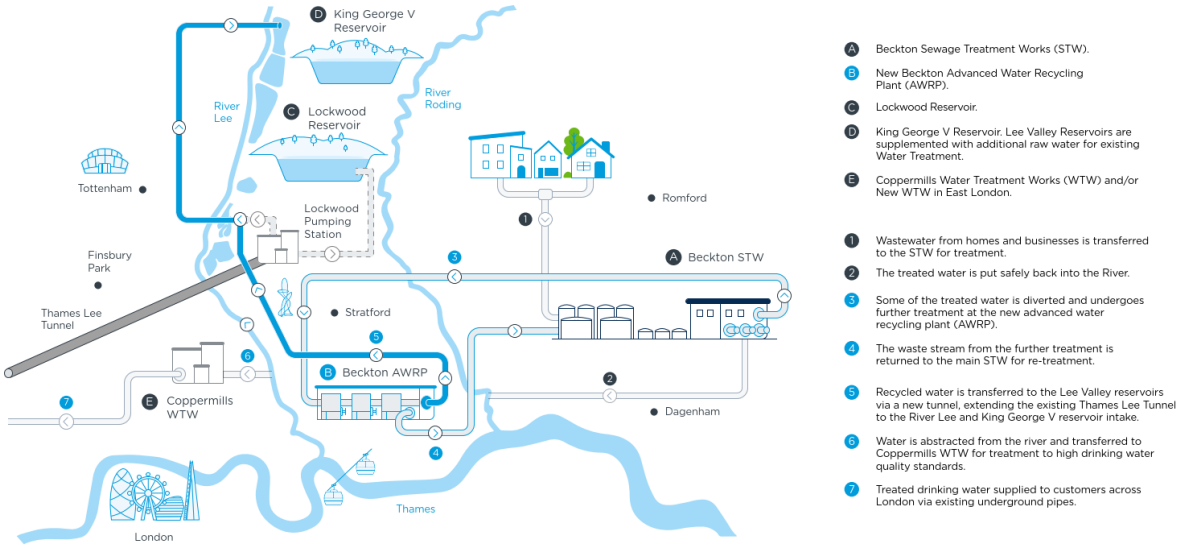
| Name | Teddington DRA Conveyance from Mogden to River Thames (Teddington Outfall) |
|---|---|
| Interdependencies/ Exclusivity | The following elements are also required for the Teddington DRA option:<br>• Teddington DRA Tertiary Treatment Plant<br>• Direct River Abstraction - Teddington to Thames Lee Tunnel<br>To provide an additional resource to London WRZ, the following elements may also be required:<br>• Upgrades to raw water conveyance systems in both east and west London<br>• Additional treatment capacity at Water Treatment Works (WTWs) in both east and west London<br>• Network reinforcements, potentially including extensions to the London ring main<br>Teddington DRA scheme has the potential to support the Thames to Affinity Transfer (T2AT) SRO as T2AT SRO may abstract raw water from the River Thames. Additional requirements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents. |




## TLT extension from Lockwood PS to King George V Reservoir intake

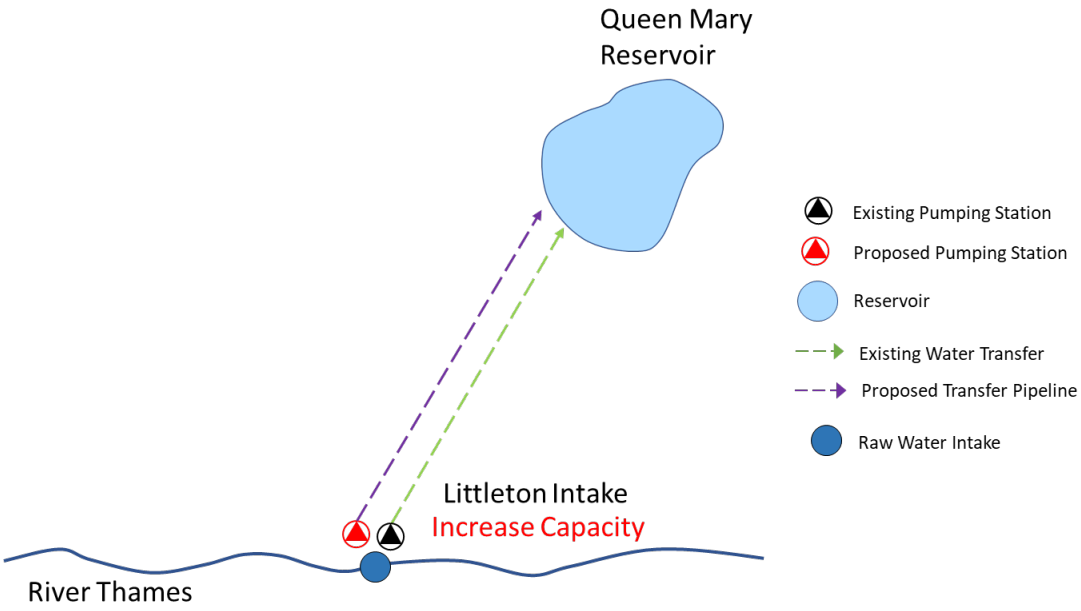
| Name | TLT extension from Lockwood PS to King George V Reservoir intake |
|---|---|
| WRSE ID | TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res |
| WRMP19 Reference | CON-RWS-LCK-KGV-800 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | A raw water tunnel from the existing Lockwood pumping station (end of Thames Lee Tunnel – TLT) to River Lee Diversion upstream of the King George V Reservoir intake. New connection from Lockwood PS to the new tunnel as well as provision for future connections. |

| Name | TLT extension from Lockwood PS to King George V Reservoir intake |
|---|---|
| Engineering Components | Bulk raw water transfer tunnel for an extension of the Thames Lee Tunnel (TLT) to take raw water and recycled water (from Beckton Effluent Recycling and other options) from Lockwood Pump Station to the River Lee Diversion near King George V reservoir:<br>• Tunnel from Lockwood to KGV<br>• 5No. tunnel shafts for the tunnel construction<br>• Submersible pumps within final shaft to discharge the water to the River Lee Diversion outfall<br>• Pipework, control valving arrangement and ancillaries for the connection to the existing TLT Lockwood Pumping Station<br>• Sub-structures and in-river works for the outfall to River Lee diversion, upstream of KGV |
| Phases/Benefits | n/a. The tunnel would have sufficient capacity for the maximum flow from Beckton Effluent Recycling and additional capacity for other options if required. |
| Benefits | n/a |
| Lead Time | Alternative delivery programmes have been developed for Gate 2 which show a lead time of 9 years and an earliest operational date of 2031. |
| Mutual Exclusivities | n/a |
| Interdependencies/ Exclusivity | This option is required as part of the Beckton Effluent Reuse option<br>To provide an additional resource to London WRZ the following system elements may also be required:<br>• Additional capacity in the raw water systems to allow the water to be abstracted from the River Lee Diversion into the Lee Valley Reservoirs and from there conveyed to a Water Treatment Works in east London<br>• Additional treatment capacity in east London<br>• Additional capacity in the Thames Water ring main<br>Beckton Recycling has the potential to support the Thames to Affinity Transfer (T2AT) SRO as T2AT SRO may abstract raw water from the River Lee. Additional requirements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents. |




## Raw Water System – Increase capacity of Littleton intake PS

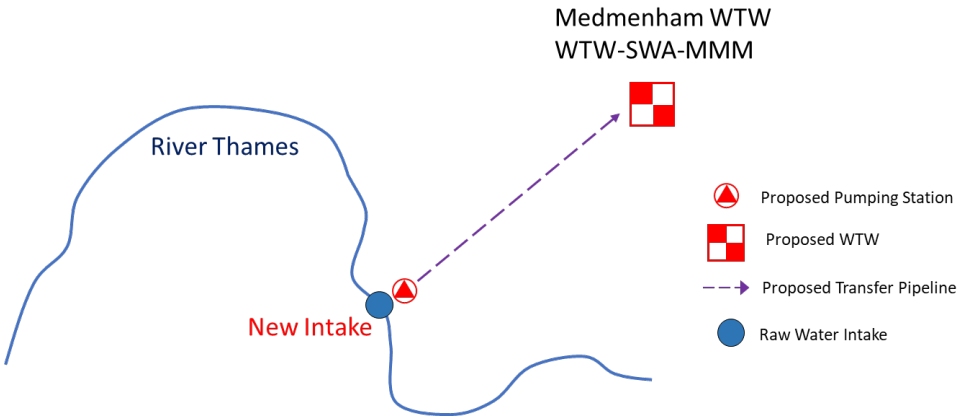
| Name | Raw Water System – Increase capacity of Littleton intake PS |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_LON_ALL_littleton int-qm |
| WRMP19 Reference | CON-RWS-LTN-300 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | Capacity increase of existing River Thames Littleton intake to 300 Ml/d. |
| Engineering Components | The components for this scope are as follows:<br>• New Pumping station located at Littleton intake<br>• Above ground pipelines to reservoir |
| Phases/benefits | n/a |
| Benefit | n/a |
| Lead Time | 5 Years |
| Mutual exclusivities | No other options on the constrained list are mutually exclusive with this option. |
| Interdependencies/ Exclusivity | May be required in order to deliver the benefit from the increase in raw water within the west London system from resource options. |




## Raw Water System – New Medmenham Intake

| Name | Medmenham Intake |
|---|---|
| WRSE ID | TWU_SWA_HI-TFR_UTC_ALL_medmenham intake 53<br>TWU_SWA_HI-TFR_UTC_ALL_medmenham intake 80 |
| WRMP19 Reference | CON-RWS-MMM-53<br>CON-RWS-MMM-80 |
| Element Type | Conveyance |
| WRZ | SWA |
| Engineering Scope | Construction of 53 Ml/d or 80 Ml/d intake near Medmenham to abstract water from the River Thames including a 53 Ml/d or 80 Ml/d raw water pumping station to the new Medmenham WTW and raw water pipeline to transfer the water from the intake to the WTW. |
| Engineering Components | The components for this scope are as follows:<br>• New 53 Ml/d / 80 Ml/d raw water intake and screens<br>• New gravity pipeline between intake and raw water pumping station<br>• Raw water pumping station<br>• Raw water pipeline from abstraction point to new Medmenham WTW |
| Phases/benefits | n/a |
| Benefit | n/a |
| Lead Time | 5 Years |
| Mutual Exclusivities | The 53 Ml/d and 80 Ml/d capacity options are mutually exclusive to each other. |
| Interdependencies/ Exclusivity | Dependent on new Medmenham WTW and treated water pipeline to new Widdenton SR Medmenham WTW (72Ml/d). |

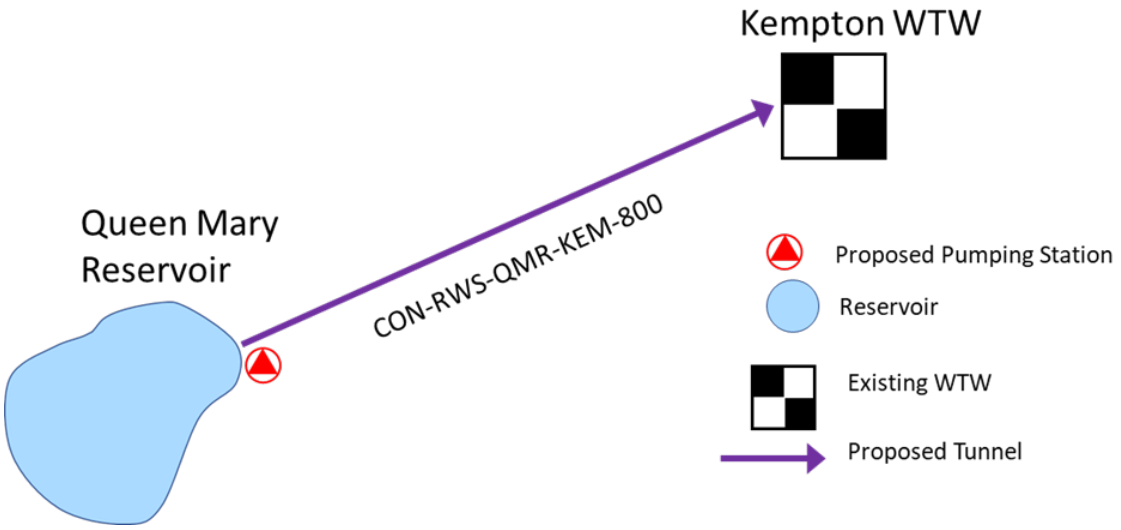
| Name | Medmenham Intake |
|---|---|
| | The intake will abstract from the River Thames, supported by one or more of the following options:<br>• Didcot Raw Water Purchase<br>• SESRO<br>• Marsh Gibbon Reservoir<br>• Chinnor Reservoir<br>• Deerhurst to Culham (300Ml/d) pipeline Deerhurst to Culham (400Ml/d) pipeline Deerhurst to Culham (500Ml/d) pipeline<br>• Oxford Canal to Cropredy |




## Raw Water System – Queen Mary Reservoir to Kempton WTW site

| Name | Raw Water System – Queen Mary Reservoir to Kempton WTW site |
|---|---|
| WRSE ID | TWU_WLJ_HI-TFR_WLJ_XXX_qm res-kempton wtw |
| WRMP19 Reference | CON-RWS-QMR-KEM-800 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | New conveyance of raw water from Queen Mary Reservoir to new Kempton WTW. |
| Engineering Components | The components for this scope are as follows:<br>• Tunnel from Queen Mary to Kempton<br>• 1 No drive shaft<br>• 1 No intermediate shaft<br>• 1 No reception shaft<br>• High Integrity Gate Valve; 2 at the intermediate shaft.<br>• Installation of jetty<br>• Pumps installed in the reservoir including housing and control room for the pumps |
| Phases/benefits | n/a |
| Benefit | n/a |
| Lead Time | 8 Years |
| Mutual Exclusivities | None |

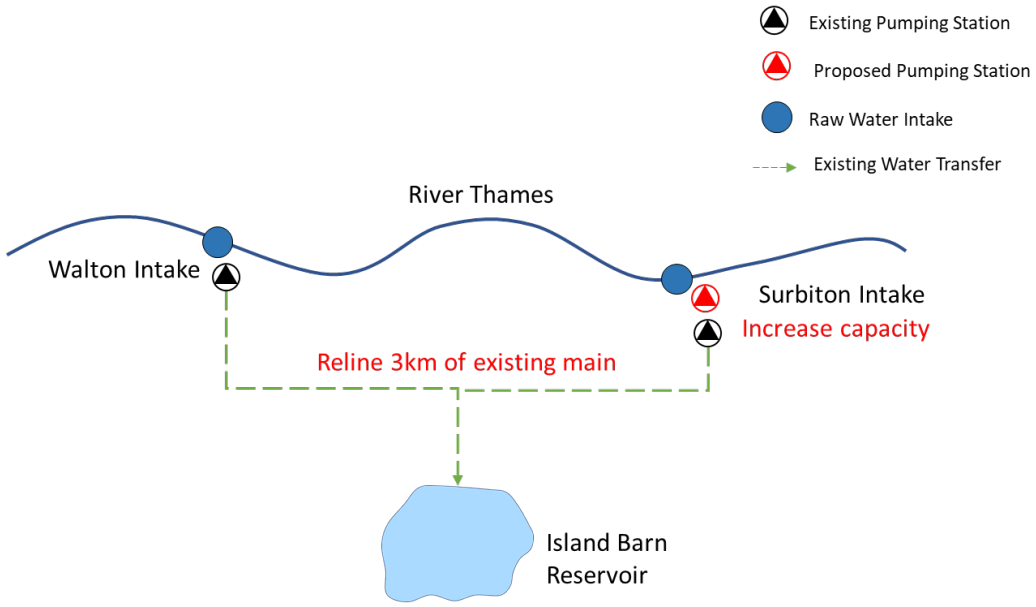
| Name | Raw Water System – Queen Mary Reservoir to Kempton WTW site |
|---|---|
| Interdependencies/ Exclusivity | May be required to support additional raw water resources in West London:<br>• SESRO<br>• Marsh Gibbon Reservoir<br>• Chinnor Reservoir<br>• Deerhurst to Culham (300Ml/d) pipeline, Deerhurst to Culham (400Ml/d) pipeline, Deerhurst to Culham (500Ml/d) pipeline<br>• Oxford Canal to Cropredy<br>• and transfer additional water to new treatment at Kempton WTW expansion |




## Raw Water System – Increase capacity of Surbiton intake

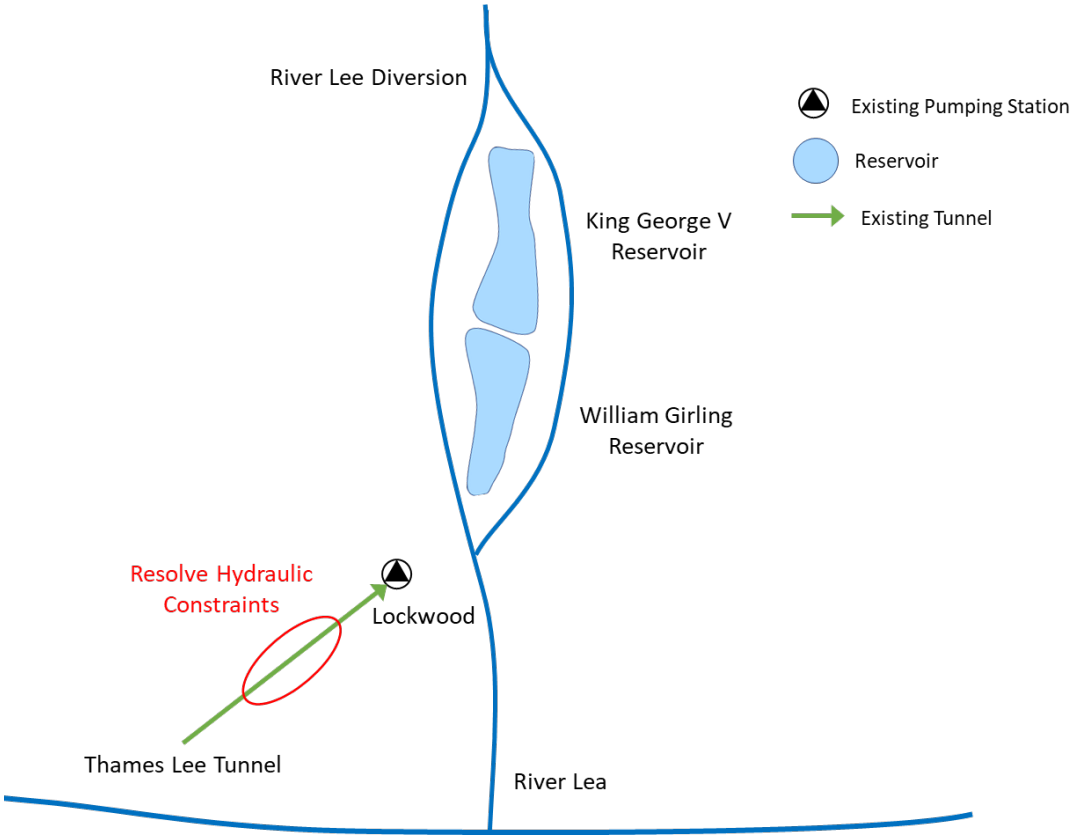
| Name | Raw Water System – Increase capacity of Surbiton intake |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_LON_XXX_surbiton int-walton |
| WRMP19 Reference | CON-RWS-SUR-100 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | Increase capacity of existing River Thames Surbiton intake by 100 Ml/d. Includes additional pump at the intake and relining a section of the existing main between Surbiton and Walton intakes and Island Barn Reservoir. |
| Engineering Components | The components for this scope are as follows:<br>• Installation of an extra pump within the Surbiton Pumping station intake<br>• Upgrade screens at Surbiton<br>• Reline section of an existing main |
| Phases/benefits | n/a |
| Benefit | n/a |
| Lead Time | 6 Years |
| Mutual Exclusivities | None |

| Name | Raw Water System – Increase capacity of Surbiton intake |
|---|---|
| Interdependencies/ Exclusivity | None |




## Raw Water System – TLT upgrade

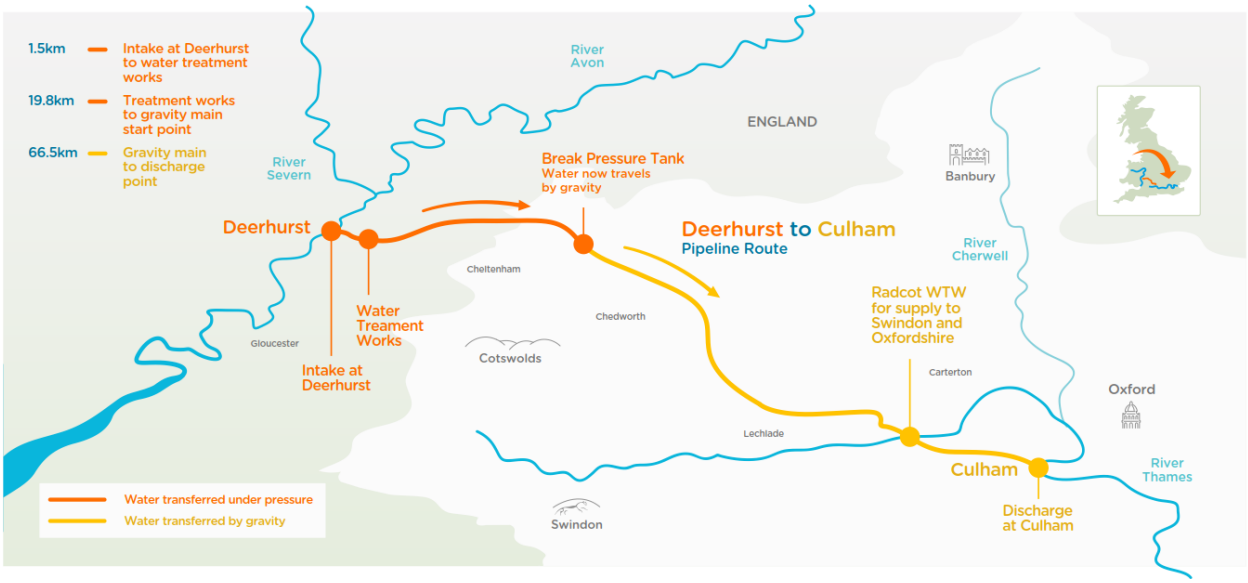
| Name | Raw Water System – TLT upgrade |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_LON_XXX_tlt upgrade - roc |
| WRMP19 Reference | CON-RWS-TLT-UPG-450 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | Nominal 450 Ml/d upgrade to the Thames Lee Tunnel to remove existing constraints. |
| Engineering Components | The components for this scope are as follows:<br>• Reinforcing section of the tunnel<br>• New shaft<br>• New air valve |
| Phases/benefits | n/a |
| Benefit | n/a |
| Lead Time | 6 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | Not dependent on other elements. |




## Severn Thames Transfer – Deerhurst to Culham (300Ml/d) pipeline

| Name | STT – Raw Water Transfer Deerhurst to Culham 300Ml/d |
|---|---|
| WRSE ID | TWU_STT_HI-IMP_STT_XXX_sttpipe300(lon) |
| WRMP19 Reference | CON-RWT-DEH-CLM-300 |
| Element Type | Conveyance |
| WRZ | LONDON / SWOX / SWA |
| Engineering Scope | A supported conveyance pipeline option from Deerhurst on the River Severn to Culham on the River Thames with a 300 Ml/d capacity and a total length circa 88km. The element includes all engineering works required to transfer the flow to the River Thames. |
| Engineering Components | A river intake structure at Deerhurst including inlet screens and a twin pipeline to a low lift pump station:<br>• A raw water low lift pump station and a twin pipeline to treatment works<br>• Treatment works including inlet screens, coagulation and lamella clarifiers, rapid gravity filtration and sludge and washwater treatment<br>• A treated water high lift pump station<br>• A single rising main to a break pressure tank<br>• A break pressure tank at the high point<br>• A single gravity main to the outfall location |

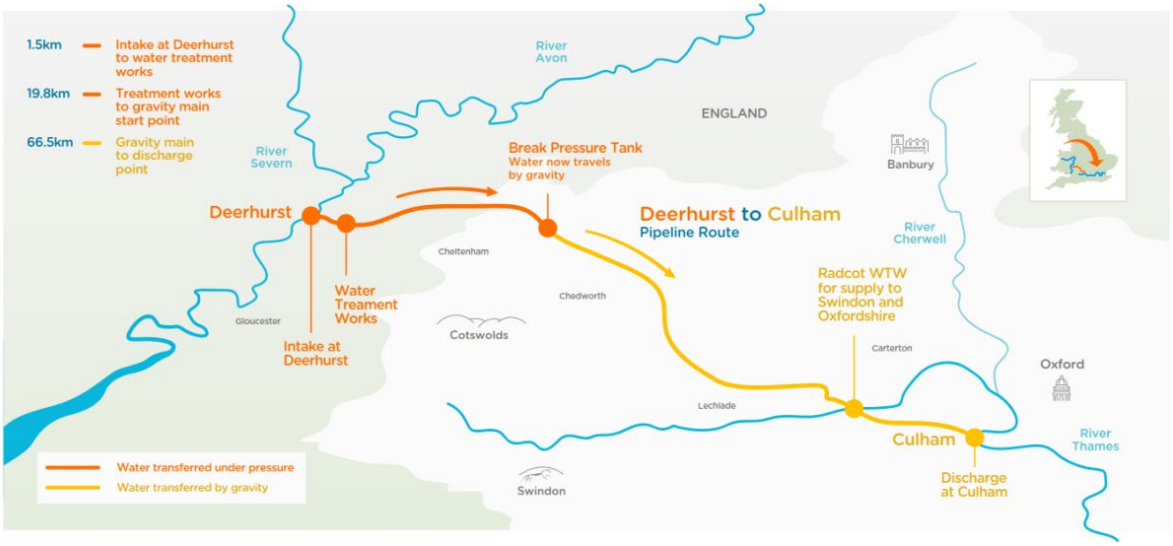
| Name | STT – Raw Water Transfer Deerhurst to Culham 300Ml/d |
|---|---|
| | • An outfall at Culham with an actuated valve and an aeration cascade |
| Phases/Benefit | The independent unsupported River Severn resource option, without support options was rejected at feasibility stage and is not included in the Constrained List; however unsupported River Severn water will be abstracted for transfer in the Deerhurst pipeline when available in combination with other resources.<br>Stochastic modelling allowing for climate change and other abstractors indicates a benefit of 80 Ml/d for the 300 Ml/d pipeline option, from the unsupported flow in the River Severn. |
| Lead Time | 10 Years (to supply unsupported flow). The full SRO project delivery programme allows for an Earliest Operational Date of 2033 |
| Mutual exclusivities | Mutually exclusive with Deerhurst to Culham (400Ml/d) pipeline and Deerhurst to Culham (500Ml/d) pipeline |
| Interdependencies/ Exclusivity | This element is dependent on River Severn support elements that will be provided by third parties (Severn Trent Water and United Utilities):<br>• Minworth STW to River Avon 115Ml/d<br>• Netheridge STW to River Severn 35Ml/d<br>• Lake Vyrnwy (United Utilities) – 180Ml/d<br>Not all support options may be required, depending on the capacity of the STT that is selected.<br>For STT to deliver a benefit, the water that is released into the River Thames will need to be re-abstracted. There are other water resource options being considered in WRMP24 and/or WRSE regional planning that would either benefit, or be dependent on, water supply from SESRO directly or from water provided into, and conveyed by, the River Thames (whether this be via SESRO, STT or a combination of both), these include:<br>• Thames to Affinity Transfer (T2AT) SRO<br>• Thames to Southern Transfer (T2ST) SRO<br>• Thames Water non-SRO options to supply the SWOX or SWA Water Resource Zones<br>Additional requirements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents and requirements to supply Southern Water WRZs are described in the Thames to Southern Water Transfer Gate 2 documents.<br>To provide an additional resource to London WRZ the following system elements may also required:<br>• Additional capacity in the raw water systems to allow the water to be abstracted from the River Thames into the west London reservoirs and from there conveyed to a Water Treatment Works in west London<br>• Additional treatment capacity in west London<br>• Additional capacity in the Thames Water ring main |




## Severn Thames Transfer – Deerhurst to Culham (400 Ml/d) pipeline

| Name | STT – Raw Water Transfer Deerhurst to Culham 400 Ml/d |
|---|---|
| WRSE ID | TWU_STT_HI-IMP_STT_XXX_sttpipe400(lon) |
| WRMP19 Reference | CON-RWT-DEH-CLM-400 |
| Element Type | Conveyance |
| WRZ | LONDON / SWOX / SWA |
| Engineering Scope | A supported conveyance pipeline option from Deerhurst on the River Severn to Culham on the River Thames with a 400 Ml/d capacity and a total length circa 88km. The element includes all engineering works required to transfer the flow to the River Thames. |
| Engineering Components | • A river intake structure at Deerhurst including inlet screens and a twin pipeline to a low lift pump station<br>• A raw water low lift pump and a twin pipeline to treatment works<br>• Treatment works including inlet screens, coagulation and lamella clarifiers, rapid gravity filtration and sludge and washwater treatment<br>• A treated water high lift pump station<br>• A single rising main to a break pressure tank<br>• A break pressure tank at the high point<br>• A single gravity main to the outfall location<br>• An outfall at Culham with an actuated valve and an aeration cascade |
| Phases/Benefits | The independent unsupported River Severn resource option, without support options was rejected at feasibility stage and is not included in the Constrained List; however unsupported River Severn water will be abstracted for transfer in the Deerhurst pipeline when available in combination with other resources.<br>Stochastic modelling allowing for climate change and other abstractors indicates a benefit of 107 Ml/d from the River Severn for the 400 Ml/d pipeline option, from the unsupported flow in the River Severn. |

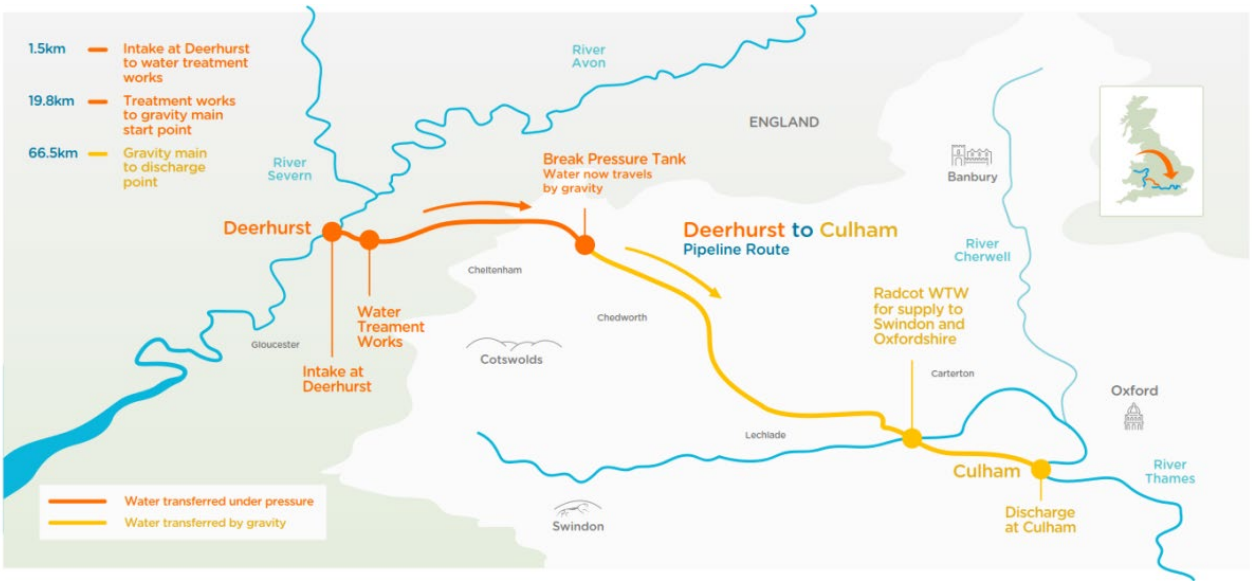
| Name | STT – Raw Water Transfer Deerhurst to Culham 400 Ml/d |
|---|---|
| Mutual exclusivities | Mutually exclusive with Deerhurst to Culham (300Ml/d) pipeline and Deerhurst to Culham (500Ml/d) pipeline |
| Lead Time | 10 Years. The full SRO project delivery programme allows for an Earliest Operational Date of 2033. |
| Interdependencies/ Exclusivity | This element is dependent on River Severn support elements that will be provided by third parties (Severn Trent Water and United Utilities).<br>• Minworth STW to River Avon 115Ml/d<br>• Netheridge STW to River Severn 35Ml/d<br>• Lake Vyrnwy (United Utilities) – 180Ml/d<br>Not all support options may be required, depending on the capacity of the STT that is selected<br>For STT to deliver a benefit, the water that is released into the River Thames will need to be re-abstracted. There are other water resource options being considered in WRMP24 and/or WRSE regional planning that would either benefit, or be dependent on, water supply from SESRO directly or from water provided into, and conveyed by, the River Thames (whether this be via SESRO, STT or a combination of both), these include:<br>• Thames to Affinity Transfer (T2AT) SRO<br>• Thames to Southern Transfer (T2ST) SRO<br>• Thames Water non-SRO options to supply the SWOX or SWA Water Resource Zones<br>Additional requirements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents and requirements to supply Southern Water WRZs are described in the Thames to Southern Water Transfer Gate 2 documents.<br>To provide an additional resource to London WRZ the following system elements may also required:<br>• Additional capacity in the raw water systems to allow the water to be abstracted from the River Thames into the west London reservoirs and from there conveyed to a Water Treatment Works in west London<br>• Additional treatment capacity in west London<br>• Additional capacity in the Thames Water ring main |




## Severn Thames Transfer – Deerhurst to Culham (500Ml/d) pipeline

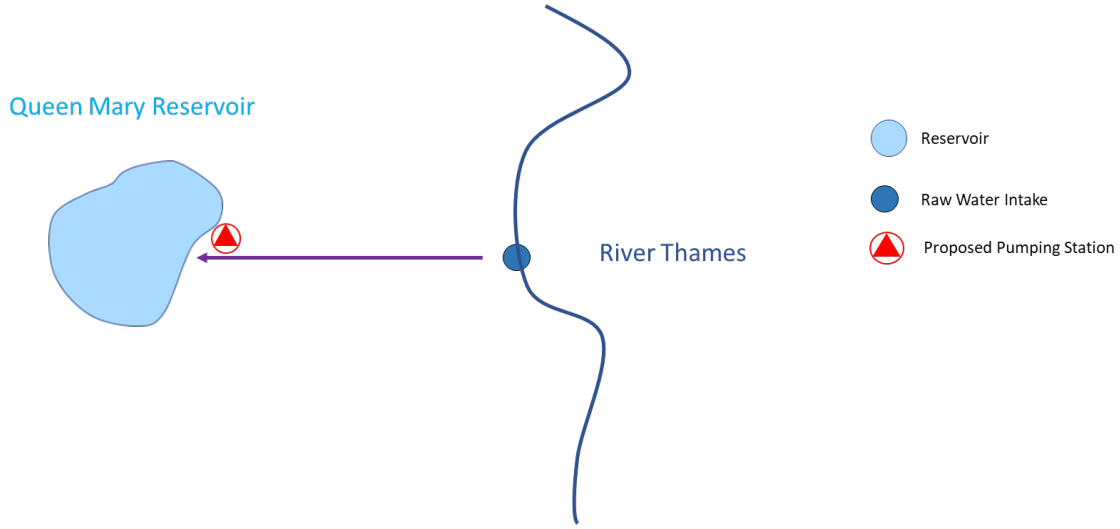
| Name | STT – Raw Water Transfer Deerhurst to Culham 500 Ml/d |
|---|---|
| WRSE ID | TWU_STT_HI-IMP_STT_XXX_sttpipe500(lon) |
| WRMP19 Reference | CON-RWT-DEH-CLM-500 |
| Element Type | Conveyance |
| WRZ | LONDON / SWOX / SWA |
| Engineering Scope | A supported conveyance pipeline option from Deerhurst on the River Severn to Culham on the River Thames with a 500 Ml/d capacity and a total length circa 88km. The element includes all engineering works required to transfer the flow to the River Thames. |
| Engineering Components | • A river intake structure at Deerhurst including inlet screens and a twin pipeline to a low lift pump station<br>• A raw water low lift pump station and a twin pipeline to treatment works<br>• Treatment works including inlet screens, coagulation and lamella clarifiers, rapid gravity filtration and sludge and washwater treatment<br>• A treated water high lift pump station<br>• A single rising main to a break pressure tank<br>• A break pressure tank at the high point<br>• A single gravity main to the outfall location<br>• An outfall at Culham with an actuated valve and an aeration cascade |
| Phases/Benefit | The independent unsupported River Severn resource option, without support options was rejected at feasibility stage and is not included in the Constrained List; however unsupported River Severn water will be abstracted for transfer in the Deerhurst pipeline when available.<br>Stochastic modelling allowing for climate change and other abstractors indicates a benefit of 134 Ml/d from the River Severn for the 500 Ml/d pipeline option, from the unsupported flow in the River Severn. |

| Name | STT – Raw Water Transfer Deerhurst to Culham 500 Ml/d |
|---|---|
| Mutual exclusivities | Mutually exclusive with Deerhurst to Culham (300Ml/d) and pipelineDeerhurst to Culham (400Ml/d) pipeline |
| Lead Time | 10 Years. The full SRO project delivery programme allows for an Earliest Operational Date of 2033. |
| Interdependencies/ Exclusivity | This element is dependent on River Severn support elements that will be provided by third parties (Severn Trent Water and United Utilities):<br>• Minworth STW to River Avon 115Ml/d<br>• Netheridge STW to River Severn 35Ml/d<br>• Lake Vyrnwy (United Utilities) – 180Ml/d<br>Not all support options may be required, depending on the capacity of the STT that is selected.<br>For STT to deliver a benefit, the water that is released into the River Thames will need to be re-abstracted. There are other water resource options being considered in WRMP24 and/or WRSE regional planning that would either benefit, or be dependent on, water supply from SESRO directly or from water provided into, and conveyed by, the River Thames (whether this be via SESRO, STT or a combination of both), these include:<br>• Thames to Affinity Transfer (T2AT) SRO<br>• Thames to Southern Transfer (T2ST) SRO<br>• Thames Water non-SRO options to supply the SWOX or SWA Water Resource Zones<br>Additional requirements to supply water to Affinity Water WRZs are described in the Thames to Affinity Water Transfer Gate 2 documents and requirements to supply Southern Water WRZs are described in the Thames to Southern Water Transfer Gate 2 documents.<br>To provide an additional resource to London WRZ the following system elements may also required:<br>• Additional capacity in the raw water systems to allow the water to be abstracted from the River Thames into the west London reservoirs and from there conveyed to a Water Treatment Works in west London<br>• Additional treatment capacity in west London<br>• Additional capacity in the Thames Water ring main |



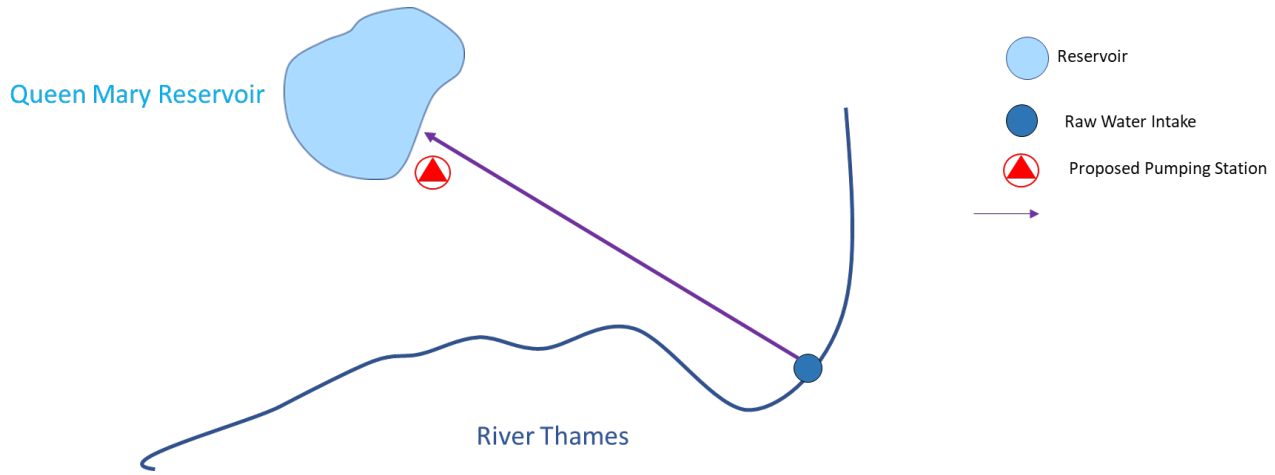

## New Lower Thames Intake : Teddington to Queen Mary Reservoir

| Name | New Lower Thames Intake : Teddington to QM Reservoir |
|---|---|
| WRSE ID | TWU_WLJ_HI-TFR_WLJ_ALL_teddingqmreservoir |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | New water conveyance tunnel of raw water abstracting from the River Thames near Teddington to a discharge point into the existing Queen Mary Reservoir. |
| Engineering Components | • Tunnel from Teddington to Queen Mary<br>• New pumping station<br>• Power supply, standby generator and transformer for pump station<br>• Discharge pipework from pump station to Queen Mary Reservoir |
| Benefit | n/a |
| Time Lead | 10 years |
| Mutual exclusivities | Mutually exclusive with New Lower Thames Intake : Surbiton to Queen Mary reservoir and New Lower Thames Intake : Walton to Queen Mary Reservoir. |
| Interdependencies/ Exclusivity | n/a |


Queen Mary Reservoir
River Thames
Reservoir
Raw Water Intake
Proposed Pumping Station

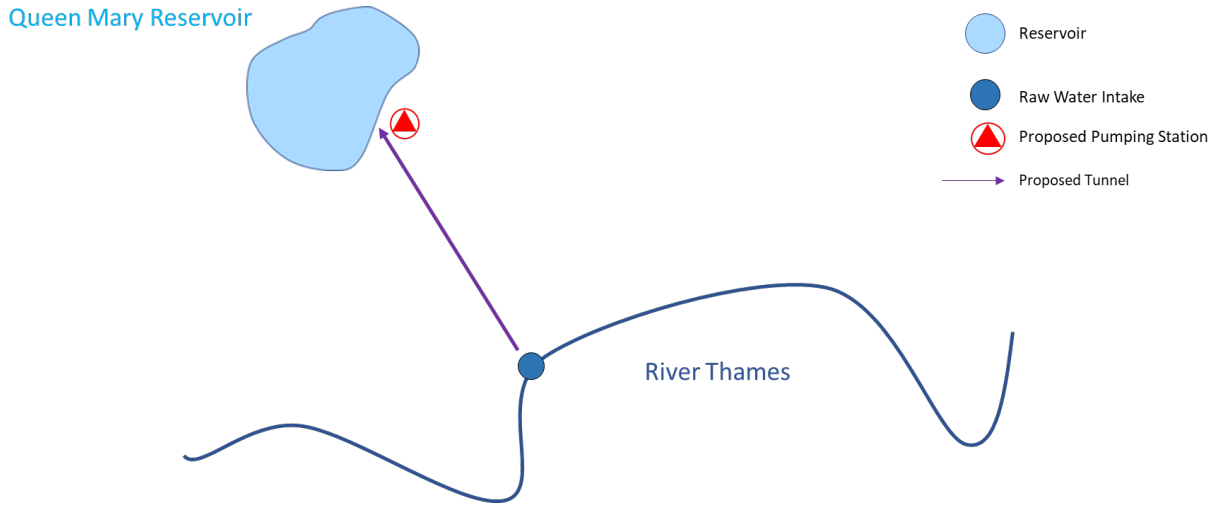
## New Lower Thames Intake : Surbiton to Queen Mary reservoir

| Name | New Lower Thames Intake : Surbiton to Queen Mary Reservoir |
|---|---|
| WRSE ID | TWU_WLJ_HI-TFR_WLJ_ALL_lowerthamesintake |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | New raw water conveyance tunnel from a new abstraction point on the River Thames near Surbiton to a discharge point into the existing Queen Mary Reservoir. |
| Engineering Components | • Tunnel from Surbiton to Queen Mary<br>• New Pumping station<br>• Power supply, standby generator and transformer for pump station<br>• Above ground pipelines to Queen Mary Reservoir |
| Benefit | n/a |
| Time Lead | 10 years |
| Mutual exclusivities | Mutually exclusive with New Lower Thames Intake : Teddington to Queen Mary Reservoir and New Lower Thames Intake : Walton to Queen Mary Reservoir. |
| Interdependencies/ Exclusivity | n/a |



## New Lower Thames Intake : Walton to Queen Mary Reservoir

| Name | New Lower Thames Intake : Walton to Queen Mary Reservoir |
|---|---|
| WRSE ID | TWU_WLJ_HI-TFR_WLJ_ALL_walton-qmreservoir |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Conveyance |
| WRZ | LONDON |
| Engineering Scope | A new raw water conveyance tunnel from a new abstraction point on the River Thames near Walton to a discharge point into the existing Queen Mary Reservoir. |
| Engineering Components | • Tunnel from Walton to Queen Mary<br>• New Pumping station<br>• Power supply, standby generator and transformer for pump station<br>• Above ground pipelines to Queen Mary Reservoir |
| Benefit | n/a |
| Time Lead | 10 years |
| Mutual exclusivities | Mutually exclusive with New Lower Thames Intake : Teddington to Queen Mary Reservoir and New Lower Thames Intake : Surbiton to Queen Mary reservoir. |
| Interdependencies/ Exclusivity | n/a |




## Catchment Management

R.20 Catchment options were compiled into catchment portfolios to compare the proposed options with regards to their contribution to current and future catchment challenges, targeting catchment deficits, catchment issues, problem characterisation and future problems. Standard options (Portfolio 1) were those identified to address the deficit issues and environmental need, both now and with any predicted changes in the future, and these portfolios of options were inputted into WRSE's investment model to develop to regional plan.

R.21 We have identified three schemes (below) within our nature-based solutions programmes that may offer a deployable output benefit over the longer term. These schemes involve working with farmers to provide support and advice to implement environmental interventions, including measures to reduce the potential for nitrate to leach into groundwater. These schemes have been included within our catchment options longlist to be screened and modelled by WRSE to develop the draft Regional Plan. As with the other catchment options on our longlist, the information for these options is less mature and the option type itself generates less certain water resources benefits. This means that a high degree of uncertainty remains around the deliverability of the estimated deployable output benefits from these options. Through our existing programmes to improve the environment and our Water Industry National Environment Programme (WINEP) and Price Review 2024 (PR24) process we are working as a business to better understand the benefits of these options and support their implementation.

## Bean Wellfield (Groundwater)

| Name | |
|---|---|
| WRSE ID | CM_TWU_3 |
| WRMP 19 Reference | n/a |
| Element Type | Catchment Management |
| WRZ | London |
| Engineering Scope | To carry out a programme of catchment management measures to reduce seasonal and long-term trend in nitrate. |
| Engineering Components | To be delivered as part of Portfolio 1 (Standard) Darent and Cray – see above. |
| Phases/benefits | 0.1 Ml/d |
| Time Lead | To be delivered as part of a portfolio. |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |

## Green Street Green (Groundwater)

| Name | |
|---|---|
| WRSE ID | CM_TWU_14 |
| WRMP 19 Reference | n/a |
| Element Type | Catchment Management |
| WRZ | London |
| Engineering Scope | To carry out a programme of catchment management measures to reduce seasonal and long-term trend in nitrate. |
| Engineering Components | To be delivered as part of Portfolio 1 (Standard) Darent and Cray – see above. |
| Phases/benefits | 0.3 Ml/d |
| Time Lead | To be delivered as part of a portfolio. |

| Name | |
|---|---|
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |

## Wilmington (Groundwater)

| Name | |
|---|---|
| WRSE ID | CM_TWU_36 |
| WRMP 19 Reference | n/a |
| Element Type | Catchment Management |
| WRZ | London |
| Engineering Scope | To carry out a programme of catchment management measures to reduce seasonal and long-term trend in nitrate. |
| Engineering Components | To be delivered as part of Portfolio 1 (Standard) Darent and Cray – see above. |
| Phases/benefits | 0.2 Ml/d |
| Time Lead | To be delivered as part of a portfolio. |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |

# Drought Permit options

Drought permit options are concerned with abstraction from our existing sources, outside of the conditions stated in the individual licences. These drought permit options represent an important supply-side resource.

This section provides a summary of Drought Permit Options

## Gatehampton

| Name | Gatehampton Drought Permit |
|---|---|
| WRZ | SWOX |
| Scope | Suspension of abstraction licence flow constraint to allow an increase in abstraction of 3.5 Ml/d. |
| Components | NA |
| Benefit | 3.5Ml/d |
| Time Lead | NA |
| Mutual exclusivities | NA |
| Interdependencies/ Exclusivity | NA |

## Playhatch

| Name | Playhatch Drought Permit |
|---|---|
| WRZ | Kennet |
| Scope | Increased output from existing licensed borehole source. |
| Components | NA |
| Benefit | 4.1Ml/d |
| Time Lead | NA |
| Mutual exclusivities | NA |
| Interdependencies/ Exclusivity | Network restrictions on WTW output |

## Harpsden/Sheeplands

| Name | Harpsden Sheeplands Drought Permit |
|---|---|
| WRZ | Henley |
| Scope | Removing the licence aggregation between Sheeplands and Harpsden sources to allow increased total abstraction from both sources |
| Components | NA |
| Benefit | 5.6Ml/d |
| Time Lead | NA |
| Mutual exclusivities | NA |

| Name | Harpsden Sheeplands Drought Permit |
|---|---|
| Interdependencies/ Exclusivity | NA |

# Water Treatment Works

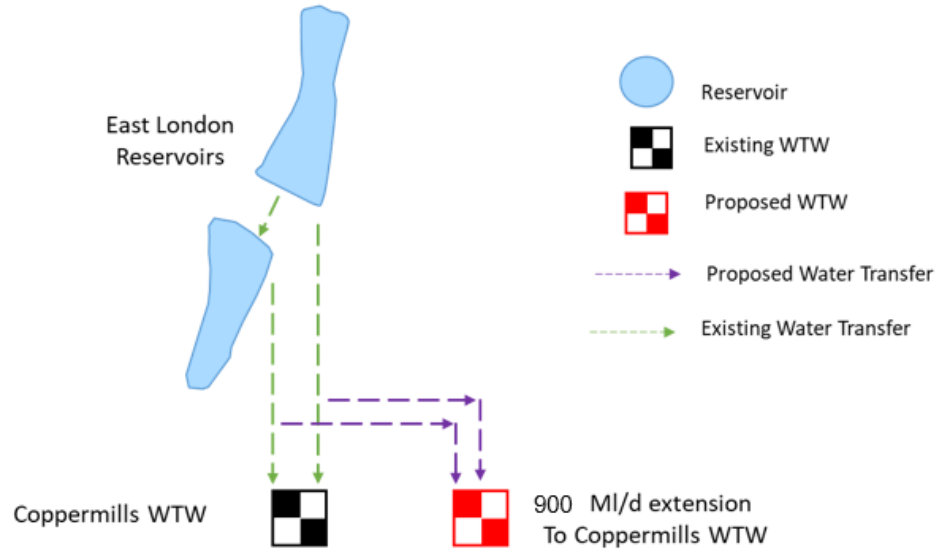
## East London (600 Ml/d)

| Name | East London Water Treatment Works extension |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_WT1_XXX_eastlondonwtw100<br>TWU_LON_HI-ROC_WT1_XXX_eastlondonwtw150<br>TWU_LON_HI-ROC_WT1_XXX_eastlondonwtw200<br>TWU_LON_HI-ROC_WT1_XXX_eastlondonwtw300 |
| WRMP 19 Reference | WTW-LON-COP-100<br>WTW-LON-COP-150 |
| Element Type | Water Treatment |
| WRZ | LONDON |
| Engineering Scope | New WTW in East London to treat water from various water resource options such as: recycling and transfer. |
| Engineering Components | The components for this scope are as follows:<br>• New WTW to support required capacities<br>• Inter-stage pumping station<br>• Land purchase<br>• New abstraction and conveyance pipelines |
| Phases/benefits | Option has a maximum capacity of 600 Ml/d which can be achieved through phase options as set out below: |

| Phase 1 Ml/d | Phase 2 Ml/d | Phase 3 Ml/d | Phase 4 Ml/d | Phase 5 Ml/d | Phase 6 Ml/d | Total Ml/d |
|---|---|---|---|---|---|---|
| 100 | 100 | 100 | 100 | 100 | 100 | 600 |
| 150 | 100 | 100 | 100 | 100 | | 550 |
| 200 | 100 | 100 | 100 | 100 | | 600 |
| 300 | 100 | 100 | 100 | | | 600 |

| | |
|---|---|
| Time Lead | 9 Years for Phase 1 elements and 7 Years for subsequent phases. |
| Mutual exclusivities | Phase 1 elements are mutually exclusive with each other. |
| Interdependencies/ Exclusivity | This WTW would treat new raw water resources in East London including from:<br>• Beckton Effluent Reuse<br>• Deephams Reuse<br>To provide an additional resource to London WRZ the following system elements may also be required: |

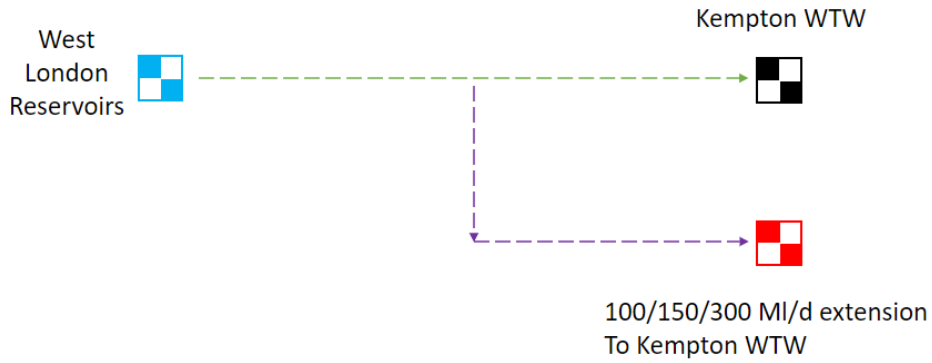
| | |
|---|---|
| | • Raw water system upgrades will be required to convey the raw water to the new WTW<br>• Additional capacity in the Thames Water ring main |




## Kempton WTW expansion (800 Ml/d)

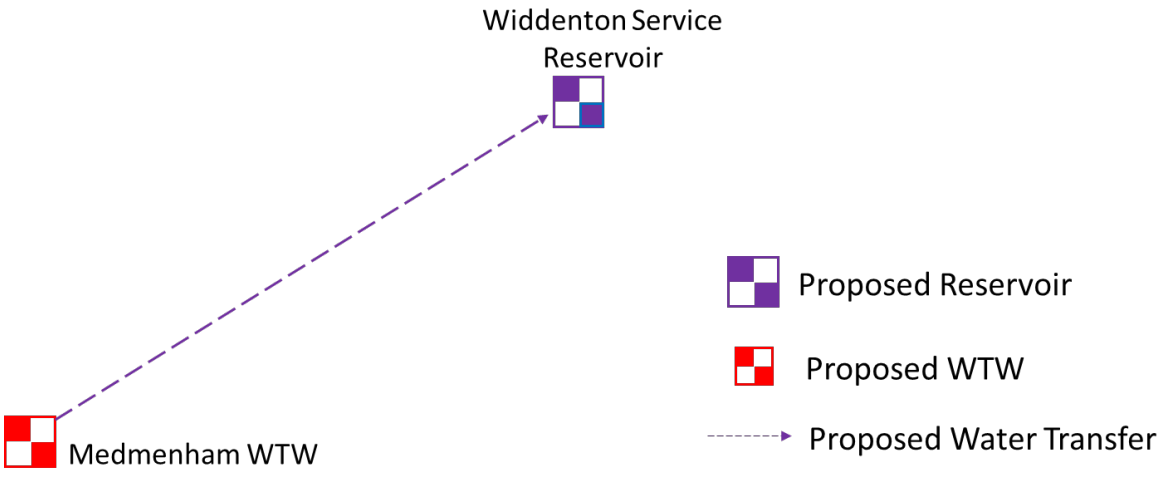
| Name | Kempton Water Treatment Works expansion 800 Ml/d |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_WT1_XXX_kemptonwtw300<br>TWU_LON_HI-ROC_WT1_XXX_kemptonwtw100<br>TWU_LON_HI-ROC_WT1_XXX_kemptonwtw150 |
| WRMP19 Reference | WTW-LON-KEM-300<br>WTW-LON-KEM-100<br>WTW-LON-KEM-150 |
| Element Type | Water Treatment |
| WRZ | LONDON |
| Engineering Scope | Phased construction of new WTW with maximum capacity of 800 Ml/d located at the existing Kempton WTW site to treat water from West London reservoirs. This could originate from various raw water option types including reservoir, recycling, and raw water transfers. |
| Engineering Components | The components for this scope are as follows:<br>• Raw water pumping station<br>• New Water Treatment Works<br>• Interstage pumping station<br>• Treated water pumping station |

<table>
<tr><td>Name</td><td>Kempton Water Treatment Works expansion 800 Ml/d</td></tr>
<tr><td>Phases/benefits</td><td>Option is a phased option up to a maximum capacity of 800Ml/d. Phased elements are as below:
<table>
<tr><th>Phase 1 Ml/d</th><th>Phase 2 Ml/d</th><th>Phase 3 Ml/d</th><th>Phase 3 Ml/d</th><th>Phase 4 Ml/d</th><th>Phase 5 Ml/d</th><th>Phase 6 Ml/d</th><th>Phase 7 Ml/d</th><th>Total Ml/d</th></tr>
<tr><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>800</td></tr>
<tr><td>150</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td></td><td>750</td></tr>
<tr><td>300</td><td>100</td><td>100</td><td>100</td><td>100</td><td>100</td><td></td><td></td><td>800</td></tr>
</table></td></tr>
<tr><td>Time Lead</td><td>8 Years for Phase 1 elements and 6 Years for subsequent phases.</td></tr>
<tr><td>Mutual Exclusivities</td><td>Phase 1 elements are mutually exclusive with each other.</td></tr>
<tr><td>Interdependencies/ Exclusivity</td><td>Dependent on Kempton WTW New shaft which would be constructed with Phase 1.<br>This WTW would treat new water resources in west London including from:<br>• Abingdon Reservoir(SESRO)<br>• Marsh Gibbon Reservoir<br>• Chinnor Reservoir<br>Severn Thames Transfer – Deerhurst to Culham 300Ml/D, Deerhurst to Culham 400Ml/d, Deerhurst to Culham 500Ml/d).<br>To provide an additional resource to London WRZ the following system elements may also be required:<br>• Raw water system upgrades will be required to convey the raw water to the new WTW<br>• Additional capacity in the Thames Water ring main</td></tr>
</table>



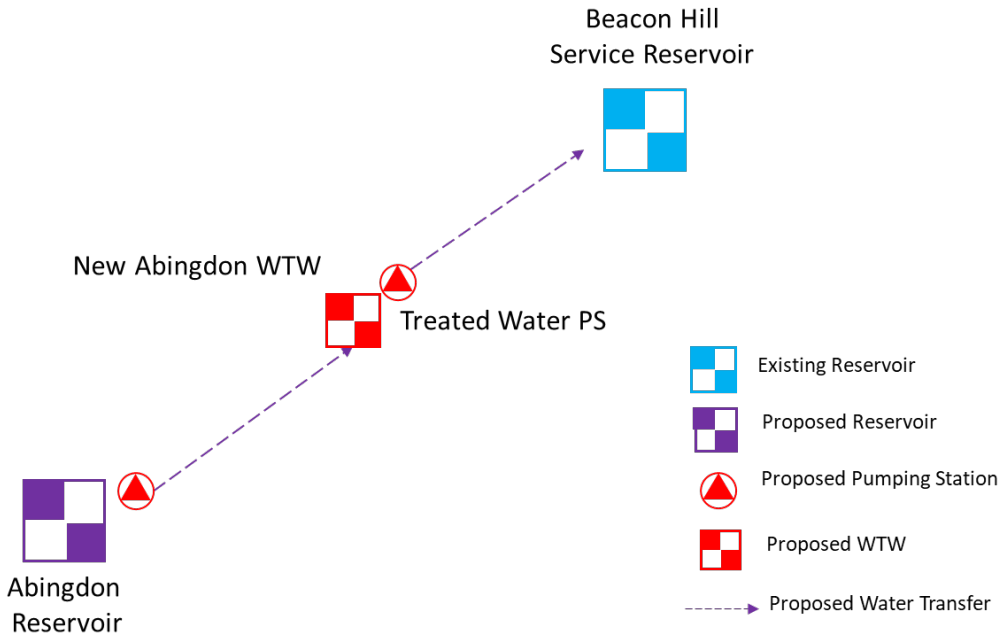
## Medmenham WTW (72 Ml/d)

| Name | Medmenham Water Treatment Works |
|---|---|
| WRSE ID | TWU_SWA_HI-ROC_WT1_XXX_medmenhamwtw |
| WRMP19 Reference | WTW-SWA-MMM |
| Element Type | Water Treatment |
| WRZ | SWA |
| Engineering Scope | Construction of a new WTW, up to 72 Ml/d capacity, near Medmenham to treat water abstracted from the River Thames. |
| Engineering Components | The components for this scope are as follows:<br>• New Water Treatment Works<br>• Interstage pumping station<br>• Treated water pumping station<br>• New Service Reservoir near Widdenton<br>• Treated water pipeline from WTW to new Widdenton Service Reservoir |
| Phases/benefits | Option has a maximum capacity of 72 Ml/d which can be achieved through 3 phases for 24 Ml/d. |
| Lead Time | 5 Years (each phase) |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | Dependent on New Medmenham Intake and raw water pipeline<br>This WTW would treat water abstracted from the River Thames, supported by one or more of the following elements:<br>• Didcot Raw Water Purchase<br>• SESRO<br>• Marsh Gibbon Reservoir<br>• Chinnor Reservoir<br>• Deerhurst to Culham (300Ml/d) pipeline, Deerhurst to Culham (400Ml/d) pipeline or Deerhurst to Culham (500Ml/d) pipeline<br>• Oxford Canal to Cropredy |



## Abingdon WTW new 24 Ml/d (SWOX)

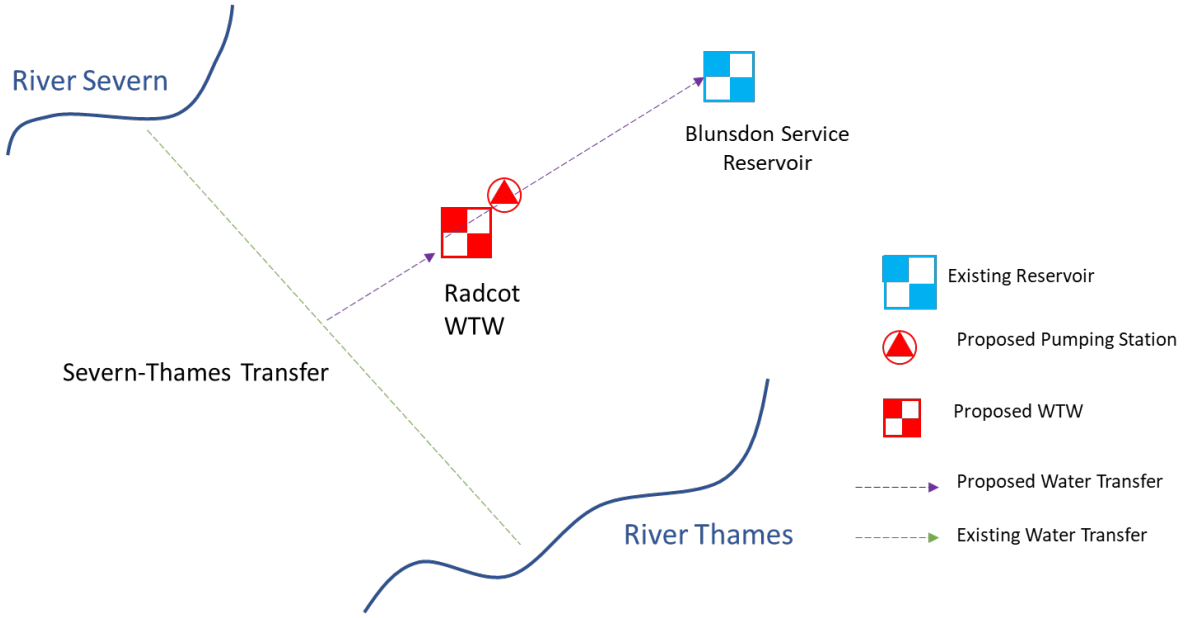
| Name | Abingdon Water Treatment Works |
|---|---|
| WRSE ID | TWU_SWX_HI-ROC_WT1_XXX_abingdon wtw |
| WRMP19 Reference | WTW-SWOX-ABI<br>WTW-SWOX-ABI-SWA |
| Element Type | Water Treatment |
| WRZ | SWOX |
| Engineering Scope | Construction of a WTW with maximum capacity of up to 72 Ml/d adjacent to, and supplied by the new Abingdon reservoir, to supply parts of the SWOX WRZ. The Engineering scope includes the raw water pipeline from the reservoir to the treatment works and the treated water pipeline from the treatment works to Beacon Hill Service Reservoir. |
| Engineering Components | The components for this scope are as follows:<br>• Raw water pipeline from reservoir to water treatment works<br>• Raw water pumping station<br>• New 72Ml/d Water Treatment Works comprising of multiple treatment steps (for more details please refer to the relevant CDR report)<br>• Interstage pumping station<br>• Treated water pumping station<br>• Treated water pipeline from WTW to Beacon Hill Service Reservoir |
| Phases/benefits | Option has a maximum capacity of 72 Ml/d which can be achieved through 3 phases for 24 Ml/d. |
| Time Lead | 5 Years (each phase) |
| Mutual exclusivities | This element is not mutually exclusive with the Radcot WTW (72Ml/d) element as they serve two different options that may both be implemented. If both options were to be implemented including the treatment elements, then consideration would be needed around the timeframe in which the two treatment works would be built and this timeframe would mainly be driven by the SWOX WRZ supply/demand balance. |
| Interdependencies/ Exclusivity | This WTW would treat water from options provided under SESRO to supply the SWOX WRZ. Water can also be supplied to SWA through the SWOX to SWA (48 Ml/d and 72 Ml/d). |




## Radcot WTW (72 Ml/d)

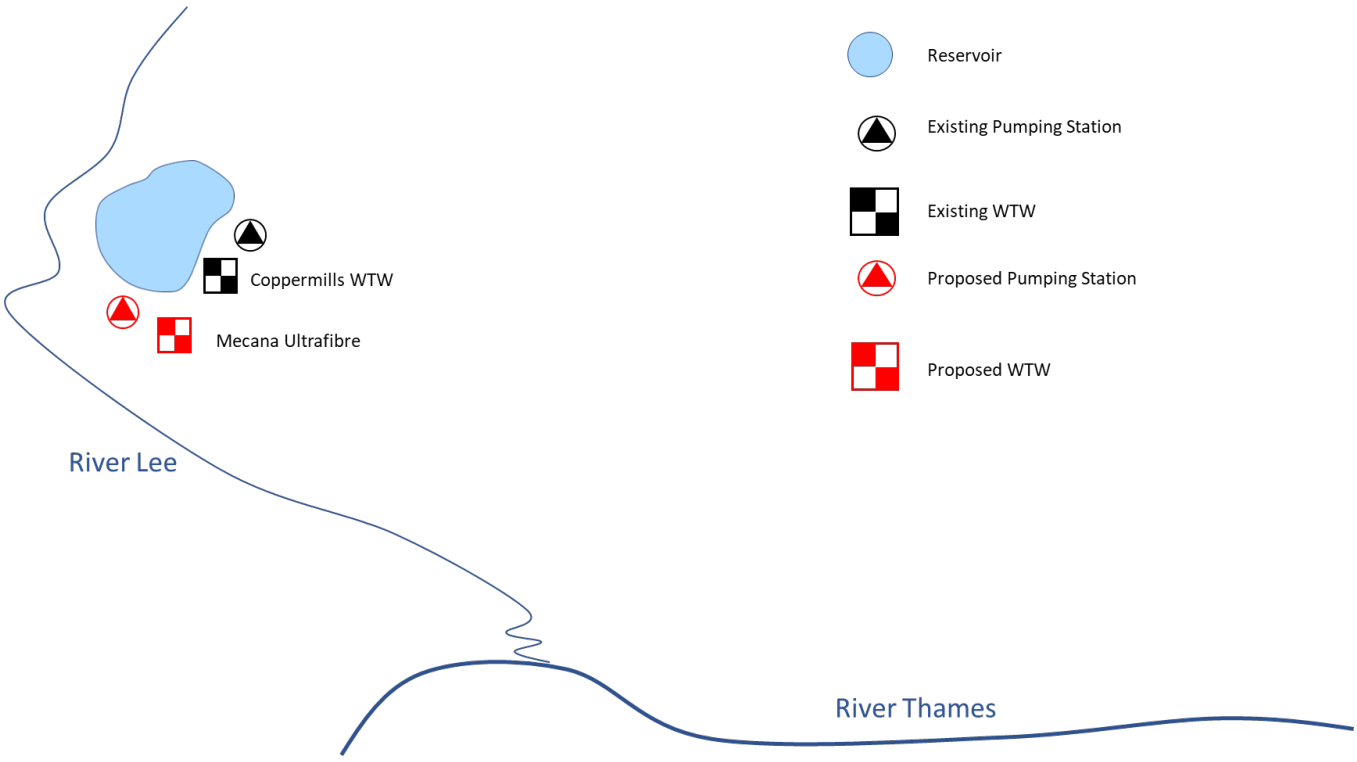
| Name | Radcot Water Treatment Works |
|---|---|
| WRSE ID | TWU_SWX_HI-ROC_WT1_ALL_radcotwtw |
| WRMP19 Reference | WTW-SWOX-RAD |
| Element Type | Water Treatment |
| WRZ | SWOX |
| Engineering Scope | Phased construction of up to 72 Ml/d water treatment works adjacent to the new main Severn Thames Transfer pipeline to supply parts of the SWOX WRZ. The Engineering scope includes the branch pipeline from the STT pipeline to the treatment works and the treated water pipeline from the treatment works to Blunsdon Service Reservoir. |
| Engineering Components | The components for this scope are as follows:<br>• Raw water pipeline from the Deerhurst to Culham pipeline to water treatment works<br>• New Water Treatment Works<br>• Interstage pumping station<br>• Treated water pumping station<br>• Treated water pipeline |
| Phases/benefits | Option has a maximum capacity of 72 Ml/d which can be achieved through 3 phases for 24 Ml/d. |
| Time Lead | 5 years (Each phase) |
| Mutual exclusivities | This element is not mutually exclusive with the Abingdon WTW element as they serve two different options that may both be implemented. If both options were to be implemented including the treatment elements, then consideration would be needed around the timeframe in which the two treatment works would be built and |

| Name | Radcot Water Treatment Works |
|---|---|
| | this timeframe would mainly be driven by the SWOX WRZ supply/demand balance. |
| Interdependencies/ Exclusivity | To supply the SWOX WRZ this WTW would treat water from the Severn Thames Transfer:<br>• Deerhurst to Culham (300Ml/d) pipeline<br>• Deerhurst to Culham (400Ml/d) pipeline<br>• Deerhurst to Culham (500Ml/d) pipeline |



## Coppermills WTW – Mecana Ultrafibre (200 Ml/d, 480 Ml/d or 68 0Ml/d)

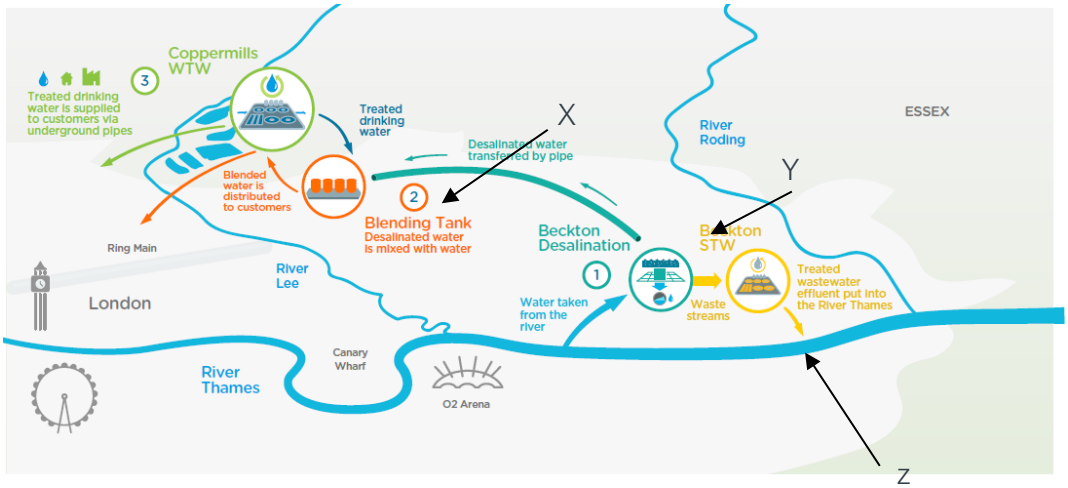
| Name | Coppermills WTW – Mecana Utrafibre (200 Ml/d, 480 Ml/d or 680 Ml/d) |
|---|---|
| WRSE ID | TWU_LON_HI-LRE_WT1_ALL_copperwtwmecana200<br>TWU_LON_HI-LRE_WT1_ALL_copperwtwmecana480<br>TWU_LON_HI-LRE_WT1_ALL_copperwtwmecana680 |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Water Treatment |
| WRZ | LONDON |
| Engineering Scope | Proposing new filtration system using Mecana Ultrafibre on water treatment work for raw water filtration at the existing Coppermills WTW. |
| Engineering Components | • Pipework diversions, shafts and connection tunnels<br>• New Inlet pumping station<br>• Mecana filters<br>• Above ground pipeline to return filtered water, including pipe |
| Benefit | n/a |
| Time Lead | 7 years |
| Mutual exclusivities | Options have been developed for 200 Ml/d, 480 Ml/d and 680 Ml/d and options are mutually exclusive to each other. |
| Interdependencies/ Exclusivity | n/a |



# Network reinforcement

## Desalination Beckton to Coppermills tunnel

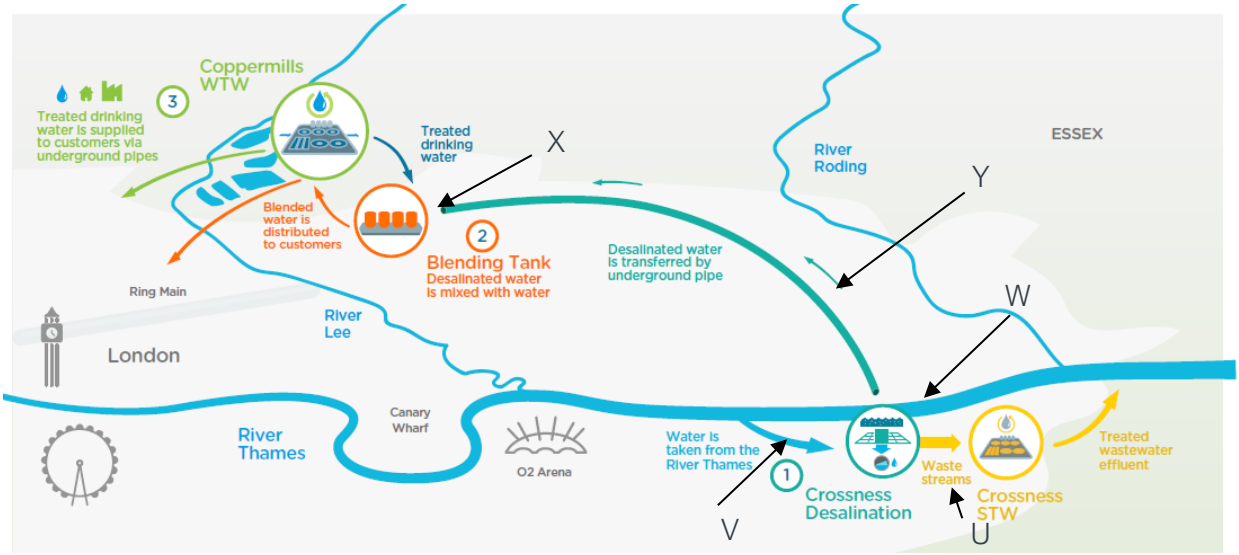
| Name | Desalination – Beckton to Coppermills tunnel |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_LON_XXX_beckton-coppermills |
| WRMP19 Reference | NET-DES-BEC-COP |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | Desalination plants at Beckton and Crossness are included on the Constrained List. The treated desalination water would be conveyed via tunnel from both Beckton and Crossness desalination works to Coppermills WTW for blending and distribution. This tunnel conveyance between Beckton desalination plant and Coppermills WTW has the capacity of over 450 Ml/d (the combined Beckton and Crossness desalination plants output). |
| Engineering Components | The components for this scope are as follows:<br>• The treated water will be conveyed via a tunnel from Beckton STW site to Coppermills site<br>• Six shaft locations<br>• Paths/access for the permanent area for the six shafts |
| Phases/benefits | n/a |
| Lead Time | 11 Years |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | This is the treated water conveyance for Beckton Desalination. Additional blending capacity at Coppermills WTW New Header Tank and Pumping Station at Coppermills WTW).<br>To provide an additional resource to London WRZ the following system elements may also be required:<br>• Capacity to discharge into the local water supply network or into the Thames Water Ring Main |



| | |
|---|---|
| X | New Header Tank and Pumping Station at Coppermills WTW |
| Y | Beckton to Coppermills Tunnel |
| Z | Beckton Desalination |

## Desalination – Crossness to Beckton tunnel

| Name | Desalination – Crossness to Beckton tunnel |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_XXX_crossness-beckton |
| WRMP19 Reference | NET-DES-CRO-BEC |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | A desalination plant at Crossness. The treated desalination water would be conveyed via tunnel from the Crossness plant to the Beckton desalination plant and then via the Beckton to Coppermills tunnel for blending and distribution at Coppermills WTW. |
| Engineering Components | The components for this scope are as follows:<br>• The treated water will be conveyed via a tunnel from the Crossness desalination site to Beckton<br>• Three shaft locations<br>• Paths/access for the permanent area for the three shafts |
| Phases/benefits | n/a |
| Lead Time | 10.5 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | This tunnel combined with Beckton to Crossness tunnel form the treated water conveyance for Crossness Desalination plant. Additional blending capacity at Coppermills WT provided through New Header Tank and Pumping Station at Coppermills WTW.<br>To provide an additional resource to London WRZ the following system elements may also be required:<br>• Capacity to discharge into the local water supply network or into the TWRM |

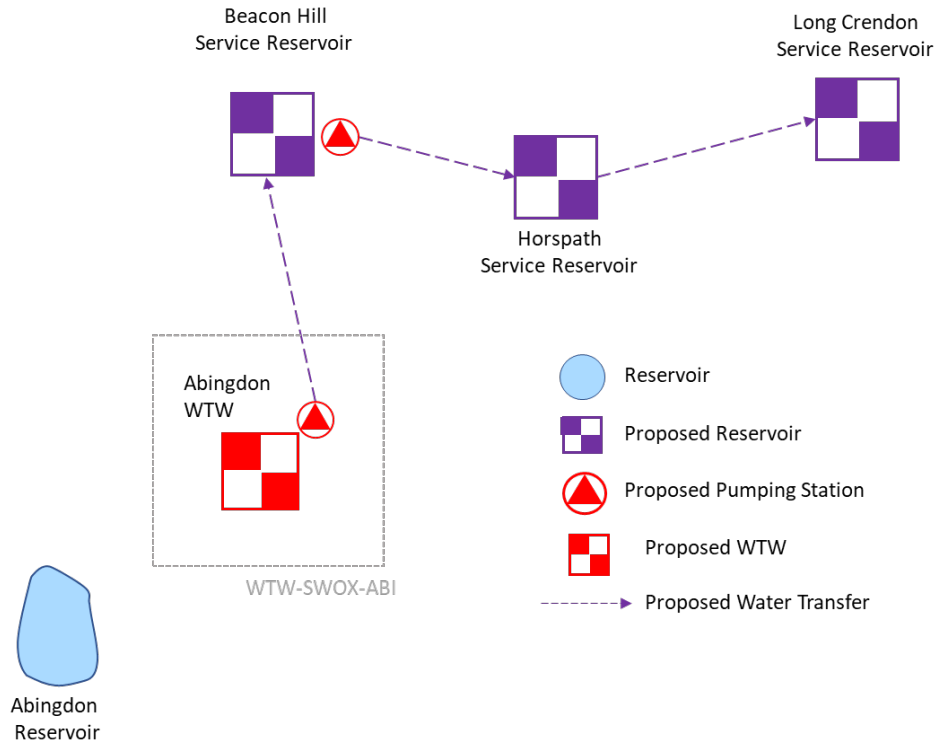



| | |
|---|---|
| X | New Header Tank and Pumping Station at Coppermills WTW |
| Y | Beckton to Coppermills Tunnel |
| Z | Beckton Desalination |
| W | Crossness to Beckton tunnel |
| V | Beckton to Crossness tunnel |
| U | Crossness Desalination |

## SWOX to SWA (48/72) Ml/d

| Name | SWOX to SWA |
|---|---|
| WRSE ID | TWU_SWA_HI-TFR_SWX_ALL_swoxswa72<br>TWU_SWA_HI-TFR_SWX_ALL_swoxswa48 |
| WRMP19 Reference | NET-IZT-AB-LC-72<br>NET-IZT-AB-BS-48 |
| Element Type | Network Reinforcement |
| WRZ | SWA |
| Engineering Scope | The engineering scope includes either a 72 Ml/d or 48 Ml/d treated water pipeline from the new Abingdon WTW first to Beacon Hill, then to Horspath and finally to Long Crendon Service Reservoirs |
| Engineering Components | The components for this scope are as follows:<br>• New treated water pipeline from the new Abingdon WTW to new Beacon Hill Service Reservoir<br>• New treated water pipeline from new Beacon Hill Service Reservoir to new Horspath Service Reservoir<br>• New treated water pipeline from new Horspath Service Reservoir to new Long Crendon Service Reservoir<br>• New treated water pumping station for pumping water from Beacon Hill SR to Horspath SR |

| Name | SWOX to SWA |
|---|---|
| | • A new service reservoir at each of Beacon Hill, Horspath and Long Crendon |
| Phases/benefits | n/a |
| Lead Time | 5 Years |
| Mutual Exclusivities | The 48 Ml/d and 72 Ml/d options are mutually exclusive to each other. |
| Interdependencies/ Exclusivity | This element is interdependent with the Abingdon WTW new 24Ml/d which would treat water from Abingdon Reservoir.[15] |

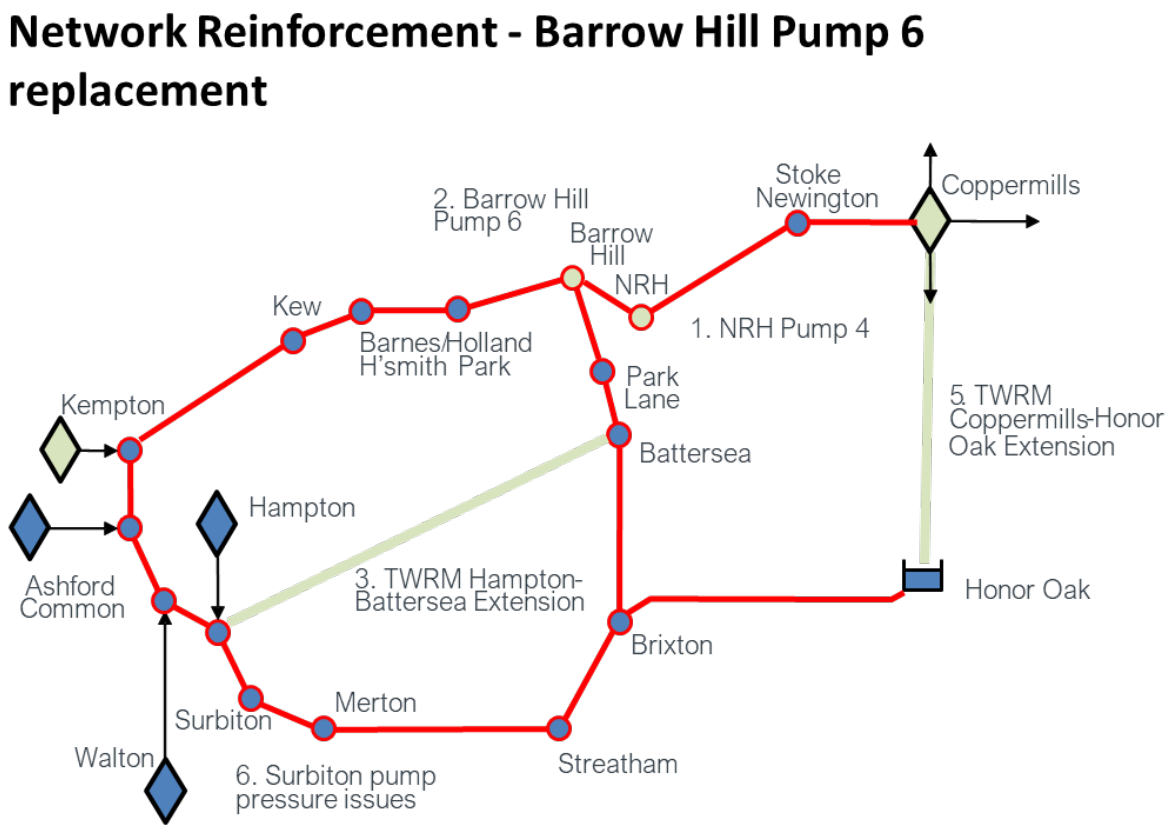



## Network Reinforcement – Barrow Hill Pump 6 replacement

| Name | Network Reinforcement – Barrow Hill Pump 6 replacement |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_ALL_barrowhillpump |
| WRMP19 Reference | NET-TWRM-BAR-PUM |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | Replacement of pump at Barrow Hill Shaft on the Thames Water Ring Main. The element will be required when additional resources from the west and/or east of the London water resource zone (WRZ) are increased reach a trigger value. |

[15] The works could also treat water from the Severn Thames transfer option. In this case a different raw water connection would be needed. There may also be differences in the treatment process.

| Name | Network Reinforcement – Barrow Hill Pump 6 replacement |
|---|---|
| Engineering Components | The components for this scope are as follows:<br>• Replacement of existing pump with a larger pump |
| Phases/benefits | n/a |
| Lead Time | 1 Year |
| Mutual exclusivities | None |
| Interdependencies/ Exclusivity | The network reinforcement is required as new water resources are developed and treated for delivery into the London WRZ to meet demand growth.<br>Additional treated water will be supplied from new WTW at East London and/or Kempton, depending on the resource options developed. |

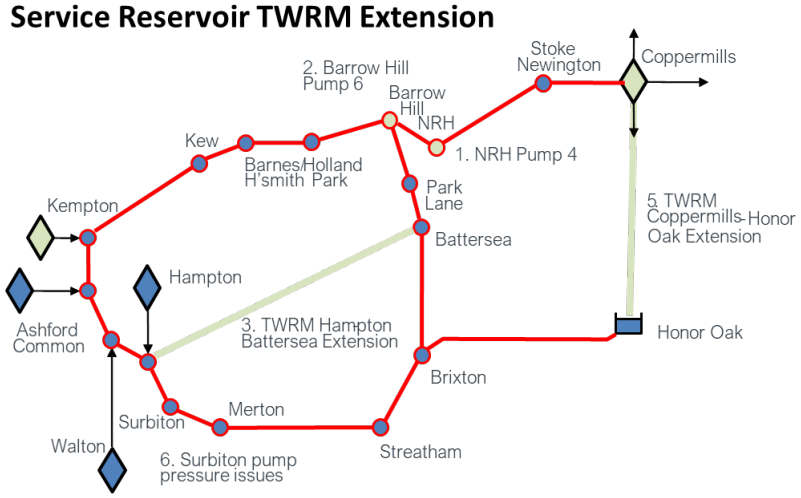



## Coppermills WTW to New Honor Oak Service Reservoir TWRM Extension

| Name | Coppermills WTW to New Honor Oak Service Reservoir TWRM Extension |
|---|---|
| WRSE ID | TWU_HON_HI-ROC_NET_XXX_cop'mills-honoroak |
| WRMP19 Reference | NET-TWRM-COP-HON |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | Thames Ring Main extension tunnel connecting existing shafts at Coppermills and Honor Oak. |

| Name | Coppermills WTW to New Honor Oak Service Reservoir TWRM Extension |
|---|---|
| | The Coppermills to Honor Oak TWRM extension will be required when additional resources from the west and/or east of the London water resource zone (WRZ) are increased reach a trigger value. |
| Engineering Components | The components for this scope are as follows:<br>• New Tunnel from Coppermills to Honor Oak<br>• 2 No drive shafts<br>• 5 No intermediate shafts<br>• Tunnel connections to existing TW Ring Main at Coppermills and Honor Oak<br>• High Integrity Gate Valves (2 per intermediate shaft) |
| Phases/benefits | n/a |
| Lead Time | 8 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | The network reinforcement is required as new water resources are developed and treated for delivery into the London WRZ to meet demand growth.<br>Additional treated water will be supplied from new WTW at East London and/or Kempton, depending on the resource options developed. |

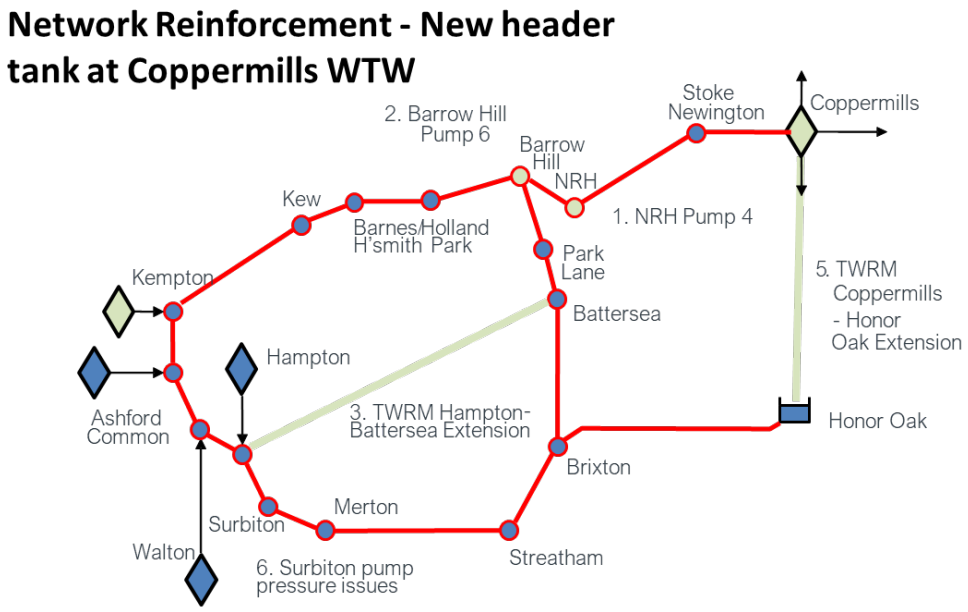
**Coppermills WTW to New Honor Oak Service Reservoir TWRM Extension**




## Network Reinforcement New Header tank and Pumping Station at Coppermills WTW

| Name | Network Reinforcement – New header tank at Coppermills WTW |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_ALL_twrm ht-coppermills |
| WRMP19 Reference | NET-TWRM-COP-HEA<br>NET-TWRM-COP-PS |
| Element Type | Network Reinforcement |
| WRZ | LONDON |

| Name | Network Reinforcement – New header tank at Coppermills WTW |
|---|---|
| Engineering Scope | The element will be required when additional resources from the west and/or east of the London water resource zone (WRZ) are increased reach a trigger value and/or when desalination options are developed. New low lift pump station to pump treated water from the existing Coppermills WTW contact tanks to the new blending/header tank and new header tank at Coppermills WTW to control the water levels in the Thames Water Ring Main. |
| Engineering Components | The components for this scope are as follows:<br>• New header tank<br>• New pumping station |
| Phases/benefits | n/a |
| Lead Time | 5 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | The network reinforcement is required as new water resources are developed and treated for delivery into the London WRZ to meet demand growth.<br>Additional treated water will be supplied from new WTW at East London and/or Kempton, depending on the resource options developed. |

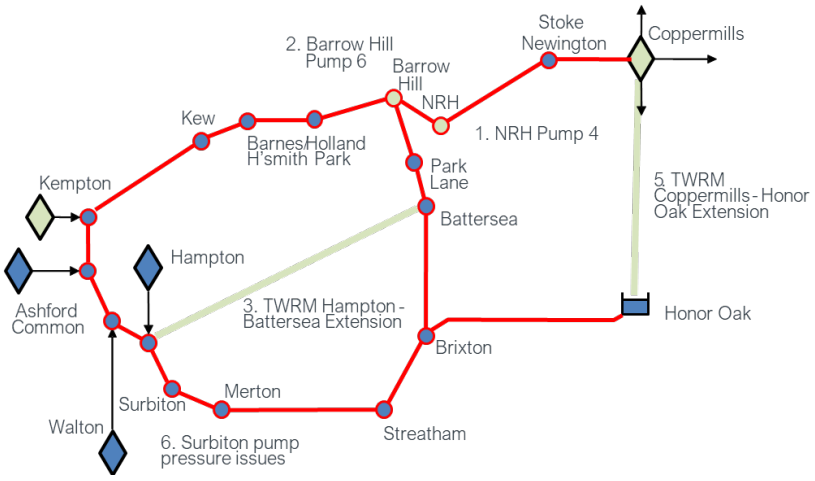



## Hampton WTW to Battersea Extension

| Name | Hampton WTW to Battersea Extension |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_XXX_hampton-battersea |
| WRMP19 Reference | NET-TWRM-HAM-BAT |
| Element Type | Network Reinforcement |
| WRZ | LONDON |

| Name | Hampton WTW to Battersea Extension |
|---|---|
| Engineering Scope | Thames Ring Main extension tunnel joining existing shafts at Hampton WTW and Battersea.<br>The Hampton Battersea TWRM extension will be required when additional resources from the west and/or east of the London water resource zone (WRZ) are increased reach a trigger value. |
| Engineering Components | The components for this scope are as follows:<br>• New Tunnel from Hampton to Battersea<br>• 2 No drive shafts<br>• 8 No intermediate shafts<br>• Tunnel connections to existing TW Ring Main at Hampton and Battersea<br>• High Integrity Gate Valves |
| Phases/benefits | n/a |
| Lead Time | 9 Years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | The network reinforcement is required as new water resources are developed and treated for delivery into the London WRZ to meet demand growth.<br>Additional treated water will be supplied from new WTW at Coppermills and/or Kempton, depending on the resource options developed. |

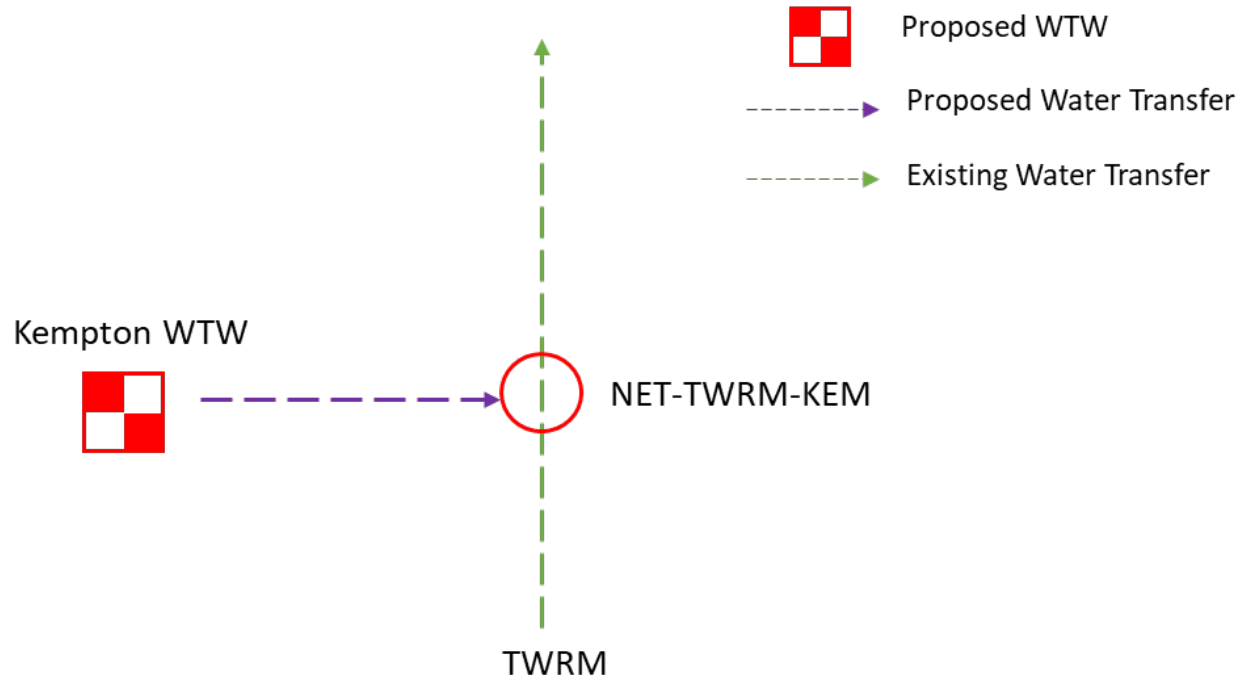
**Hampton WTW to Battersea Extension**




## Network Reinforcement – Kempton WTW New shaft

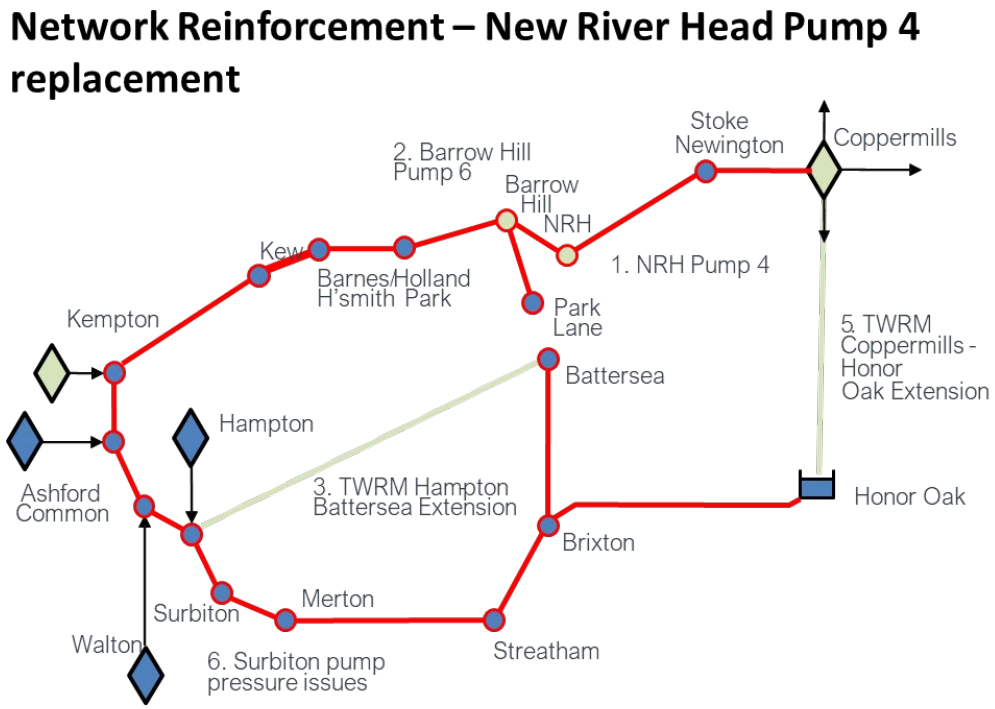
| Name | Network Reinforcement – Kempton WTW New shaft |
|---|---|
| WRSE ID | TWU_WLJ_HI-ROC_NET_XXX_twrm shaft kempton |
| WRMP19 Reference | NET-TWRM-KEM |
| Element Type | Network Reinforcement |
| WRZ | LONDON |

| Name | Network Reinforcement – Kempton WTW New shaft |
|---|---|
| Engineering Scope | New shaft on the Thames Water Ring Main to accommodate up to 800 Ml/d of treated water flow from the expanded Kempton WTW expansion (800Ml/d). |
| Engineering Components | The components for this scope are as follows:<br>• New shaft on TWRM shaft |
| Phases/benefits | n/a |
| Lead Time | 7 Years |
| Mutual exclusivities | No other options on the constrained list are mutually exclusive with this option. |
| Interdependencies/ Exclusivity | This element is interdependent with the new WTW at Kempton (Kempton WTW expansion) and will be required at the time that the first additional treatment at Kempton is provided. |



## Network Reinforcement – New River Head Pump 4 replacement

| Name | Network Reinforcement – New River Head Pump 4 replacement |
|---|---|
| WRSE ID | TWU_LON_HI-TFR_LON_ALL_newriverhead pump 4 |
| WRMP19 Reference | NET-TWRM-NRV-PUM |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | Replacement of a pump at the New River Head Shaft on the Thames Water Ring Main with a larger and a suitable pump.<br>The element will be required when additional resources from the west and/or east of the London water resource zone (WRZ) are increased reach a trigger value. |
| Engineering Components | The components for this scope are as follows:<br>• Replacement of the old pump with a larger pump. |
| Phases/benefits | n/a |
| Lead Time | 5 years |
| Mutual Exclusivities | None |
| Interdependencies/ Exclusivity | The network reinforcement is required as new water resources are developed and treated for delivery into the London WRZ to meet demand growth.<br>Additional treated water will be supplied from new WTW at East London and/or Kempton, depending on the resource options developed. |



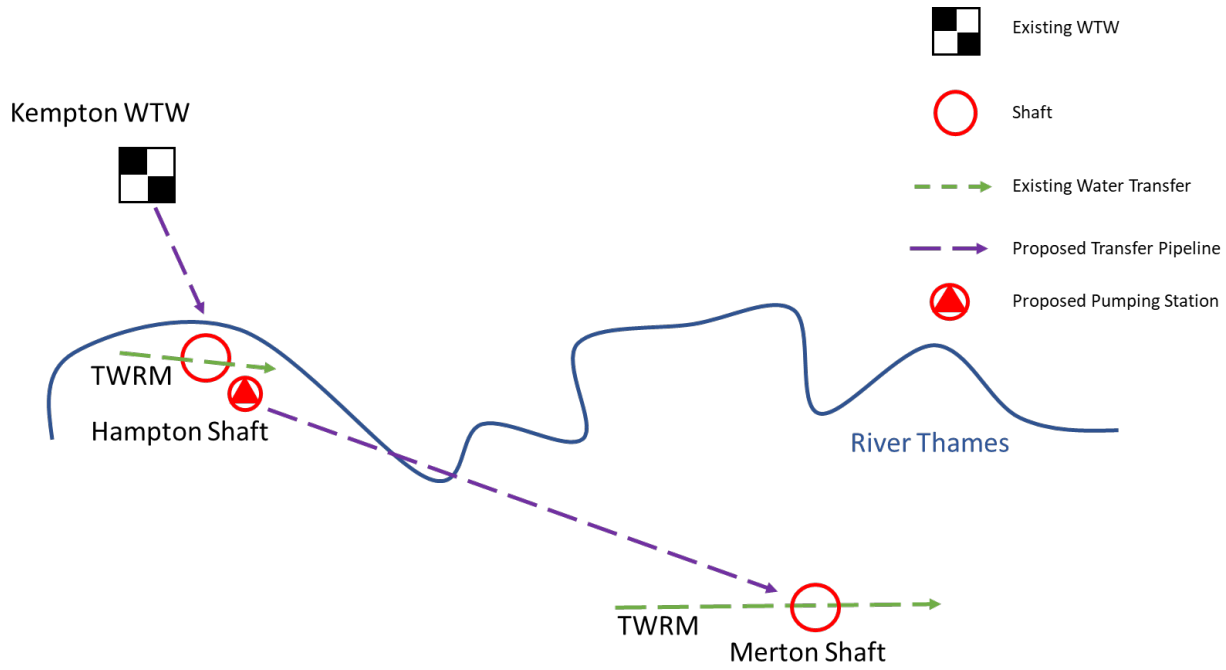
## Merton TWRM Shaft to Hampton 36 Flow Monitoring Zone (FMZ)

| Name | Merton TWRM Shaft to Hampton 36 FMZ |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_ALL_merton-hampton |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | New pipeline from Merton Thames Water Ring Main (TWRM) Shaft to Hampton 36 Flow Monitoring Zone. |
| Engineering Components | • New main from Merton Shaft to Hampton 36 FMZ<br>• 3 No railway crossing |
| Benefit | n/a |
| Time Lead | 7 years |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | Dependent on Kempton WTW to Merton TWRM Shaft. |


## Kempton WTW to Merton TWRM Shaft

| Name | Kempton WTW to Merton TWRM Shaft |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_ALL_kemptonwtw-merton |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | New pipeline from Kempton Water Treatment Works (WTWs) to a discharge location at Merton Thames Water Ring Main (TWRM) Shaft. |
| Engineering Components | • New main from Kempton WTWs to Hampton TWRM Shaft |

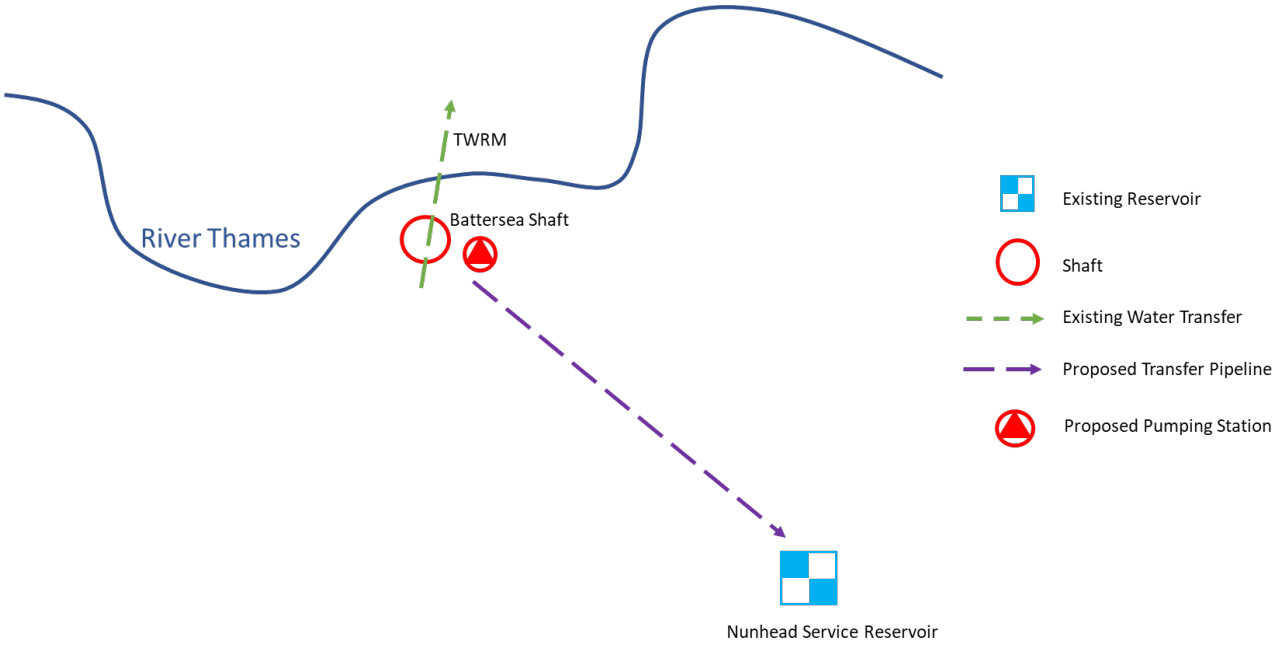
| Name | Kempton WTW to Merton TWRM Shaft |
|---|---|
| | • New main from Hampton Shaft to Merton TWRM Shaft<br>• One major road crossing, two rail and two river crossings<br>• New Shaft to house Pumping Station (PS) and facilitate connecting new main to TWRM Hampton shaft<br>• New pumping station in the vicinity of Hampton WTW<br>• Power supply, standby generator and transformer for pumping station |
| Benefit | n/a |
| Time Lead | 10 years |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |




## Battersea TWRM Shaft to Nunhead Service Reservoir

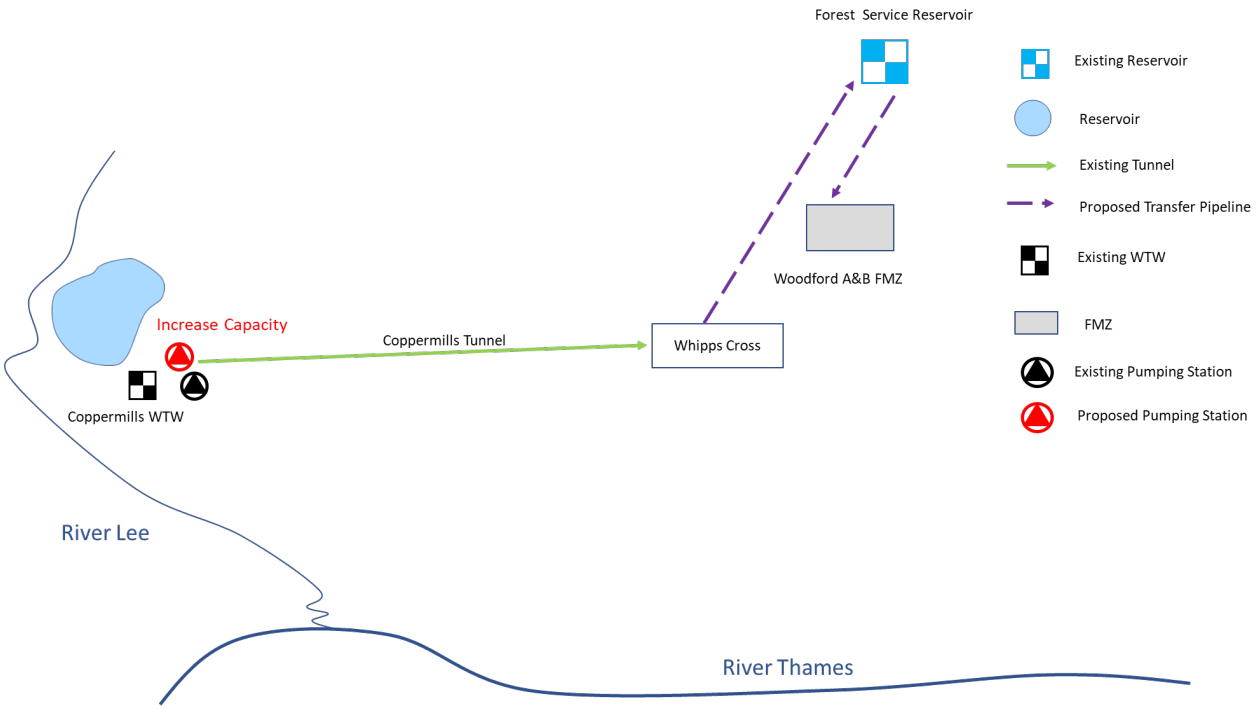
| Name | Battersea Shaft to Nunhead Service Reservoir |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_ALL_battersea-nunhead |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | New pipeline to convey drinking water from Battersea TWRM Shaft to a discharge location at Nunhead Service Reservoir (SR). |
| Engineering Components | • New main from Battersea TWRM Shaft to Nunhead SR<br>• Four major road crossings<br>• New pumping station at Battersea Shaft |

| Name | Battersea Shaft to Nunhead Service Reservoir |
|---|---|
| | • Power supply, standby generator and transformer for pumping station |
| Benefit | n/a |
| Time Lead | 7 years |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |



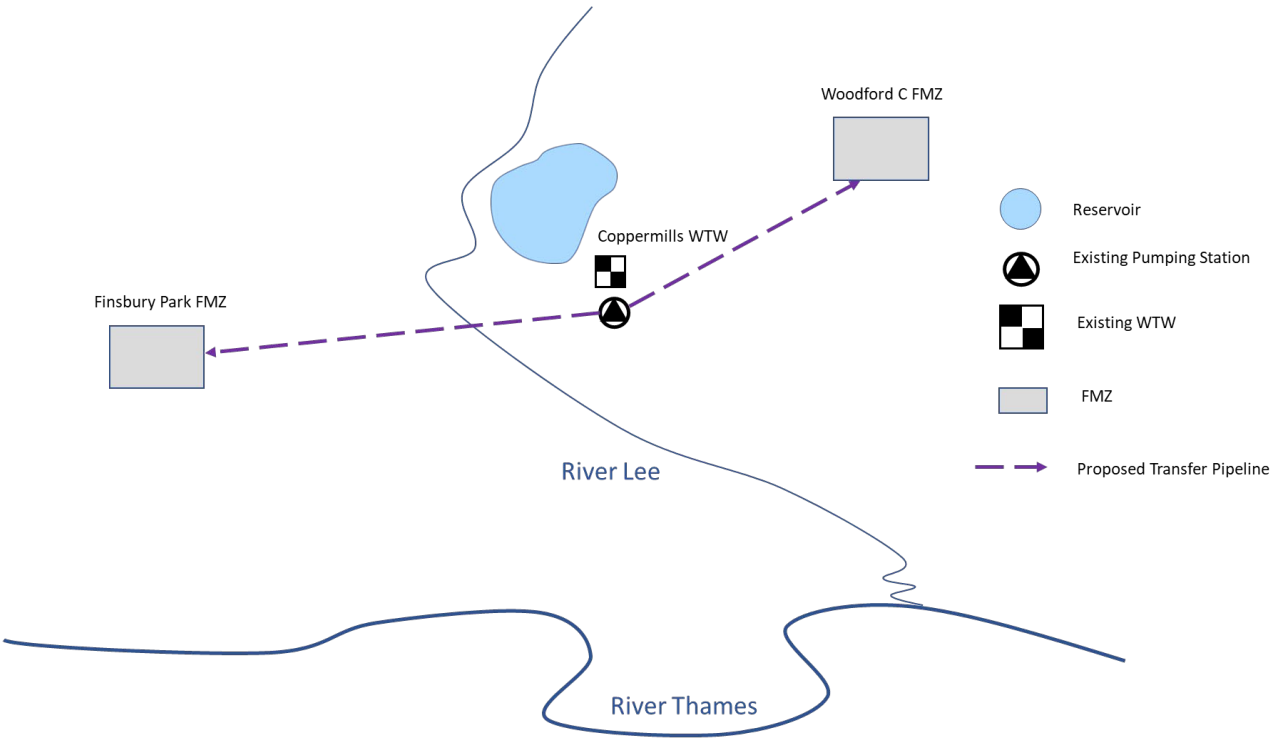
## Coppermills 70" Tunnel to Woodford FMZ

| Name | Coppermills 70" Tunnel to Woodford FMZ |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_ALL_copperwtw-woodford |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | Enhanced pumps and pipeline(s) to convey drinking water from Coppermills WTW to a discharge location at Woodford (Forest) Service Reservoir (SR), then onto Woodford A&B FMZ.<br><br>Upgrade of the existing Coppermills WTW pumps to provide an additional 100 Ml/d from Coppermills to Woodford A&B FMZ. |
| Engineering Components | • New main from Whipps Cross to Forest SR<br>• New main from Forest SR to Woodford A&B FMZ<br>• Upgrade of existing pumping station at Coppermills WTW<br>• Power supply, standby generator and transformer for Coppermills PS |
| Benefit | n/a |
| Time Lead | 7 years |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |



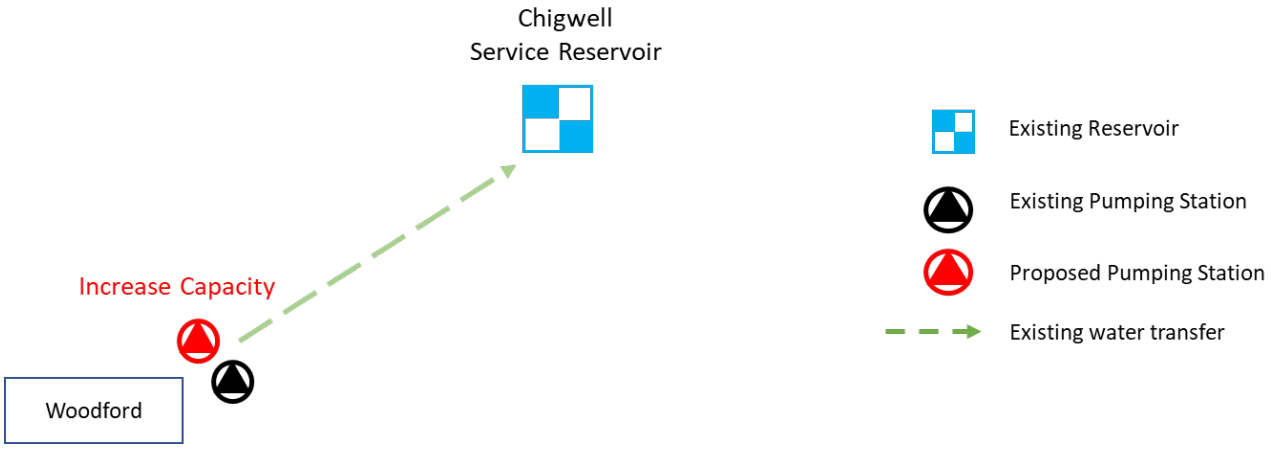
## Coppermills WTW to Finsbury Park and Woodford C FMZs

| Name | Coppermills WTW to Finsbury Park and Woodford C FMZ |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_ALL_coppertofinsparkfmz |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | New pipelines to convey drinking water from Coppermills WTW to Finsbury Park and Woodford C FMZs. |
| Engineering Components | • New main from Coppermills WTW to Finsbury Park FMZ<br>• New main from Coppermills WTW to Woodford FMZ |
| Benefit | n/a |
| Time Lead | 7 years |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |

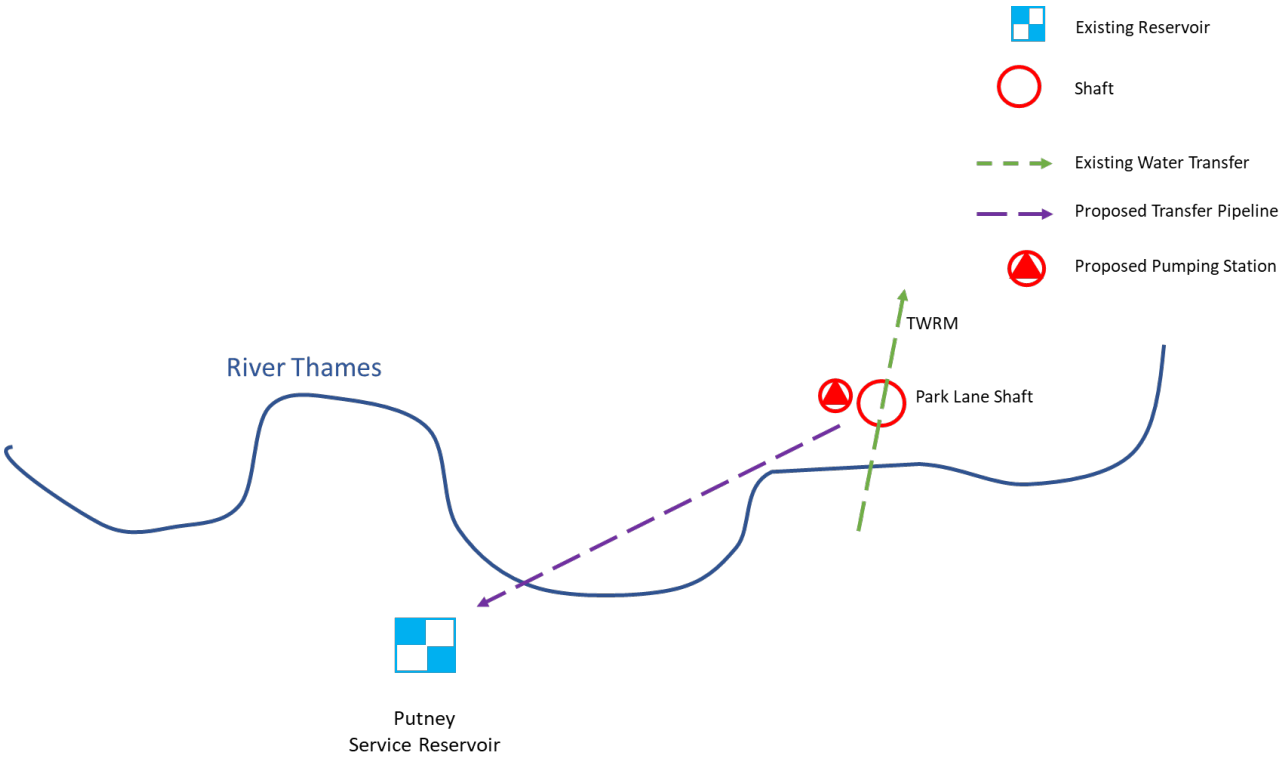


## Woodford PS to Chigwell Service Reservoir

| Name | Woodford PS to Chigwell Service Reservoir |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_ALL_woodford-chigwell |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | Enhanced pumps and pipeline(s) to convey drinking water from Woodford (Forest) PS to Chigwell SR. |
| Engineering Components | • New main from Woodford (Forest) PS to Chigwell SR<br>• Upgrade of existing pumping station at Woodford<br>• Power supply, standby generator and transformer for Woodford PS |
| Benefit | n/a |
| Time Lead | 7 years |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |

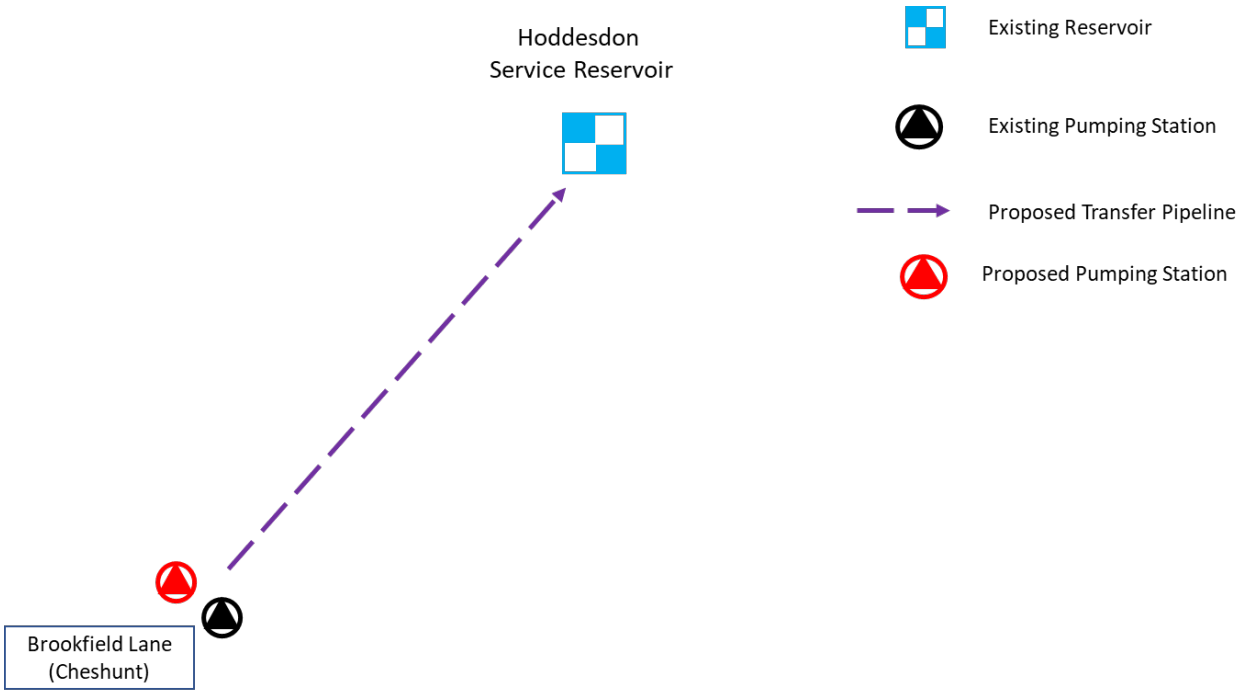


| Name | Park Lane TWRM Shaft to Putney Service Reservoir |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_ALL_parklanetoputneyps |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | Enhanced pumps and pipeline(s) to convey drinking water from Park Lane TWRM Shaft to Putney SR. |
| Engineering Components | • New main from Woodford PS to Chigwell SR<br>• Three major road crossing, three rail, one river (Thames)<br>• New Shaft to house Pumping Station (PS) and facilitate connecting New pumping station at Park Lane<br>• Power supply, standby generator and transformer for Park Lane PS |
| Benefit | n/a |
| Time Lead | 7 years |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |



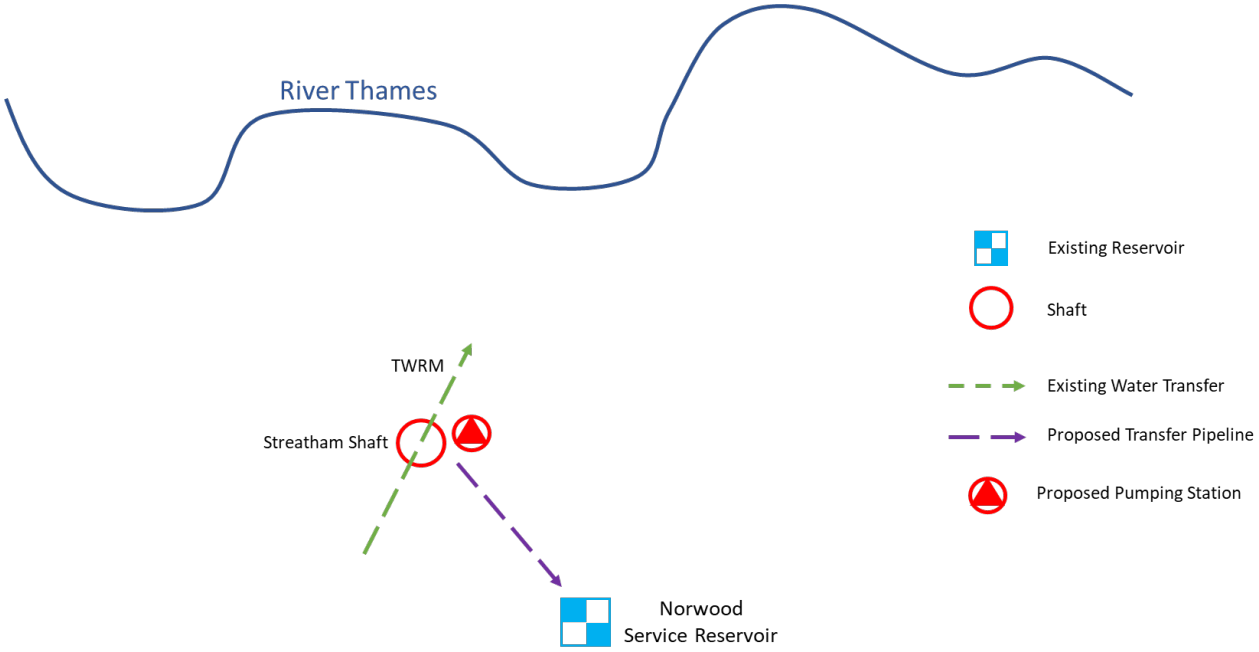

## Brookfield Lane (Cheshunt) PS to Hoddesdon Service Reservoir

| Name | Brookfield Lane (Cheshunt) PS to Hoddesdon Service Reservoir |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_ALL_brookps-hoddeson |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | Enhanced pumps and pipeline(s) to convey drinking water from Brookfield Lane (Cheshunt) PS to Hoddesdon SR. |
| Engineering Components | • New main from Brookfield Lane PS to Hoddesdon SR<br>• One major road crossing<br>• New pumping station and standby generator at Brookfield Lane PS<br>• Power supply and transformer for Brookfield Lane PS |
| Benefit | n/a |
| Time Lead | 7 years |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |


Hoddesdon
Service Reservoir
Existing Reservoir
Existing Pumping Station
Proposed Transfer Pipeline
Proposed Pumping Station
Brookfield Lane
(Cheshunt)

## Streatham TWRM Shaft to Norwood Service Reservoir

| Name | Streatham TWRM Shaft to Norwood Service Reservoir |
|---|---|
| WRSE ID | TWU_LON_HI-ROC_NET_ALL_streathamtonorwood |
| WRMP19 Reference | New option to WRMP24 |
| Element Type | Network Reinforcement |
| WRZ | LONDON |
| Engineering Scope | Enhanced pumps and pipeline(s) to convey drinking water from Streatham TWRM Shaft to Norwood SR. |
| Engineering Components | • New main from Streatham TWRM Shaft to Norwood SR<br>• One major road crossing, one rail<br>• New Shaft to house Pumping Station (PS) and facilitate connecting new pumping station at Streatham to TWRM<br>• Power supply, standby generator and transformer for Streatham PS |
| Benefit | n/a |
| Time Lead | 7 years |
| Mutual exclusivities | n/a |
| Interdependencies/ Exclusivity | n/a |




## Demand options: Scheme dossiers

R.22 This section provides the demand options dossiers for options included in the WRSE investment modelling.

R.23 These options were included in the optimisation stage, which resulted in development of demand reduction programmes; this is further described in Section 8 of our dWRMP24, Creating Demand Reduction Programmes.

### Metering – Progressive Metering Programme (PMP)

| Name | Progressive Metering Programme (PMP) |
|---|---|
| WRZ | All WRZs |
| Option Scope | PMP is a compulsory programme of proactive meter installation for unmeasured household customers (customers who do not currently have a water meter).<br>The PMP seeks to install a digital smart meter, which is either:<br>• Advanced Metering Infrastructure (AMI): commonly referred to as a 'smart meter', which sends readings automatically using a secure wireless network when Local Communication Equipment (LCE) and Wide Area Network (WAN) systems are available<br>• An Automatic Meter Reading (AMR): these meters are equipped with a short-range radio that communicates with a meter reading device, enabling a 'walk by' or 'drive by' reading. Referred to as 'smart enabled', they have the capability to be switched into AMI mode when LCE and a WAN are available<br>When a new smart meter is installed it will either be installed:<br>• Externally - a meter is fitted in the pavement at the stop tap position. This has the benefit that the meter will record |

| Name | Progressive Metering Programme (PMP) |
|---|---|
| | leakage on the customer's supply pipe aiding quicker pipe repair and the meters are easier to install<br>• Where there is an existing sufficient sized standard boundary box a screw in meter can be installed<br>• Where there is not a suitable boundary box, one must be excavated<br>• Internally - a meter is fitted at the first stop tap inside the property. This location is used if the property does not have an individual supply pipe |
| Technical application | Households – all property types including detached, semi-detached and terraced houses and individual dwellings in Mini Bulk (small blocks of flats) and Bulk (large blocks of flats) properties. |
| Benefit | Reduction in per capita consumption (PCC) through:<br>• Behavioural use change. Previously unmetered customers change water use behaviour after a meter is installed<br>• Wastage reduction. Metering a previously unmeasured property makes it easier to identify any internal wastage (e.g. leaking toilets or taps |
| Option Programme | The meter installation programme will be completed by 2025 (end of AMP8). There will be ongoing maintenance through AMP9 and AMP10 to sustain the level of demand reduction. |
| Constraints | Meter installation is generally constrained by the location of the meter and the feasibility of installing one.<br>• Location of meter. The ratio of external/internal meter locations varies by property type. Internal meters will usually be installed where a property does not have an individual supply, e.g. dwellings in blocks of flats<br>• Survey to fit ratio. Prior to meter any meter installation a survey is required to ascertain the most appropriate meter type and location for a property. It is not possible to install meters at all properties for variety of technical, economic and safety reasons |

## Metering – Progressive Smart Upgrade Programme Household (HH PSUP)

| Name | Progressive Smart Upgrade Programme Household (HH PSUP) |
|---|---|
| WRZ | All WRZs |
| Option Scope | The Progressive Smart Upgrade Programme Household (HH PSUP) is a proactive replacement/upgrade from basic meters to smart meters to reduce the total number of basic meters in the Thames Water area (basic meters are meters which require physical access and visual recording of the reading).<br>The basic meters are replaced with smart (AMI) technology meters.<br>When a new smart meter is installed, it will either be installed:<br>• Externally - a meter is fitted in the pavement at the stop tap position. This has the benefit that the meter will record |

| Name | Progressive Smart Upgrade Programme Household (HH PSUP) |
|---|---|
| | leakage on the customer's supply pipe aiding quicker pipe repair and the meters are easier to instal<br>• Where there is an existing sufficient sized standard boundary box a screw in meter can be installed<br>• Where there is not a suitable boundary box, one must be excavated<br>• Internally - a meter is fitted at the first stop tap inside the property. This location is used if the property does not have an individual supply pipe |
| Technical application | Households – all property types which contain a basic meter including detached, semi-detached and terraced houses and individual dwellings in Mini Bulk (small blocks of flats) and Bulk (large blocks of flats) properties. |
| Benefit | Leakage reduction through reduced Customer Side Leakage (CSL) reduction. This only applies to externally fitted meters. An externally fitted meter can identify leakage of the supply pipe within a customer's property boundary. |
| Option Programme | The meter upgrade programme will be completed by 2030 (end of AMP9). There will be ongoing operational activity through AMP10 to sustain the level of demand reduction. |
| Constraints | The number of basic meters which can be upgraded is dependent on:<br>• The number of existing basic meters and their location, broken down into internal and external meters<br>The year of reaching the end of their useful life for basic meters grouped into two categories:<br>• Due in AMP8. Includes both meters that will expire within AMP8 and those which have already expired such as basic meters that were installed more than 10 – 15 years ago<br>• Due in AMP9 to 10<br>• Survey to fit ratio. The number of properties which are likely to have a successful exchange from a basic to AMI meter<br>• The assumed progress of the HH PSUP meter installations |

## Metering – Bulk Metered Area (BMA)

| Name | Bulk Metered Area (BMA) |
|---|---|
| WRZ | All WRZs |
| Option Scope | Bulk Metered Area (BMA) may include a mix of household and non-household customers and:<br>• Feeds 25 or more properties<br>• Can supply multiple buildings<br>• Can have multiple supplies to the BMA<br>• Involves longer and/or more complex pipework (>20m of pipe in London, >50m of pipe in Thames Valley)<br>• Can include metered and unmeasured properties within the BMA |

| Name | Bulk Metered Area (BMA) |
|---|---|
| | The meter fitted to a Bulk Metered Area (BMA) is non-revenue which means it will measure the water supplied but will not be used for billing. Individual premises within a BMA may have individual meters on which they are billed.<br>A Bulk Metered Area (BMA) cannot be created if supplies into the area are already metered with meters used for billing or if the area is fed from more than one District Meter Area (DMA). |
| Technical application | Bulks – 25 or more properties within multiple buildings and multiple sources. Includes metered, unmeasured, household and non-household. |
| Benefit | Leakage reduction through reduced Customer Side Leakage (CSL). |
| Option Programme | The meter installation programme will be completed by the end of AMP9. There will be ongoing operational activity through AMP10 to sustain the level of demand reduction. |
| Constraints | Bulk meter installation is constrained by the technical limitations of installing such meters. |

## Metering – Mini Bulk Metered Area (mBMA)

| Name | Mini Bulk Metered Area (mBMA) |
|---|---|
| WRZ | All WRZs |
| Option Scope | Mini Bulk Metered Area (mBMA) includes a mix of household and non-household customers (particularly sites with flats over a business premises) and;<br>• Feeds up to 25 properties<br>• Supplies one building only<br>• Has a single supply to the mBMA only<br>• Has simple pipe work feeding multiple dwellings in one building (<20m of pipe in London, <50m of pipe in Thames Valley)<br>Can include metered and unmeasured properties within the mBMA.<br>The meter fitted to a mBMA is non-revenue which means it will measure the water supplied but will not be used for billing. Individual premises within a mBMA may have individual meters on which they are billed.<br>A mBMA cannot be created if supplies into the area are already metered with meters used for billing or if the area is fed from more than one DMA. |
| Technical application | Mini Bulks – a single building with up to 25 properties within, with only a single supply to the mBMA. This includes metered, unmeasured household and non-household properties. |
| Benefit | Leakage reduction through reduced Customer Side Leakage (CSL). |
| Option Programme | The meter installation programme is ongoing through AMP8, AMP9 and AMP10. |

| Name | Mini Bulk Metered Area (mBMA) |
|---|---|
| Constraints | Mini Bulk meter installation is constrained by the technical limitations of installing such meters. |

## Metering – Progressive Smart Upgrade Programme Non-Household (NHH PSUP)

| Name | Progressive Smart Upgrade Programme Non-Household (NHH PSUP) |
|---|---|
| WRZ | All WRZs |
| Option Scope | Proactive programme to upgrade basic meters with smart or AMI technology meters.<br>Where the Wide Area Network (WAN) is unavailable for non-household properties, an AMI meter shall be fitted. |
| Technical application | Non-household properties |
| Benefit | Non Household Consumption (NHH Consumption) reduction and Customer Side Leakage (CSL) reduction. |
| Option Programme | The meter upgrade programme will be completed by the end of AMP9. There will be ongoing operational activity through AMP10 to sustain the level of demand reduction. |
| Constraints | Age of meter. Less than 14 years old, 71.58% are basic and should be upgraded. 100% of meters older than 14 years, both internal and external, will be upgraded in AMP8.<br>Location of external meters. It is assumed 10% will require digs to install. |

## Metering – Metering Innovation – PMP

| Name | Metering Innovation – PMP |
|---|---|
| WRZ | All WRZs |
| Option Scope | Metering Innovation has two workstreams; Metering Innovation - PMP for properties that have not been metered following PMP and Metering Innovation - PSUP for properties that have not been metered following PSUP.<br>Meter installations are constrained in two areas:<br>• No Access: properties where the customer is not available or will not provide permission for access to install a meter (either internally or externally)<br>• Unmeterable: properties where it is impractical, too expensive or a health and safety risk to provide an installation<br>Metering Innovation will reduce the number of No Access and Unmeterable properties in the TW area by:<br>• No Access: Metering properties when customers vacate or move into a property<br>• Extend access to customer support for making meter installation appointments |

| Name | Metering Innovation – PMP |
|---|---|
| | • Extend operating hours to customers for meter installation appointments i.e., evenings and weekends<br>• Cover a portion of costs of reinstatement works where external meter impacts a customer drive or garden<br>• Investigate use of higher tariff for 'no access' customers<br>Unmeterable Innovation:<br>• Use innovative and emerging technologies, such as smaller meters<br>• Seek funding from regulators to increase limit for meter installs deemed to be expensive |
| Technical application | Households – all property types which contain a basic meter including detached, semi-detached and terraced houses and individual dwellings in Mini Bulk (small blocks of flats) and Bulk (large blocks of flats) properties. |
| Benefit | Reduction in per capita consumption (PCC) through:<br>• Behavioural use change. Previously unmetered customers change water use behaviour after a meter is installed<br>• Wastage reduction. Metering a previously unmeasured property makes it easier to identify any internal wastage (e.g. leaking toilets or taps)<br>Leakage reduction through reduced Customer Side Leakage (CSL). This only applies to externally fitted meters. An externally fitted meter can identify leakage of the supply pipe within a customer's property boundary. |
| Option Programme | The programme is ongoing through AMP8, AMP9 and AMP10. |
| Constraints | The number of total properties, which cannot be metered under the PMP programme, which are either unmeterable due to technical/safety constraints or no access which can be successfully metered under the Metering Innovation - PMP programme. |

## Metering – Metering Innovation – PSUP

| Name | Metering Innovation – PSUP |
|---|---|
| WRZ | All WRZs |
| Option Scope | Metering Innovation has two workstreams; Metering Innovation - PMP for properties that have not been metered following PMP and Metering Innovation - PSUP for properties that have not been metered following PSUP.<br>Meter installations are constrained in two areas:<br>• No Access: properties where the customer is not available or will not provide permission for access to install a meter (either internally or externally)<br>• Unmeterable: properties where it is impractical, too expensive or a health and safety risk to provide an installation for upgrading a meter |

| Name | Metering Innovation – PSUP |
|---|---|
| | Metering Innovation will reduce the number of No Access and unmeterable properties in the TW area by:<br>No Access:<br>• Metering properties when customers vacate or move into a property<br>• Extend access to customers for making meter installation appointments<br>• Extend operating hours to customers for meter installation appointments i.e. evenings and weekends<br>• Cover a portion of costs of reinstatement works where external meter impacts a customer drive or garden<br>• Investigate use of higher tariff for 'no access' customers<br>Unmeterable Innovation:<br>• Use innovative and emerging technologies, such as smaller meters<br>• Seek funding from regulators to increase limit for meter installs deemed to be expensive |
| Technical application | Households – all property types which contain a basic meter including detached, semi-detached and terraced houses and individual dwellings in Mini Bulk (small blocks of flats) and Bulk (large blocks of flats) properties. |
| Benefit | Reduction in per capita consumption (PCC) through:<br>• Behavioural use change<br>• Wastage reduction |
| Option Programme | Programme is planned to start in AMP9 and continue throughout AMP10. |
| Constraints | The number of currently considered no access installs (properties currently considered to be unsuitable for installation of a smart meter) that can have a smart meter installed due to innovations. |

## Water Efficiency – Digital Engagement

| Name | Digital Engagement |
|---|---|
| WRZ | All WRZs |
| Option Scope | Through digital engagement, smart metered customers will have continuous access to their own water consumption data.<br>Digital Engagement has two parts:<br>Digital Engagement Portal:<br>• Enables customers to log on and access their smart meter data at their convenience<br>• Allows customers to track both their water consumption and cost throughout each day<br>• Allows customers to identify areas where they could save water or money on their bills<br>Digital Engagement Advice: |

| Name | Digital Engagement |
|---|---|
| | • Assists customers with the interpretation of their smart meter data, including:<br>• Identifying which proportion of consumption may be a leak or internal wastage issue<br>• Identifying peak periods of behavioural usage and recommend water saving tips<br>• Providing context of a customer's consumption impact on the environment and context for the environmental benefits for water saved<br>• Providing advice to find and fix leakage or wastage issues within the home<br>• Encouraging customers to maintain their previous water savings by highlighting any subsequent increase<br>• Alerting customers when they are entering the 'high use' category of consumption |
| Technical application | Households – all property types including detached, semi-detached and terraced houses and individual dwellings in Mini Bulk (small blocks of flats) and Bulk (large blocks of flats) properties. |
| Benefit | Reduction in Household Consumption (HH consumption) which includes HH behavioural use reduction and HH wastage reduction. |
| Option Programme | Programme to be completed by the end of AMP9 and will become a component of the household innovation and tariffs option from AMP10. |
| Constraints | Number of customers who engage with digital engagement.<br>Digital Engagement will build upon the benefits provided by smart metering (Progressive Metering Programme, Progressive Smart Upgrade Programme and those customers who have opted to have a meter installed). The access to continuous water consumption data is an improvement on what is currently available for customers.<br>The Digital Engagement programme will become a component of the household innovation and tariffs option. |

## Water Efficiency – Household Innovation and Tariffs

| Name | Household Innovation and Tariffs |
|---|---|
| WRZ | All WRZs |
| Option Scope | Household Innovation and Tariffs encompasses innovative household activity and future tariffs. From all the options, the critical solution is AMP8 Water Efficiency Innovation Trials as the viability and practicality of other solutions depends on AMP8 investment in trials.<br>AMP8 Water Efficiency Innovation Trials (new).<br>Investment in trials of emerging approaches and technology to establish the most cost efficient and viable solutions to achieve long-term, sustainable reductions in household Per Capita Consumption (PCC). Specific investment will be made in a trial of non-potable solutions. |

| Name | Household Innovation and Tariffs |
|---|---|
| | Eliminate Wastage (new)<br>Smart meter data from Progressive Metering Programme (PMP) shows that a greater proportion of consumption is wastage compared with the volume assumed in WRMP19. Even after Progressive Metering Programme (PMP), Smarter Home Visits (SHVs), Wastage Fixes and conducted Digital Engagement programs are completed, some customers will still have internal wastage issues. This option will explore innovative ways to understand and approach the customers to repair any remaining internal wastage issues.<br>Non-Potable Water Supplies<br>Non-potable water is water that is not of drinking water quality, but that can be used for other purposes such as toilet flushing, laundry and garden watering to reduce the total demand on potable supply. Schemes which are a combination of rainwater harvesting, stormwater harvesting, and greywater recycling are considered here.<br>Water Efficiency on Bulk Metered Areas (BMAs) and Mini Bulk Metered Areas (mBMAs) (new).<br>Bulk Metered Areas (BMAs) and Mini Bulk Metered Areas (mBMAs) may be non-revenue or revenue.<br>Non-revenue Bulk Metered Areas (BMAs) are smart metered for leakage detection and may include individually metered dwellings within the Bulk Metered Area (BMA).<br>Revenue Bulk Metered Areas (BMAs) meter the supply to a multi occupancy building for the purposes of billing the building landlord or managing agent and do not have meters installed on individual premises within that building. This solution involves conducting a smarter home visit and, where required, a wastage repair on dwellings within revenue and non-revenue Bulk Metered Areas (BMAs). This solution will specifically focus on those dwellings without a meter.<br>Media campaigns<br>Media campaigns will be designed with overarching messages to provide more focus to link water savings with environmental value and protection in the local area and include the promotion of local activities to help save water. Media campaigns in the shorter term will raise awareness of all Water Efficiency activities and assist to increase the take up of specific water saving initiatives.<br>New Water Efficiency Innovation<br>Although there are indications of the types of future household innovation, there are solutions that are yet to be conceptualised. The New Water Efficiency Innovation category includes these solutions and makes an allowance for solutions that will be discovered and developed in the future.<br>Tariffs |

| Name | Household Innovation and Tariffs |
|---|---|
| | Tariff charging to encourage water conservation can be implemented by reforming water rates, introducing surcharges, or establishing penalties to deter high water or wasteful water practices. Tariffs are planned to be introduced in 2035, once meter penetration is sufficiently high to ensure fairness in billing to customers. |
| Technical application | Households – all property types including detached, semi-detached and terraced houses and individual dwellings in Mini Bulk (small blocks of flats) and Bulk (large blocks of flats) properties. |
| Benefit | Reduction in Household Consumption (HH consumption) which includes HH behavioural use reduction and HH wastage reduction. |
| Option Programme | Innovate solution trials to take place throughout AMP8. Tariffs are planned to be introduced from 2035, once meter penetration is sufficiently high to ensure fairness in billing to customers. |
| Constraints | All of the innovation methods are constrained by the types of and success of the innovative methods that are trialled. Some of these are not yet conceptualised.<br>Tariffs are constrained by meter penetration being sufficiently high to ensure fairness in billing to customers. |

## Water Efficiency – Smarter Home Visit – Progressive Metering Programme (PMP)

| Name | Smarter Home Visit – Progressive Metering Programme (PMP) |
|---|---|
| WRZ | All WRZs |
| Option Scope | This option offers a Smarter Home Visit (SHV) to customers who are newly smart metered through the Progressive Metering Programme (PMP). Smarter Home Visits offered to those who have requested a smart meter from Thames Water (Optants) and those who have been metered through the Progressive Smart Upgrade Programme Household (HH PSUP) programme are separate options.<br>A Smarter Home Visit (SHV) includes a free home visit by qualified staff to install water saving devices and provide personalised water saving advice to households. It includes an App which is used to produce a tailored water savings report for every customer.<br>This report helps customers to quantify their potential water, energy, and money savings from changing their water use behaviour in the home. |
| Technical application | Households – all property types including detached, semi-detached and terraced houses and individual dwellings in Mini Bulk (small blocks of flats) and Bulk (large blocks of flats) properties. |
| Benefit | Reduction in per capita consumption (PCC) through behavioural use change.<br>Smarter Home Visits can also identify wastage fixes, the benefits of which are described in Wastage Fix Demand Option. |

| Name | Smarter Home Visit – Progressive Metering Programme (PMP) |
|---|---|
| Option Programme | The Smarter Home Visits be completed by the end of AMP8. There will be ongoing maintenance through AMP9 and AMP10 to sustain the level of demand reduction achieved from the visits. |
| Constraints | • The Smarter Home Visit - Progressive Metering Programme (PMP) builds upon the Progressive Metering Programme (PMP)<br>• The ratio of high (more than 500 l/d) and normal (less than 500 l/d) households. Higher use households are particularly targeted as part of the programme<br>• The uptake rate of Smarter Home Visits among eligible households |

## Water Efficiency – Smarter Home Visit – Optants

| Name | Smarter Home Visit – Optants |
|---|---|
| WRZ | All WRZs |
| Option Scope | This option offers a Smarter Home Visit (SHV) to customers who are newly smart metered after requesting a meter from Thames Water. Optants are customers who request a meter from Thames Water. Smarter Home Visits offered to those who have been metered through the Progressive Metering Programme (PMP) and Progressive Smart Upgrade Programme Household (HH PSUP) programme are separate options.<br>A Smarter Home Visit (SHV) includes a free home visit by qualified staff to install water saving devices and provide personalised water saving advice to households. It includes an App which is used to produce a tailored water savings report for every customer.<br>This report helps customers to quantify their potential water, energy, and money savings from changing their water use behaviour in the home. |
| Technical application | Households – all property types including detached, semi-detached and terraced houses and individual dwellings in Mini Bulk (small blocks of flats) and Bulk (large blocks of flats) properties. |
| Benefit | Reduction in per capita consumption (PCC) through behavioural use change.<br>Smarter Home Visits can also identify wastage fixes, the benefits of which are described in Wastage Fix Demand Option. |
| Option Programme | The Smarter Home Visits be completed by the end of AMP8. There will be ongoing maintenance through AMP9 and AMP10 to sustain the level of demand reduction achieved from the visits. |
| Constraints | The Smarter Home Visit – Optants builds upon the base of customers who have requested a meter from Thames Water (Optants). |

## Water Efficiency – Smarter Home Visit – Progressive Smart Upgrade Programme (PSUP)

| Name | Smarter Home Visit – Progressive Smart Upgrade Programme (PSUP) |
|---|---|
| WRZ | All WRZs |
| Option Scope | This option offers a Smarter Home Visit (SHV) to customers who are newly smart metered through the Progressive Metering Programme (PSUP). Smarter Home Visits offered to those who have requested a smart meter from Thames Water (Optants) and those who have been metered through the Progressive Metering Programme (PMP) are separate options.<br>A Smarter Home Visit (SHV) includes a free home visit by qualified staff to install water saving devices and provide personalised water saving advice to households. It includes an App which is used to produce a tailored water savings report for every customer.<br>This report helps customers to quantify their potential water, energy, and money savings from changing their water use behaviour in the home. |
| Technical application | Households – all property types including detached, semi-detached and terraced houses and individual dwellings in Mini Bulk (small blocks of flats) and Bulk (large blocks of flats) properties. |
| Benefit | Reduction in per capita consumption (PCC) through behavioural use change.<br>Smarter Home Visits can also identify wastage fixes, the benefits of which are described in Wastage Fix Demand Option. |
| Option Programme | The Smarter Home Visits be completed by the end of AMP9. There will be ongoing maintenance through AMP10 to sustain the level of demand reduction achieved from the visits. |
| Constraints | The Smarter Home Visit – Progressive Smart Upgrade Programme (PSUP) builds upon the Progressive Smart Upgrade Programme Household (HH PSUP) Metering Option. |

## Water Efficiency – Wastage Fix

| Name | Wastage Fix |
|---|---|
| WRZ | All WRZs |
| Option Scope | Wastage Fixes are offered to customers following a Smarter Home Visit (SHV) if they are found to have a leaking toilet or tap. |
| Technical application | Households – all property types including detached, semi-detached and terraced houses and individual dwellings in Mini Bulk (small blocks of flats) and Bulk (large blocks of flats) properties. |
| Benefit | Reduction in Household Consumption (HH Consumption) through wastage reductions. |
| Option Programme | The Wastage fixes be completed by the end of AMP9. There will be ongoing maintenance through AMP10 to sustain the level of demand reduction achieved from the fixes. |

| Name | Wastage Fix |
|---|---|
| Constraints | Wastage Fixes result from repairs of leaks on toilets and taps identified through Smarter Home Visits and dependent on the number of Smarter Home Visits through the following Water Efficiency options:<br>• Smarter Home Visit – Progressive Metering Programme (PMP)<br>• Smarter Home Visit – Optants<br>• Smarter Home Visit – Progressive Smart Upgrade Programme (PSUP) |

## Water Efficiency – Green Redeem

| Name | Green Redeem |
|---|---|
| WRZ | All WRZs |
| Option Scope | Customers are incentivised to use less water through awarding points that can be exchanged for money off vouchers, charity donations, prize draw entries and days out.<br>Customers are given water reduction targets based on their current usage and are awarded points if they can reach their water saving target, sustain the reduction in water usage and if they exceed their reduction targets. |
| Technical application | Households – all property types including detached, semi-detached and terraced houses and individual dwellings in Mini Bulk (small blocks of flats) and Bulk (large blocks of flats) properties. |
| Benefit | Reduction in per capita consumption (PCC) through behavioural use change resulting in lower water consumption. |
| Option Programme | The programme will be completed by the end of AMP9. There will be ongoing operational activity through AMP10 to sustain the level of demand reduction. |
| Constraints | Green Redeem is offered to customers who have had a Smarter Home Visit and/or a Smart Meter installed and is therefore dependent on the following other Water Efficiency options:<br>• Smarter Home Visit – Progressive Metering Programme (PMP)<br>• Smarter Home Visit – Optants<br>• Smarter Home Visit – Progressive Smart Upgrade Programme (PSUP)<br>And the following metering options (as well as those who have requested a meter from Thames Water (Optants)):<br>• Progressive Metering Programme (PMP)<br>• Progressive Smart Upgrade Programme Household (HH PSUP) |

## Water Efficiency – Smarter Business Visits (SBVs)

| Name | Smarter Business Visits (SBVs) |
|---|---|
| WRZ | All WRZs |
| Option Scope | A free visit by a qualified member of staff to install water saving devices and provide personalised water saving advice to non-households. |
| Technical application | Non-household properties (businesses) |
| Benefit | Reduction in non-household consumption (NHH consumption) which is the sum of two subcomponents which includes NHH behavioural use reduction and NHH wastage reduction. |
| Option Programme | The Smarter Business Visits be completed by the end of AMP8. There will be ongoing operational through AMP9 and AMP10 to sustain the level of demand reduction achieved from the visits. |
| Constraints | Smarter Business Visits are offered to businesses both through lettering and more targeted groundwork by Thames Water. |

## Water Efficiency – Non-Household Continuous Flow Fixes

| Name | Non-Household Continuous Flow Fixes |
|---|---|
| WRZ | All WRZs |
| Option Scope | Fixes are offered to non-household properties (businesses) which are identified as having a continuous flow (where the flow rate does not drop below a minimum consistently for several days). Continuous flows can be targeted distinct from Smarter Business Visits (SBVs) and metering. It is envisioned that a dedicated element of the SBV team would be added to prioritise the identification and reduction of continuous flow elements. |
| Technical application | Non-household properties (businesses) |
| Benefit | Reduction in non-household consumption (NHH consumption). |
| Option Programme | Through AMP8 and AMP9 a dedicated element of the Smarter Business Visit (SBV) team will target priority Non-Household Continuous Flow Fixes. From AMP10 onwards smart meter data will be used to target sites. |
| Constraints | The option is constrained by the ability to identify continuous flows at non-household properties. This ability will be enhanced from AMP10 onwards with the use of Smart Metering data to target the properties. |

## Water Efficiency – Non-Household New Tariff Structure

| Name | Non-Household New Tariff Structure |
|---|---|
| WRZ | All WRZs |
| Option Scope | In the non-household sector, water usage tariffs are envisioned to be brought in from AMP10 and onwards. These tariffs would look to |

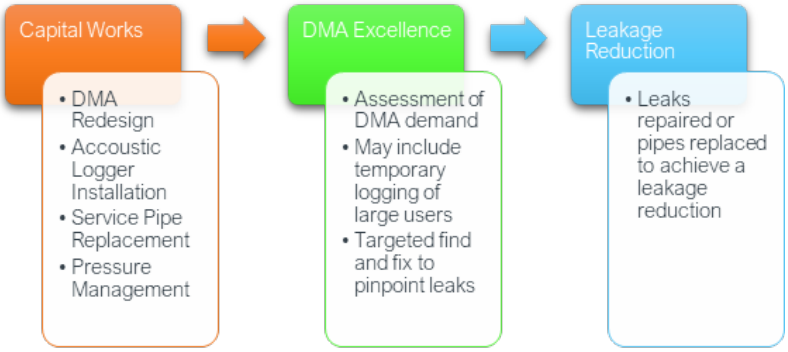
| Name | Non-Household New Tariff Structure |
|---|---|
| | implement higher cost rates for overuse of water in the commercial sector, in order to drive down demand. |
| Technical application | Non-household properties (businesses) |
| Benefit | Reduction in non-household consumption (NHH consumption). |
| Option Programme | It is envisaged that the tariff structure will be implemented from AMP10 onwards. |
| Constraints | The option is contingent upon Smart Metering Data being available. |

## Water Efficiency – Non-Household Retailer Activity

| Name | Non-Household Retailer Activity |
|---|---|
| WRZ | All WRZs |
| Option Scope | Communication with non-household water retailers to further reduce business use by incentivising change. This will likely be a combination of:<br>• A retailer-led water efficiency scheme which, similar to tariffs, would target overuse of water. It is expected that this would be more in-depth than the tariffing option would be, with coordination between retailers and NHH users allowing for further savings<br>• A revised retail exit code, which could better enable NHH retailer demand reduction activity |
| Technical application | Non-household properties (retailers) |
| Benefit | Reduction in non-household retailer consumption (NHH consumption). |
| Option Programme | The Programme will run through AMP8 to AMP12. |
| Constraints | This option may be constrained by the need to expand the objectives of the REC by using it to incentivise water efficiency amongst business customers. |

## Leakage Reduction – Advanced District Metered Area Intervention (DMAi)

| Name | Advanced District Metered Area Intervention (DMAi) |
|---|---|
| WRZ | All WRZs excl. Henley WRZ as the network is in a good condition such that it is possible to detect and understand where leakage is occurring. |
| Option Scope | Advanced DMAi – Capital Works:<br>• DMA Redesign – involves splitting and reconfiguring DMAs to make it more efficient to pinpoint leaks i.e., ensure there is an appropriate property count, length of pipework and number of meters in each DMA. This will help resolve longstanding network issues and ensure leakage detection and repair can be undertaken<br>• Acoustic logger installation<br>• Service pipe replacement |

| Name | Advanced District Metered Area Intervention (DMAi) |
|---|---|
| | • Pressure Management: install new pressure management schemes within individual DMAs at sub-DMA level<br>Advanced DMAi – Operational Works/DMA Excellence:<br>• DMA Excellence: operational component of the work following DMA Redesign<br>• This includes an assessment of demand in the DMA that looks at the assets, properties, and customer water demand. This may include temporary logging of large customers<br>• Traditional or innovative find and fix activity is employed to pinpoint leaks<br>Advanced DMAi – Final Works/Leakage Reduction:<br>• The final stage of Advanced DMAi is to fix the leaks identified to realise the leakage reduction<br>  |
| Technical application | Network |
| Benefit | Reduction in leakage |
| Option Programme | The capital programme will be completed throughout AMP8-AMP10. There will be ongoing maintenance and operational activity through AMP11 and AMP12 to sustain the level of leakage reduction achieved. |
| Constraints | The Advanced DMAi option involves a range of measures which are closely interlinked to create holistic strategies specific to individual DMAs. The availability and suitability of measures in particular DMAs will affect the implementation of others. The three high level work streams of Capital Works, DMA Excellence and Leakage Reduction, all influence and are dependent upon each other. |

## Leakage Reduction – Leakage Innovation

| Name | Leakage Innovation |
|---|---|
| WRZ | All WRZs |
| Option Scope | Leakage Innovation includes:<br>• Advanced technologies for precise and accurate leakage detection – artificial intelligence and machine learning applied to pattern recognition<br>• Adoption of keyhole repair techniques |

| Name | Leakage Innovation |
|---|---|
| | • Advanced technologies for precise and accurate leak location – acoustics<br>• Advanced technologies for precise and accurate leakage location – tracer gases<br>• New quality or design of joints so they are leak free – product development<br>• Using technologies for repairing pipes from the inside<br>• Enhanced detection equipment or innovation in detection<br>• Enhanced repair methods or innovation in repair methods<br><br>AMP8 Investment in Innovation Trials<br>In AMP8, investment in trials of innovative technology and leakage reduction and repair trials are foreseen. This investment is crucial to test and demonstrate the most cost-effective innovative solutions prior to their full implementation in later AMPs.<br>• The technology and approach to achieve long-term leakage reduction ambitions is either emerging or is yet to be developed.<br>• It is therefore critical to understand the emerging technology and approaches to ensure the deliverability of Leakage innovation. |
| Technical application | Network |
| Benefit | Reduction in leakage |
| Option Programme | The programme is expected to capital works only (which will have a life of greater than 60 years). The programme will run through AMP8 to AMP12. There are no operational maintenance costs associated with this option. |
| Constraints | The technology and approach required to achieve the long-term leakage reduction ambition is either emerging or is yet to be developed.<br>• The success of innovative techniques that we are currently aware of but have not yet implemented<br>• The successful development of new innovative techniques that we are currently not aware of and the degree of leakage reduction benefit that they return once implemented |

## Leakage Reduction – Mains Rehabilitation

| Name | Mains Rehabilitation |
|---|---|
| WRZ | All WRZs |
| Option Scope | Water mains rehabilitation is a traditional and long-term sustainable option to reduce leakage from the distribution mains network - which includes over 31,000km of water mains across London and Thames Valley.<br>A lot of London's water mains are between 100 and 150 years old and more likely to leak or burst than modern water supplies, due to |

| Name | Mains Rehabilitation |
|---|---|
| | increase in road traffic, corrosive soil conditions and ground movement.<br>This option focuses on water mains rehabilitation of the 100–150-year-old Victorian mains in a phased manner. This includes mains replacement, relining and repair. |
| Technical application | Network |
| Benefit | Reduction in leakage volume from mains |
| Option Programme | The programme will run through AMP8-AMP12. |
| Constraints | Particular rehabilitation methods are specific to the situation in each DMA.<br>Appropriate where water mains that require either renovating or replacement where leakage issues cannot be addressed by either Advanced DMAi or Leakage Innovation. |


Thames
Water