Water Resources Management Plan 2024

Resource Options - Desalination Feasibility Report

Addendum

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Executive summary

1. This report provides a summary of changes that have been made to the desalination options since Thames Water's 2019 Water Resources Management Plan (WRMP19) as part of the 2024 Water Resources Management Plan (WRMP24) development.

2. This report acts as an addendum to Thames Water WRMP19 Resource Options Desalination feasibility report, February 2018, Rev 02.

3. No new desalination options have been identified at WRMP24 but phasing variations have been incorporated within the WRMP19 options; Options (1a) Beckton Desalination treatment plant and (2d) Crossness desalination treatment plant. The option phasing allows greater flexibility in investment modelling and alignment with other large options in adopting a common phasing capacity of 50 Ml/d.

4. At WRMP24 backchecking of the WRMP19 screening decisions has been undertaken, where appropriate options have been further developed.

5. The updated WRMP24 feasibility assessment presents the WRMP19 options and the additional WRMP24 phasing options. The findings for Stage 1 and Stage 2 Assessments were unchanged from the WRMP19 feasibility assessments. The four WRMP24 additional phasing options all passed the Stage 3 feasibility assessment.

6. The WRMP24 assessment verifies that the additional proposed phasing options considered allow flexibility for a phased approach to be included in the investment modelling decisions.

7. The following list of options are the confirmed Feasible List of desalination options for WRMP24:

   - Option 1a (Beckton STW / Gascoigne Way): A new desalination plant located on the existing Beckton STW site to transfer desalinated water to Coppermills WTW for blending. This can be phased in 50 Ml/d or 100 Ml/d stages up to a limit of 150 Ml/d. The WRMP19 Stage 1-3 assessment findings for this option remain unchanged.
   - Option 2d (Crossness - Thamesmead Industrial Estate Extension, Waldrist Way): A new desalination plant located to the South of Erith Marshes to transfer desalinated water to Coppermills WTW for blending. This can be phased in 50 Ml/d or 100 Ml/d stages up to a limit of 300 Ml/d. The WRMP19 Stage 1-3 assessment findings for this option remain unchanged.

Introduction

8. Thames Water is developing options for the 2024 Water Resources Management Plan (WRMP24). These options build on options developed as part of Thames Water's 2019 Water Resources Management Plan (WRMP19). This report provides a summary of changes that have been made to the desalination options since WRMP19 and as part of WRMP24 development.

9. This report acts as an addendum to **Thames Water WRMP19 Resource Options Desalination feasibility report, February 2018, Rev 02**. This report should be read alongside the WRMP19 report. Information in this report supersedes information provided in the WRMP19 report.

10. Changes to the WRMP19 Desalination Options have been detailed in Section 2 – 'Updates since WRMP19'. A backchecking exercise has been completed to assess if any changes are required to WRMP19 as a result of developments since WRMP19. Backchecking also provides the opportunity to take into account any changes of circumstance that might affect how an option is considered. This might include a change in the planning and environmental status of a site, changes in national and local planning policy and the emergence of viable technical solutions that were unavailable at the time the original assessment was undertaken.

11. The WRMP24 screening, option development and backchecking methodology is detailed in Section 7 - Appraisal of Resource Options.

12. This report summarises changes to the desalination options up to the end of feasibility screening. Information on option development and investment modelling can be found in WRMP24 Section 7 - Appraisal of Resource Options.

Structure of this report

13. Table 1 summarises the structure of this report.

Section Name	Description
Executive summary	Summary of addendum report
Introduction	This section
Updates since WRMP19	Summary of the changes made to the options list since WRMP19, including changes to WRMP19 options, new WRMP24 phasing options and changes to Deployable Output (DO).
Updated feasibility assessment	Provides a summary of the current feasibility assessment for all options including options identified at both WRMP19 and WRMP24.
Option verification	Validation of risk and uncertainty for all options and the confirmation of the feasible list of options.
Appendix A: Reference information	A list of useful links and references
Appendix B: Option WRMP19 and WRSE IDs	List of Desalination Option WRMP19 and WRSE IDs

Table 1: Structure of this report

Updates since WRMP19

Option Identification

14. To ensure Thames Water is aligned with the Water Resources South East (WRSE) approach, the following updates have been made to option identification for WRMP24:

- Generic option screening has been revised to reflect the updated list of generic option types recommended by WRSE (refer to WRMP24 Section 7).
- The WRMP19 rejection register has been revisited to ensure that the rejection reasoning remains robust for all rejected options.
- Rejected options have been reviewed to identify any options which should be revisited due to potential for regional benefits, particularly in light of changes in requirements to plan for 1:500 drought resilience (previously 1:200 at WRMP19) and the need to plan for a long-term environmental destination that achieves and maintains a sustainable level of abstraction by 2050.
- A review has been undertaken to identify new options to be considered in addition to the existing WRMP19 options, no new desalination options were identified through this process.

Feasibility Screening Criteria

15. The following tables detail the criteria used for feasibility screening, which is further detailed in the WRMP19 Desalination Feasibility Report. This is a 3 stage process.

- Stage 1 – Option identification and assessment of absolute and other key constraints
- Stage 2 - Assessment of site performance and compilation of short list
- Stage 3 - Further detailed assessment

Stage 1 has two phases:

- Identification of potential sites – the criteria for which is detailed in Table 2
- Assessment of the options identified against absolute and other key constraints to the development of a new desalination plant - the criteria for which is detailed in Table 3. This is a pass / fail assessment for each criterion.

16. At Stages 2 and 3 the assessed performance of each option is reviewed against a red / amber / green classification system, as

- Red – issue or constraint can be overcome, but will be very challenging
- Amber – issue or constraint can be overcome
- Green – no constraint posed

17. Additionally, Stage 3 allows for costing of each option to provide a comparison across all water resource options. The Stage 2 criteria are shown in Table 4 and the Stage 3 criteria are shown in Table 5.

Criteria	Basis for assessment
Property/legal criteria	
Available footprint[1]	For larger size plants, a minimum of 80,000m^2 (footprint required for a 150 Ml/d plant including 24 hour raw water storage). This applies to treatment sites near to the Thames bank, located a reasonable distance from sufficient treated water to be blended and feed into the supply system locally. The treated water sites to have sufficient footprint for local blending. or For smaller size plants, a minimum of 20,000m^2 (footprint required for a 25 Ml/d minimum plant size including 24 hour raw water storage). This applies to treatment / blending sites, near to the Thames bank, located a reasonable distance to feed into the supply system locally.
Number of landowners	Fewer than 5 land titles
Engineering criteria	
Proximity to the River Thames	Within 1km (approximately), with exception for smaller size plants (i.e. Battersea option).

Table 2: Stage 1 Criteria to Identify Potential Desalination Sites

Desalination Stage 1 assessment criteria	Basis for assessment
Land availability	Is there sufficient space at the abstraction location?
Impact on National/International conservation sites	Is any part of the scheme likely to impact on an existing conservation site, including SSSI, Ramsar and Special Protection Areas?
Impact on any National / International heritage sites	Is any part of the scheme likely to impact on an existing Heritage site?
Environmental viability of the abstraction	Is there sufficient flow at the location of abstraction? Are there any anticipated adverse effects on the water body due to abstraction?
Impact on downstream abstractors (including unlicensed)	Is there any quality and quantity impact on the downstream abstractors through implementation of a desalination scheme?
Source Quality (Treatability)	Is the quality of the source currently treatable, within reasonable cost and technical feasibility?
Environmental impact neutrality (i.e. brine can be disposed of safely)	Is it possible to discharge desalination by-products without negative impact? Is there a waterbody available to discharge the effluent from the desalination process without causing adverse effects?

Table 3: Criteria for Stage 1

[1] For treatment plants smaller than 150Ml/d, smaller footprints are to be considered where it is feasible to feed directly to a discrete supply zone via a treated water reservoir.

		Basis for assessment		
Criterion Title	Stage 2 Criteria	Green	Amber	Red
Property and legal criteria				
Ownership of Site and Tenancies	Is there sufficient space required to build the facilities? Is there sufficient space to accommodate future growth and permit changes?	Existing TW land is available and sufficient unconstrained space is available both for now and the future	Some TW land is available, additional land may also be acquired for treatment sites and/or pipelaying required in private land under Statutory Notice. Space is available but is constrained both for now and the future.	No TW land available. Private land needs to be acquired. Pipelaying required in land that cannot be served with Statutory Notice. No extra space for growth/there is not enough space for the maximum DO.
Estimated Land Acquisition Cost	Are land acquisition costs likely to be reasonable?	Land acquisition costs likely to be relatively low. Agricultural land and isolated properties only affected.	Land acquisition costs likely to be moderate. Local or regional business or other facilities affected in addition to agricultural land.	Land acquisition costs likely to be relatively high. National businesses or land required for statutory agency's business affected in addition to agricultural land.
Planning and environmental criteria				
Land Use and Land Use Quality	Can brownfield land be reused? Will Best and Most Versatile Agricultural land be affected? Will existing non-agricultural high value land-uses be affected?	The site will reuse all brownfield land which appears to have low value use.	The site contains some brownfield land to be re-used and is currently occupied by existing business / commercial use.	The site is entirely greenfield or occupied by high value business.
Flood plain encroachment	Percentage of the site covered by flood plain.	Less than 25% of the site is within Flood Zones 2 or 3 or the site is solely located within Flood Zone 1.	Between 25-50% of the site located within Flood Zones 2 or 3 or if greater than 50% the site benefits from existing flood protection measures.	Over 50% of the site located within Flood Zones 2 or 3 and site does not benefit from existing flood protection measures.

		Basis for assessment		
Criterion Title	Stage 2 Criteria	Green	Amber	Red
Landscape Character Sensitivity	Are any landscape designations affected?	No designations likely to be affected or effect likely to be positive. Site unlikely to affect a national landscape designation and not covered by a local landscape designation.	Designation of regional or local importance likely to be affected. The site lies within a locally designated landscape.	Designation of national importance likely to be affected. Site lies wholly or partly within or is likely to impact the setting of a national landscape designation (National Park or AONB).
Views and Visual Amenity	Are any visually sensitive viewpoints affected?	Important / recognised viewpoints unlikely to be affected. Site lies at a distance greater than 3km from recognised viewpoints	Important / recognised viewpoints may be affected. Site lies at a distance of between 1km and 3km from recognised viewpoints.	Highly visible / panoramic views likely to be affected. Site lies at a distance less than 1km from recognised viewpoints.
Nature Conservation and Biodiversity	Are any designated areas of nature conservation/biodiversity importance affected?	No national, regional, or local designations likely to be adversely affected, or effect likely to be positive. Site does not contain sites of nature conservation importance.	Designation of regional or local importance likely to be adversely affected. Site includes or lies within a regionally designated site (County Wildlife Site, Local Nature Reserve).	Designation of national importance and/or Ancient Woodland likely to be adversely affected.
Archaeology and Historic Environment	Are any heritage assets affected?	Heritage interest low or unknown.	Designation of regional or local importance likely to be adversely affected. No statutory designated sites present but site contains known non-designated heritage assets.	Nationally Designated Heritage Assets likely to be affected. Site includes an international / national heritage asset (World Heritage Site, Scheduled Monument, Listed Building of a type not considered to be an absolute constraint at Stage 1), Registered Historic Park or Garden, Listed battlefield site.

		Basis for assessment		
Criterion Title	Stage 2 Criteria	Green	Amber	Red
Non-traffic impact of construction on local residents	Will construction activities (excluding traffic impacts) affect local residents within a 350m radius of the site?	Less than 100 residential properties likely to be affected by construction.	Between 100 and 499 residential properties likely to be affected by construction.	More than 500 residential properties likely to be affected by construction.
Impact of construction on traffic	Will construction traffic affect local roads / built up areas?	Route largely not through built up areas and/or likely to have limited impacts on local traffic.	Route partly through built up areas and/or likely to have moderate impacts on local traffic.	Route predominantly through built up areas and/or likely to have substantial impacts on local traffic.
Impact on recreation	Are recreational sites or rights of way affected?	No recreational resource / right of way disrupted or affected. Sites with no formal recreational activities.	Recreational resource / right of way of local importance disrupted or affected. The site is likely to affect public rights of way.	Recreational resource / right of way of national or regional importance disrupted or affected. The site is likely to affect major recreational activities.
Water resources & water quality	Are there likely impacts on water resources and water quality, including Water Framework Directive objectives?	Minor adverse impacts likely; no risk to Water Framework Directive objectives.	Moderate adverse impacts likely; low risk to Water Framework Directive objectives.	Major adverse impacts likely; high risk to Water Framework Directive objectives.
Engineering criteria				
Length of conveyance	Total length of transfer pipeline	The length of the transfer is less than 10km.	The length of the transfer is between 10-20km.	The length of the transfer is more than 20km.
Pumping head	Is the pumping head significant?	The pumping head is <50m.	The pumping head is between 50m-99m.	The pumping head is in excess of 100m.
Access during construction and operation	Are the means of access suitable, both for construction and operation?	Existing access arrangements are available and suitable for both construction and operation.	Existing access will be suitable for operations, temporary modifications will be needed for construction activities.	Existing access will require significant modification to make it suitable for both construction and operation.

		Basis for assessment		
Criterion Title	Stage 2 Criteria	Green	Amber	Red
Connectivity to waste stream	Connectivity to wider infrastructure system including for any waste streams.	The site is less than 5km from the discharge location. The site is located adjacent to the wider infrastructure (waste stream).	The site is between 10-25km from the discharge location. The site is located less than 5km of the wider infrastructure (Waste stream).	The site is greater than 25km from the discharge location. The site is located more than 5km from the wider infrastructure system (Waste stream).
Construction Complexity	Adverse ground conditions.	No major crossings required or contaminated land risks identified.	1-5 major crossings required or contaminated land risks identified.	Over 5 major crossings required or significant contaminated land risks identified.

Table 4: Criteria for Stage 2 and basis for assessment of site performance

		Basis for assessment		
Criterion Title	Stage 3 Criteria	Green	Amber	Red
Property and legal criteria				
Ownership of Site and Tenancies	Assessment of ownership and tenancy constraints to any development.	Land involved is under a single freehold title.	Land involved has between 1 and 5 titles.	More than 5 land titles involved.
Planning and environmental criteria				
Planning policy and history	Review of Local Plan planning policy designations and planning applications.	The site is not allocated for significant development, there are no significant permissions or submitted applications, there are no policy constraints or the site benefits from positive policy support for reservoir development.	The site has some policy constraints not considered significant and no significant permissions or applications. The site has significant permissions or applications but also benefits from positive policy support for resource option development.	The site or immediate area is allocated for significant development or has significant policy constraints. Extant planning permission or planning application has been submitted for significant development.
Land Use and Land Use Quality	Extent of land take and land quality, greenfield vs brownfield mix	Construction is entirely within brownfield sites.	Short term effects during construction phase only on greenfield sites.	Permanent effects on greenfield sites as a result of resource option development.
Floodplain encroachment (loss of floodplain / need for compensation storage)	Are there likely effects on the floodplain?	No constraint posed.	Issue or constraint can be overcome.	Issue or constraint can be overcome, but will be very challenging.
Landscape Character Sensitivity	Extent to which likely effects on landscape character & designations may be mitigated	No mitigation required.	Mitigation may be employed to reduce impacts to an acceptable level.	Adverse effects cannot be mitigated or constraint overcome resulting in adverse effects post mitigation.
Views and Visual Amenity	Extent to which likely effects on visually sensitive receptors may be mitigated	No mitigation required.	Mitigation may be employed to reduce impacts to an acceptable level.	Adverse effects cannot be mitigated or constraint overcome resulting in adverse effects post mitigation.

		Basis for assessment		
Criterion Title	Stage 3 Criteria	Green	Amber	Red
Employment and local economy	Extent of construction and operational effects on employment & local economy	No loss of employment.	Loss of land anticipated to provide a low density of employment opportunities (for example, fields that appear to be used for agricultural purposes).	Loss of land anticipated to provide a high density of employment opportunities (for example, a business park).
Nature Conservation and Biodiversity	Are there likely effects on sites / habitats and protected species	No constraint posed.	Issue or constraint can be overcome.	Issue or constraint can be overcome, but will be very challenging.
Opportunity for biodiversity improvement	Extent of any opportunities for biodiversity enhancement	Site with a watercourse and surrounding woodlands.	Site with a watercourse or surrounding woodlands.	Site without either a watercourse or surrounding woodlands.
Archaeology and Historic Environment	Are there likely effects on heritage assets, including overall setting	No constraint posed.	Issue or constraint can be overcome.	Issue or constraint can be overcome, but will be very challenging.
Non-traffic impact of construction on local residents	Potential to mitigate non-traffic construction impacts on local properties.	No constraint posed.	Issue or constraint can be overcome.	Issue or constraint can be overcome, but will be very challenging.
Impact on recreation	Are there likely effects on recreational activities	No constraint posed.	Issue or constraint can be overcome.	Issue or constraint can be overcome, but will be very challenging.
Water resources & water quality	Are there likely impacts on water resources and water quality, including Water Framework Directive targets?	No constraint posed.	Issue or constraint can be overcome.	Issue or constraint can be overcome, but will be very challenging.

Criterion Title	Stage 3 Criteria	Basis for assessment		
		Green	Amber	Red
Engineering criteria				
Length of conveyance	Length of conveyance route (s) and scale (pipe diameter or equivalent)	Very limited need to transfer water in new conveyance (e.g. abstraction and treatment on the same site).	Moderately long or large diameter water transfer conveyance, making use of existing infrastructure where possible.	Long water transfer conveyance which is comprised of entirely new infrastructure and / or large diameter and / or significant tunnelling
Normalised Cost	£/m3	< £1.00/m3	> £1.00/m3	> £1.50/m3
Water treatability / process complexity	Water treatment risks and complexity of required water treatment	Sufficient water quality data is available. No concerns highlighted with respect to water quality, standard treatment process to be employed.	Water quality data is available although may have some limitations in terms of duration / frequency / parameters. Some concerns with water quality although relatively simple to treat.	Limited water quality data is available in terms of duration / frequency / parameters. Significant concerns regarding water quality, risks remain about ability to treat.
Power Supply	Is sufficient power available to power the site?	Existing power supply to the site is adequate.	Existing power supply is not adequate, power supply can be brought into the site relatively simply.	New power supply required which would be very difficult to achieve.
Construction Complexity	More detailed review of construction requirements	Construction complexity is anticipated to have no significant impacts on construction programme and cost.	Construction complexity is anticipated to have minor impacts on construction programme and cost.	Construction complexity is anticipated to have major impacts on construction programme and cost.

Table 5: Criteria for Stage 3 and basis for assessment of site performance

Feasibility Screening Updates

53. The overall changes to options and approach since WRMP19 are described in WRMP24 Section 7 Appraisal of Resource Options. Specific changes applicable to desalination options are detailed in Table 6 and Table 7. These tables should be read alongside the WRMP19 feasibility report.

54. The key changes made at WRMP24 are to the desalination option phasing. This was incorporated to allow greater flexibility in investment modelling, and to align with a common phasing capacity of 50 Ml/d for large options.

55. At WRMP24 the approach has changed to consider the regional need rather than the TWUL need alone through Water Resources South East (WRSE) regional planning. In the WRMP24 process fine screening has been replaced by regional planning investment modelling output, which has informed screening for the WRMP24 constrained options list. This has not resulted in any changes to the list of constrained desalination options.

WRMP19 Option Reference and name	WRSE ID Option Reference and name	Changes to the Option	WRMP19 Feasibility Screening Outcome	WRMP24 Feasibility Screening Outcome
Beckton Desalination treatment plant (150Ml/d) *RES-DES-BEC-150* (Option 1a Estuary North, Beckton)	Five phased elements were included in WRMP which can be combined up to a limit of 150 Ml/d, element names are as follows: **Beckton Desalination - Phase 1: 100 Ml/d** *TWU_LON_HI-DES_ALL_CNO_beckton desal 100p1* **Beckton Desalination - 150 Ml/d** *TWU_LON_HI-DES_ALL_ALL_beckton desal* **Beckton Desalination - Phase 1: 50 Ml/d** *TWU_LON_HI-DES_ALL_CNO_beckton desal 50 p1* **Beckton Desalination - Phase 2a: 50 Ml/d Enhanced*** *TWU_LON_HI-DES_ALL_ALL_beckton desal 50p2a* **Beckton Desalination - Phase 2b: 50 Ml/d Enhanced*** *TWU_LON_HI-DES_ALL_ALL_beckton desal 50p2b* *Enhanced indicates phase 2 or 3 elements which can only be implemented after Phase 1 elements.	**This is the treatment component of Beckton Desalination** At WRMP19 the option was a single phase of 150 Ml/d. The option can now be phased as follows: Three phases of 50 Ml/d One phase of 100 Ml/d and a second Phase 50 Ml/d One phase of 150Ml/d This has resulted in 5 Beckton desalination elements at WRMP24. This change has been made to allow maximum flexibility in how the option is built up and to create a consistent phase capacity of 50 Ml/d and 100 Ml/d across option types.	Passed Stage 3– on Feasibility List	WRMP19 option screening reviewed in light of the phasing. WRMP19 scoring considered appropriate for all options for WRMP24. All options have been included on the WRMP24 Feasible List.
Desalination Beckton to Coppermills tunnel *NET-DES-BEC-COP*	**Beckton to Coppermills tunnel (treated)** *TWU_LON_HI-TFR_LON_CNO_beckton-coppermills*	**This is the treated water conveyance component of Beckton Desalination** No changes from WRMP19	Passed Stage 3– on Feasibility List	Passed – included on Feasible List of options as part of the Beckton Desalination option
Crossness desalination treatment plant (100Ml/d) *RES-DES-CRO-100* (Option 2d - 100-300Ml/d Estuary South, Waldrist Way Blended-supply)	**Crossness Desalination (Blended) - Phase 1: 100 Ml/d** TWU_LON_HI-DES_ALL_ALL_crossnessdesal **Crossness Desalination (Blended) - 100Ml/d Enhanced ***	**This is the treatment component of Crossness Desalination** At WRMP19 the option was in Phases of 100 Ml/d up to a limit of 300 Ml/d. This has been updated at WRMP24 as follows:	Passed Stage 3– on Feasibility List	Phased WRMP19 options scoring reviewed in light of the new phasing. WRMP19 scoring considered appropriate for all options for WRMP24. All options have been

WRMP19 Option Reference and name	WRSE ID Option Reference and name	Changes to the Option	WRMP19 Feasibility Screening Outcome	WRMP24 Feasibility Screening Outcome
This was proposed as 3 phases of 100Ml/d	*TWU_LON_HI-DES_ALL_ALL_crossnessdesal100p2* **Crossness Desalination (Blended) - Phase 1: 50 Ml/d** *TWU_LON_HI-DES_ALL_CNO_crossnessdesal50p1* **Crossness Desalination (Blended) - 50Ml/d Enhanced *** *TWU_LON_HI-DES_ALL_ALL_crossnessdesal50p2* *Enhanced indicates phase 2 or 3 elements which can only be implemented after Phase 1 elements.	Initial phase of 50 Ml/d. Further phases can be 50 Ml/d or 100 Ml/d up to a limit of 300 Ml/d. Initial phase of 100 Ml/d. Further phases can be 50 Ml/d or 100 Ml/d up to a limit of 300 Ml/d. This has resulted in 4 Crossness Desalination option elements at WRMP24. This change has been made to allow maximum flexibility in how the option is built up and to create a consistent phase capacity of 50 Ml/d and 100 Ml/d across option types.		included on the WRMP24 Feasible List.
Desalination – Beckton to Crossness tunnel *CON-RWS-BEC-CRO-300*	**Beckton to Crossness tunnel (raw)** *TWU_LON_HI-TFR_LON_CNO_beckton-crossness*	**This is the raw water conveyance component of Crossness Desalination** No changes from WRMP19	Passed Stage 3– on Feasibility List	Passed – included on Feasible List of options as part of the Crossness Desalination option
Desalination – Crossness to Beckton tunnel *NET-DES-CRO-BEC*	**Crossness to Beckton tunnel (treated)** *TWU_LON_HI-ROC_NET_CNO_crossness-beckton*	**This is the treated water conveyance component of Crossness Desalination** No changes from WRMP19	Passed Stage 3– on Feasibility List	Passed – included on Feasible List of options as part of the Crossness Desalination option
Option 3a (Crossness – Erith Southern Grazing Marshes) *No code as didn't reach Constrained List*	**Crossness Desalination (Unblended) - 65 Ml/d - Option 3A** *TWU_LON_HI-DES_RE1_ALL_crossdesalunblend-65*	No change since WRMP19	Passed Stage 3 but rejected at Fine Screening. Capacity also revised to 65Ml/d at Fine Screening.	Rejection reasoning reviewed and confirmed. Option remains rejected at WRMP24.

Table 6: Option changes since WRMP19

WRMP19 Option Name	WRMP24 Option Name	WRMP19 DO (Ml/d)		WRMP24 DO (Ml/d)			Difference (Ml/d)		Impact on Feasibility Assessment Scoring (all options Passed Stage 3 and Fine Screening – on Constrained List at WRMP19)
		Average	Peak	1 in 2 average	1 in 500 average	1 in 500 peak	Average	Peak	
Beckton Desalination treatment plant (150Ml/d) RES-DES-BEC-150 (Option 1a Estuary North, Beckton)	Beckton Desalination - 50 Ml/d cumulative (see Table 2.1 for option ID and combinations)	NA*	NA*	44	44	44	NA	NA	New option capacity added in WRMP24. Screening reviewed against WRMP19 option capacities, no changes to screening made.
	Beckton Desalination - 100 Ml/d cumulative (see Table 2.1 for option ID and combinations)	NA*	NA*	89	89	89	NA	NA	New option capacity added in WRMP24. Screening reviewed against WRMP19 option capacities, no changes to screening made.
	Beckton Desalination - 150 Ml/d cumulative (see Table 2.1 for option ID and combinations)	142	142	133	133	133	-9	-9	Updated DO did not result in a change to screening.
RES-DES-CRO-100 Phase 1	Crossness Desalination (Blended) - 100 Ml/d cumulative (see Table 2.1 for option ID and combinations)	95	95	89	89	89	-6	-6	Updated DO did not result in a change to screening.
RES-DES-CRO-100 Phase 2 (200 Ml/d cumulative)	Crossness Desalination (Blended) - 200Ml/d cumulative (see Table 2.1 for option ID and combinations)	189	189	178	178	178	-11	-11	Updated DO did not result in a change to screening.
RES-DES-CRO-100 Phase 3 (300 Ml/d cumulative)	Crossness Desalination (Blended) - 300Ml/d cumulative (see Table 2.1 for option ID and combinations)	284	284	267	267	267	-17	-17	Updated DO did not result in a change to screening.
NA*	Crossness Desalination (Blended) - Phase 1: 50 Ml/d	NA*	NA*	44	44	44	NA	NA	New option capacity added in WRMP24. Screening reviewed against WRMP19 option capacities, no changes to screening made.

*WRMP19 option DO is marked as NA, where the option capacity is new to WRMP24

Table 7: Option Deployable Output (DO) changes since WRMP19

Strategic resource options

56. Section not in use: No desalination options have been identified as Strategic Resource Options (SROs) by Regulators' Alliance for Progressing Infrastructure Development (RAPID).

Cumulative limits

57. WRMP19 investigations identified that the decrease in freshwater inputs to the Tideway, arising from water reuse, desalination and DRA options, should be limited to no more than 275-366 Ml/d in order to mitigate impacts on potentially sensitive ecological receptors.

58. A cumulative limit on the total additional capacity of water reuse, direct river abstraction and desalination options, that decrease in freshwater inputs to the Tideway, of 366 Ml/d has therefore been included in the regional modelling. Beckton desalination and Crossness desalination capacity is included within this cumulative limit.

Updated Feasibility Assessment

Feasibility Assessment Approach

59. This section of the report outlines the updates made in WRMP24 to the WRMP19 feasibility assessment. This should be read alongside the WRMP19 Desalination Feasibility Report. Where options have been rejected through the screening process the rejection reason is recorded in WRMP24 Appendix Q Scheme Rejection Register further information can also be found in WRMP19 Desalination Feasibility Report.

60. A three-stage feasibility screening approach was taken at WRMP24, this approach is unchanged from WRMP19, details of the approach can be found in the WRMP19 Desalination Feasibility Report.

61. At WRMP19, fine screening was undertaken for all options which passed the feasibility screening. The WRMP19 fine screening took account of the estimated volume of water resource needed by Thames Water and, where applicable, neighbouring companies. However, the potential water resources need for the region at WRMP24[2] is significantly higher than at WRMP19, owing to:

- Increased sustainability reductions
- A change to planning for water supply resilience for a 1 in 500-year drought from 1 in 200 at WRMP19[3]

62. Furthermore, potential new transfers identified by Water Resources South East (WRSE) would allow new resource options in the Thames Water supply area to supply more WRSE Water Resource Zones (WRZs) than was considered at WRMP19. For these reasons, the potential resource need is not being used as a consideration in the screening process at WRMP24. This is to avoid rejecting options based on Thames Water's need where there could be a regional benefit. At WRMP24 the fine screening stage has therefore been replaced by use of the WRSE investment model to compare options against cost, environmental, and resilience criteria. Through investment modelling the regional need is taken into consideration.

63. Appendix B provides a list of the WRMP19 and WRSE option identification numbers (IDs). These can be used to cross reference options to WRSE lists and WRMP19 documentation.

Stage 1 Assessment Results

64. At WRMP19 total of eight potential desalination sites were identified taking account:

- The various desalination technologies available
- The potential sources of water that can be treated
- How the treated water can be introduced into the water distribution network
- What sites are potentially suitable for the development of a new desalination plant

[2] https://wrse.uk.engagementhq.com/the-challenge
[3] A 1 in 500-year event explained: This does not refer to an event that will occur every 500 years, it is better considered an event where there is a 1 in 500 chance of the event occurring in a given year, or a 0.2% chance. The probability of it happening in one year remains the same in each of the following years.

65. These sites were then assessed against a number of absolute and other key constraints.

66. The options identified are listed below, grouped into desalination site locations north and south of the River Thames:

- Option 1 Estuary North – A new desalination plant with capacity up to 300 Ml/d, conveying desalinated water to Coppermills WTW for blending.
  - Option 1a : Locate the desalination plant adjacent to Beckton gas works (Armada Way), with abstraction from the River Thames and return of brine effluent back to the River Thames.
  - Option 1b : Locate the desalination plant on industrial land adjacent to the River Lee, with abstraction from the River Thames and return of brine effluent to the River Lee.
- Option 2 Estuary South – A new desalination plant with capacity up to 300 Ml/d, conveying desalinated water to Honor Oak service reservoir or Coppermills WTW for blending.
  - Option 2a : Locate the desalination plant at Manor Road, near Erith, with abstraction from the River Thames and return of brine effluent back to the River Thames.
  - Option 2b : Locate the desalination plant south of Crossness STW, at Erith Marshes, with abstraction from the River Thames and return of brine effluent back to the River Thames.
  - Option 2c : Locate the desalination plant near Thamesmead, with abstraction from the River Thames and return of brine effluent back to the River Thames.
  - Option 2d : Locate the desalination plant to the south of Erith Marshes on Thamesmead Industrial Estate Extension, Waldrist Way, with abstraction from the River Thames and return of brine effluent back to the River Thames.
- Option 3 Estuary South – A new 65 Ml/d desalination plant conveying desalinated water to Northumberland Heath service reservoir for direct supply to Riverside WRZ.
  - Option 3a : Locate the desalination plant next to Crossness STW, near Erith Marshes, with abstraction from the River Thames and return of brine effluent back to the River Thames.
- Option 4 Battersea – A new 25 Ml/d desalination plant and 50Ml/d blending site. Water would be abstracted from the Battersea Thames Water Ring Main shaft, blended with desalinated water and returned to the shaft for supply. Brine effluent would be returned to the River Thames.

67. No additional sites were identified for WRMP24.

68. The Stage 1 assessment of all WRMP19 and WRMP24 options is presented in Table 8 according to the assessment of the criteria described in the WRMP19 desalination feasibility report.

69. There are no changes from the WRMP19 assessment Seven options passed the Stage 1 assessment and were taken forward to Stage 2 assessment.

Desalination stage 1 assessment criteria	Option 1a Estuary North-Beckton	Option 1b Estuary North-River Lee	Option 2a Estuary South-Manor Road, Erith	Option 2b Estuary South-Erith Marshes south of Crossness STW	Option 2c Estuary South-Thamesmead West of Crossness STW	Option 2d Estuary South-Waldrist Way south of Crossness STW	Option 3a Estuary South- Erith Marshes south of Crossness STW direct-supply	Option 4 Battersea-new treatment / blend site direct-to Thames Water ring Main
Land availability	✓	✓	✓	✓	✓	✓	✓	X
Impact on National/ International conservation sites	✓	✓	✓	✓	✓	✓	✓	
Impact on any National / International heritage sites	✓	✓	✓	✓	✓	✓	✓	
Environmental viability of the abstraction	✓	✓	✓	✓	✓	✓	✓	
Impact on downstream abstractors (including unlicensed)	✓	✓	✓	✓	✓	✓	✓	
Source Quality (Treatability)	✓	✓	✓	✓	✓	✓	✓	
STAGE 1 Assessment	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL
	Back-checking completed for changes to phasing capacities					Backchecking completed for changes to phasing capacities		

Table 8: Stage 1 assessment of all options

Note - Yellow background indicates backchecking completed at WRMP24 for changes to phasing capacities.

70. One option, Option 4 at Battersea, failed the Stage 1 assessment; the reasons for the option rejection are included in the Rejection Register [WRMP24 Appendix Q - Scheme rejection register].

71. Further details regarding the Stage 1 assessments are included for WRMP19 options in the WRMP19 Desalination Feasibility Report.

Stage 2 assessment results

72. Options that passed Stage 1 were developed further for Stage 2, see WRMP19 Desalination Feasibility Report.

73. During the WRMP19 assessment at Stage 2 it became apparent that the proposed treatment site for Option 1a – using the land adjacent to Beckton gas works (Armada Way) - had significant issues and that a more viable location was to use land potentially available on Beckton STW site itself an option to use this new location was therefore taken forward.

74. The Stage 2 assessment of the WRMP19 and WRMP24 options that passed Stage 1 is presented in Table 9 providing the red, amber, green assessment of the criteria described in the WRMP19 Desalination Feasibility Report.

75. The additional options identified at WRMP24 are phasing variations incorporated within the WRMP19 options (Options 1a and 2d respectively). There were no changes to the WRMP19 RAG status as indicated in Table 9.

Criteria	Option 1a (Beckton STW)	Option 1b	Option 2a	Option 2b	Option 2c	Option 2d	Option 3a
Property & legal							
Ownership of Site and Tenancies							
Estimated Land Acquisition Cost							
Planning & environmental							
Land Use and Land Use Quality							
Floodplain encroachment (loss of floodplain / need for compensation storage)							
Landscape Character Sensitivity							
Views and Visual Amenity							
Nature Conservation and Biodiversity							
Archaeology and Historic Environment							
Non-traffic impact of construction on local residents							
Impact of construction on traffic							
Impact on recreation							
Water resources & water quality							
Engineering Criteria							
Length of conveyance							
Pumping head							
Access during construction and operation							
Connectivity to waste stream							
Construction Complexity							
STAGE 2 ASSESSMENT	PASS	FAIL	FAIL	PASS	FAIL	PASS	PASS

Table 9: Stage 2 assessment of all options

Note - Yellow background indicates backchecking completed at WRMP24 for changes to phasing capacities

76. Three options were rejected at Stage 2; the reasons for the option rejection are included in the Rejection Register [WRMP24 Appendix Q - Scheme rejection register].

77. There were no changes to the WRMP19 RAG status this is indicated in Table 9.

78. There are no changes to the WRMP19 Stage 2 feasibility assessment outcomes and the following four options were therefore taken forward to Stage 3:

- Option 1a : Desalination plant located at Beckton STW, with abstraction from the River Thames and brine returned with Beckton STW final effluent back to the River Thames. Option capacity up to 150 Ml/d. Treated water conveyed to Coppermills WTW for blending.
- Option 2b : Desalination plant located south of Crossness STW, near Erith Marshes, with abstraction from the River Thames and brine returned with Crossness STW final effluent back to the River Thames. Option capacity up to 300 Ml/d. Treated water conveyed to Honor Oak or Coppermills for blending.
- Option 2d : Desalination plant located south Erith Marshes on Thamesmead Industrial Estate Extension, Waldrist Way, with abstraction from the River Thames and brine returned with Crossness STW final effluent back to the River Thames. Option capacity up to 300 Ml/d. Treated water conveyed to Honor Oak or Coppermills for blending.
- Option 3a : Desalination plant located south of Crossness STW, near Erith Marshes, with abstraction from the River Thames and brine returned with Crossness STW final effluent back to the River Thames. Option capacity of 65 Ml/d. Treated water conveyed to Northumberland Heath service reservoir for direct supply to Riverside WRZ.

79. Further information regarding the investigations into the options is included in the WRMP19 Desalination Feasibility report.

Stage 3 assessment results

80. Assessment against Stage 3 criteria of options has been undertaken for all options that passed Stage 2.

81. The Stage 3 assessment of the WRMP19 and WRMP24 options that passed Stage 2 is presented in Table 10 providing the red, amber, green assessment of the criteria described in WRMP19 Desalination Feasibility report.

82. There were four additional phasing options identified in WRMP24 which have been included within the initial Options 2a and Option 2d of Table 10. These were found to have no changes from the WRMP19 RAG status for the original, maximum capacity option.

Criteria	Option 1a			Option 2b		Option 2d			Option 3a
Option Capacity (Ml/d)	50	100	150	150	300	50	100	300	65
Property & legal									
Ownership of Site and Tenancies									
Planning & environmental									
Planning policy and history									
Land Use and Land Use Quality									
Floodplain encroachment (loss of floodplain / need for compensation storage)									
Landscape Character Sensitivity									
Views and Visual Amenity									
Employment and local economy									
Nature Conservation and Biodiversity									
Opportunity for biodiversity improvement									
Archaeology and Historic Environment									
Non-traffic impact of construction on local residents									
Impact on recreation									
Water resources & water quality									
Engineering Criteria									
Length of conveyance									
Normalised Cost									
Water treatability / process complexity									
Power Supply									
Construction Complexity									
STAGE 3 ASSESSMENT	PASS	PASS	PASS	FAIL	FAIL	PASS	PASS	PASS	PASS

Table 10: Stage 3 assessment

*Yellow background indicates backchecking completed at WRMP24 for changes to phasing capacities.

84. Two options were rejected at Stage 3; the reasons for the option rejection are included in the Rejection Register [WRMP24 Appendix Q - Scheme rejection register], further information can also be found in WRMP19 Desalination Feasibility Report.

85. The following list of options passed Stage 3 feasibility assessment and were taken forward for further consideration:

- Option 1a (Beckton STW / Gascoigne Way) – A new 150 Ml/d desalination plant located on the existing Beckton STW site to transfer desalinated water to Coppermills WTW for blending. Source water to be abstracted from the River Thames upstream of the current Gateway abstraction, with the waste brine discharged with Beckton STW final effluent.
- Option 2d (Crossness - Thamesmead Industrial Estate Extension, Waldrist Way) - A new 300 Ml/d desalination plant located at Waldrist Way to transfer desalinated water to Coppermills WTW for blending. Source water to be abstracted is abstracted from the River Thames, with the waste brine discharged with Crossness STW final effluent.
- Option 3a (Crossness – Erith Southern Grazing Marshes) - A new 65 Ml/d desalination plant located to the south of Crossness STW to transfer desalinated water to Northumberland Heath Reservoir for direct supply to Riverside WRZ. Source water is abstracted from the River Thames, with the waste brine discharged with Crossness STW final effluent.

86. All new phasing options passed the Stage 3 assessment.

87. Further information regarding the investigations into the options is included in the WRMP19 Desalination Feasibility report.

Option Verification and Conclusion

Validation

88. At WRMP19 Option 3a (Crossness – Erith Southern Grazing Marshes) was rejected at Fine Screening. The rejection reasoning has been reviewed at WRMP24 and has been found to remain valid, the rejection reason and further information can be found in Appendix Q: rejection register and WRMP19 Desalination Feasibility Report. Option 3a has therefore been rejected at validation and has not been included on the Feasible List of options for WRMP24.

89. The validation discussion of risk and uncertainty in Section 7 of the WRMP19 Desalination Feasibility Report remains unchanged. Where options have been rejected through the screening process the rejection reason is recorded in Appendix Q Scheme Rejection Register.

90. The WRMP24 assessment verifies that the additional proposed phasing options considered allows flexibility for a phased approach to be included in the investment modelling decisions.

Confirmation of feasible list of options

91. The following list of options are the confirmed list of feasible desalination options for WRMP24:

- Option 1a (Beckton STW / Gascoigne Way): A new desalination plant located on the existing Beckton STW site to transfer desalinated water to Coppermills WTW for blending. This can be phased in 50 Ml/d or 100 Ml/d stages up to a limit of 150 Ml/d. The WRMP19 Stage 1-3 assessment findings for this option remains unchanged.
- Option 2d (Crossness - Thamesmead Industrial Estate Extension, Waldrist Way): A new desalination plant located to the South of Erith Marshes to transfer desalinated water to Coppermills WTW for blending. This can be phased in 50 Ml/d or 100 Ml/d stages up to a limit of 300 Ml/d. The WRMP19 Stage 1-3 assessment findings for this option remains unchanged.

92. Information on option development and investment modelling can be found in WRMP24 Section 7 - Appraisal of Resource Options.

Appendix A: Reference information

The WRMP24 and Technical Appendices can be found on the Thames Water website at:

Water resources | Regulation | About us | Thames Water

Please contact consultation@thames-wrmp.co.uk for access to WRMP19 reports.

Appendix B: Option WRMP19 and WRSE IDs

	WRMP 19 ID	WRSE ID
Option 1a Estuary North-Beckton	RES-DES-BEC-150	TWU_LON_HI-DES_ALL_CNO_beckton desal 100p1 TWU_LON_HI-DES_ALL_ALL_beckton desal TWU_LON_HI-DES_ALL_CNO_beckton desal 50 p1 TWU_LON_HI-DES_ALL_ALL_beckton desal 50p2a TWU_LON_HI-DES_ALL_ALL_beckton desal
Beckton to Coppermills tunnel (treated)	NET-DES-BEC-COP	TWU_LON_HI-TFR_LON_CNO_beckton-coppermills
Option 1b Estuary North-River Lee	See note	TWU_LON_HI-DES_RE1_ALL_rivleec'millsblended
Option 2a Estuary South-Manor Road, Erith	See note	TWU_LON_HI-DES_ALL_ALL_manorrd erith hr oak
Option 2b Estuary South-Erith Marshes south of Crossness STW	See note	TWU_LON_HI-DES_RE1_ALL_crossness(erith) 150 TWU_LON_HI-DES_RE1_ALL_crossness(erith) 300
Option 2c Estuary South-Thamesmead West of Crossness STW	See note	TWU_LON_HI-DES_RE1_ALL_tripcock ness 150 TWU_LON_HI-DES_RE1_ALL_tripcock ness 300
Option 2d Estuary South-Waldrist Way south of Crossness STW	RES-DES-CRO-100	TWU_LON_HI-DES_ALL_ALL_crossnessdesal TWU_LON_HI-DES_ALL_ALL_crossnessdesal100p2 TWU_LON_HI-DES_ALL_CNO_crossnessdesal50p1 TWU_LON_HI-DES_ALL_ALL_crossnessdesal50p2
Beckton to Crossness tunnel (raw)	CON-RWS-BEC-CRO-300	TWU_LON_HI-TFR_LON_CNO_beckton-crossness
Crossness to Beckton tunnel (treated)	NET-DES-CRO-BEC	TWU_LON_HI-ROC_NET_CNO_crossness-beckton
Option 3a Estuary South- Erith Marshes south of Crossness STW direct-supply	See note	TWU_LON_HI-DES_RE1_ALL_crossdesalunblend-65

Table B.1: Option WRMP19 and WRSE IDs

Note - Options rejected prior to Constrained List were not assigned a WRMP19 ID


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